M60/M62/M66 Simister Island Interchange

TR010064

ENVIRONMENTAL STATEMENT

CHAPTER 13 ROAD DRAINAGE AND THE WATER ENVIRONMENT

APFP Regulation 5(2)(a)

Planning Act 2008

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

VOLUME 6.1

September 2024

Infrastructure Planning

Planning Act 2008

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

M60/M62/M66 Simister Island Interchange

Development Consent Order 202[ ]

ENVIRONMENTAL STATEMENT
CHAPTER 13 ROAD DRAINAGE AND THE WATER ENVIRONMENT

Regulation Reference	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010064
Application Document Reference	TR010064/APP/6.1
Author	M60/M62/M66 Simister Island Interchange Costain Jacobs Partnership Project Team & National Highways

Version	**Date**	**Status of Version**
P02	September 2024	EXAMINATION DEADLINE 1 ISSUE

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13.1 Introduction

13.1.1 This chapter presents the information required by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 to be provided in the Environmental Statement for the M60/M62/M66 Simister Island Interchange (the 'Scheme') in respect of road drainage and the water environment (RDWE).

13.1.2 This chapter presents the results of an assessment of likely significant effects of the construction and operation of the Scheme on RDWE. It follows the methodology outlined in the Design Manual for Roads and Bridges (DMRB) LA 113 RDWE (Highways England, 2020a). The spatial scope of the assessment has included features of the water environment within at least 1km of the Order Limits of the Scheme. For certain matters, the study area has increased or decreased to fully assess the impacts of the Scheme on RDWE.

13.1.3 RDWE, as assessed in this chapter, comprises the following matters:

- Surface water: water quality (construction, routine runoff and spillage); water resources; and hydromorphology
- Groundwater: water quality (routine runoff and spillage); groundwater levels and flows; groundwater dependent terrestrial ecosystems (GWDTE); and groundwater abstractions
- Flood risk (all sources) and surface water drainage

13.1.4 This chapter is supported by the following Environmental Statement Figures (TR010064/APP/6.2):

- Figure 13.1: Surface Water Receptors
- Figure 13.2: Outfall Locations
- Figure 13.3: Bedrock Aquifer Designations
- Figure 13.4: Superficial Aquifers and Groundwater Receptors and Features
- Figure 13.5: GWTDEs and Groundwater Dependency Classification
- Figure 13.6: Flood Zones
- Figure 13.7: Areas At Risk From Surface Water Flooding
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13.1.5 This chapter is supported by the following Environmental Statement Appendices (TR010064/APP/6.3):

- Appendix 13.1: Water Framework Directive (WFD) Compliance Assessment Report

- Appendix 13.2: Water Quality Assessment Report
- Appendix 13.3: Hydromorphology Baseline Report
- Appendix 13.4: Groundwater Assessment Report
- Appendix 13.5: GWDTE Assessment Report
- Appendix 13.6: Flood Risk Assessment (FRA) Report
- Appendix 13.7: Drainage Strategy Report

13.2 Competent expert evidence

13.2.1 The assessment has been undertaken and reported by a team of competent water environment specialists. The competent expert responsible for the assessment is a Senior Associate Director and Head of Discipline for Water Science and Hydromorphology, qualified as a geormorphologist and environmental law specialist. They are a Chartered Scientist (CSci) and Chartered Marine Scientist (CmarSci) with the Institute of Marine Engineering, Science and Technology.

13.2.2 They have over 25 years' experience of undertaking RDWE Environmental Impact Assessments (EIA) for major infrastructure and linear schemes, including highways.

13.3 Legislative and policy framework

Legislation

13.3.1 The RDWE assessment has been undertaken in accordance with the legislation set out in Table 13.1.

Table 13.1 Legislation relevant to the RDWE assessment

Legislation	Description and relevance
Acts of Parliament	
Reservoirs Act 1975	This legislation was enacted to protect against escapes of water from large reservoirs or from artificially created or enlarged lakes. The Reservoirs Act 1975 has been amended by the Flood and Water Management Act 2010. It essentially provides regulation for assessing risk of escape of water and ensuring that reservoirs are regularly monitored, and their asset status (integrity) is regularly assessed. This is enforced by the Environment Agency in England.
Environmental Protection Act 1990 (as amended)	The Act sets out the fundamental structure and authority for waste management and control of emissions into the environment across England (plus Wales and Scotland).
Land Drainage Act 1991 (as amended)	The Act requires that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded. Sets out the requirement that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded. The riparian owner must accept the natural flow from upstream but need not carry out work to cater for increased flows resulting from some types of works carried out upstream.
Water Resources Act 1991 (as amended)	The Act regulates water resources, water quality, water pollution, flood defence, and provides for the general management of water resources, the standards expected for controlled waters, and prevention/mitigation through flood defence.
Water Industry Act 1991 (as amended)	The Act regulates water and sewerage industries and lays out the legislative provisions in relation to discharge consents to sewers.
Environment Act 1995 (as amended)	This legislation set the standard for environmental management and made provision for the establishment of the Environment Agency. The Environment Agency is a key consultee for water environment elements of the Scheme.
Water Act 2003 (as amended)	This Act amends the Water Resources Act 1991 to improve long-term water resource management. The four broad aims of the Act are as follows: the sustainable use of water resources; strengthening the voice of consumers; a measured increase in competition; and the promotion of water conservation.

Legislation	Description and relevance
Climate Change Act 2008	This legislation requires that emissions of carbon dioxide and other greenhouse gases are reduced and that climate change risks are prepared for. The Scheme is expected to consider the impact of climate change when assessing future effects.
Flood and Water Management Act 2010	The Act established Lead Local Flood Authorities (LLFAs) with responsibilities to manage local sources of flooding.
Water Act 2014	This legislation governs public water supply, water companies and provides greater protection to consumers. It sets out the main powers for water companies and provides a framework for licensing and permitting.
Regulations	
Urban Wastewater Treatment (England and Wales) Regulations 1994	The Regulations transposed the Urban Waste Water Directive 1991 (91/271/EEC). The Regulations protect the environment from the adverse effects of urban wastewater discharges and discharges from certain industrial sectors, in particular the collection, treatment and discharge of domestic wastewater; or the mixture of domestic wastewater and industrial wastewater and/or runoff rain water.
The Control of Pollution (Applications, Appeals and Registers) Regulations 1996	The Regulations prescribe the procedure to be followed in relation to applications for consents (including discharge consents) under Chapter II of Part III of the Water Resources Act 1991.
Control of Pollution (Oil Storage) (England) Regulations 2001	The Regulations control the above-ground storage of oil and oil-derived products so as to prevent pollution of the water environment.
The Water Resources (Abstraction & Impounding) Regulations 2006	Sets out provisions relating to the licensing of abstraction and impounding of water in England and Wales.

Legislation	Description and relevance
Flood Risk Regulations 2009 (as amended)	The Regulations transposed the Floods Directive 2007/60/EC and established a framework for assessing and managing flood risk, aimed at reducing the negative impact of flooding on human health, the environment, cultural heritage and economic activity. The Regulations require the preparation of flood risk assessments, flood hazard maps, flood risk maps and flood management plans for river basin districts in England and Wales and certain cross-border river basin districts.
The Groundwater (England and Wales) Regulations 2009	The Regulations prescribe the requirements of the Environment Agency in considering applications for a permit that may lead to the discharge of a pollutant.
Nitrate Pollution Prevention Regulations 2015 (as amended)	The Regulations transposed the requirements of the Nitrates Directive 91/676/EEC. The Regulations require action to be taken to reduce ground and surface water pollution caused by nitrates released from agricultural sources, and provides for the designation of land as nitrate vulnerable zones.
The Private Water Supplies (England) Regulations 2016 (as amended)	The Regulations set out standards for private water supplies (PWS) intended for human consumption including wells and boreholes. The Regulations impose a duty on the local authority to carry out a risk assessment of private water supplies and to monitor the supply to ensure water quality standards.
The Environmental Permitting (England and Wales) Regulations 2016 (as amended)	The Regulations incorporate the requirements of more than 20 EU directives, including the Drinking Water Directive (98/83/EC), the Groundwater Directive (2006/118/EC), the Water Framework Directive (2000/60/EC) and the Priority Substances Directive (2008/105/EC) (the latter is also known as the Environmental Quality Standards Directive). The Regulations set out the regulatory framework for the control of water discharge activities through environmental permitting, exclude some discharges from control as water discharge activities, exempt some water discharge activities from environmental permitting, and provide for compliance obligations. They apply environmental quality standards to waters and certain pollutants and set out measures to prevent discharges of hazardous substances and limit discharges of non-hazardous pollutants into surface and groundwater.
The Water Supply (Water Quality) Regulations 2016	The Regulations consolidated legislation concerning the quality of water supplies for human consumption in England. They aim to prevent contamination of water supply and ensure standards for water quality are met.

Legislation	Description and relevance
The Conservation of Habitats and Species Regulations 2017	The Conservation of Habitats and Species Regulations 2017 ('the Habitats Regulations 2017') implement Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ('the Habitats Directive') and elements of Directive 2009/147/EC on the conservation of wild birds ('the Birds Directive') in England, Wales and, to a limited extent, Scotland and Northern Ireland. The objective is to protect biodiversity through the conservation of natural habitats and species of wild fauna and flora through rules for the protection, management and exploitation of such habitats and species.
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017	The Regulations transposed the Water Framework Directive 2006/60/EC and require that River Basin Management Plans (RBMP) are prepared for each river basin district in England and Wales that include environmental objectives to achieve and maintain good ecological and chemical status for all surface and groundwater bodies. Public bodies must take into account river basin management plans and any supplementary plan when exercising their functions that could affect the quality of the water environment.
Floods and Water (Amendment, etc) (EU Exit) Regulations 2019	These regulations aim to ensure that, following the withdrawal of the UK from the EU, legislation in the fields of water and floods continues to operate correctly.

National policy

National Policy Statement for National Networks

13.3.2 The National Policy Statement for National Networks (NPS NN) (Department for Transport (DfT), 2014) sets out the Government's policies relating to the development of Nationally Significant Infrastructure Projects (NSIPs) on the national road and rail networks in England. The Secretary of State uses the NPS NN as the primary basis for making decisions on Development Consent Order (DCO) applications.

13.3.3 Table 13.2 summarises the policy requirements from the designated NPS NN relating to the applicant's assessment and mitigation requirements for RDWE and how these requirements have been addressed in the assessment. See also the NPS NN Accordance Tables (TR010064/APP/7.2) for an assessment of the Scheme's compliance with the NPS NN.

Table 13.2 NPS NN requirements for RDWE

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
Flood risk		
5.92	*'Applications for projects in the following locations should be accompanied by a flood risk assessment (FRA):* • *Flood Zones 2 and 3, medium and high probability of river and sea flooding;* • *Flood Zone 1 (low probability of river and sea flooding) for projects of 1 hectare or greater, projects which may be subject to other sources of flooding (local watercourses, surface water, groundwater or reservoirs), or where the Environment Agency has notified the local planning authority that there are critical drainage problems.'*	The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) demonstrates that the Scheme is within Flood Zone 1 (Low Risk). Climate change has been considered as part of the assessment, with 0.1% (1 in 1000) Annual Exceedance Probability (AEP) event flood extents from surface water flood mapping used as part of the assessment. It is considered likely that the 0.1% (1 in 1000) AEP flood extents give a reasonable approximation of potential future 1% (1 in 100) AEP extents in a credible maximum climate change scenario.
5.93	*'This should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account.'*	
5.94	*'In preparing an FRA the applicant should:* • *consider the risk of all forms of flooding arising from the project (including in adjacent parts of the United Kingdom), in addition to the risk of flooding to the project, and demonstrate how these risks will be managed and, where relevant, mitigated, so that the development remains safe throughout its lifetime;* • *take the impacts of climate change into account, clearly stating the development lifetime over which the assessment has been made;*	

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
	• *consider the vulnerability of those using the infrastructure including arrangements for safe access and exit;* • *include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular project;* • *consider if there is a need to remain operational during a worst case flood event over the development's lifetime;* • *provide the evidence for the Secretary of State to apply the Sequential Test and Exception Test, as appropriate.'*	
5.95	*'Further guidance can be found in the Government's planning guidance supporting the National Planning Policy Framework issued by the Government.'*	

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.96	*'Applicants for projects which may be affected by, or may add to, flood risk are advised to seek sufficiently early pre-application discussions with the Environment Agency, and, where relevant, other flood risk management bodies such as lead local flood authorities, Internal Drainage Boards, sewerage undertakers, highways authorities and reservoir owners and operators. Such discussions can be used to identify the likelihood and possible extent and nature of the flood risk, to help scope the FRA, and identify the information that will be required by the Secretary of State to reach a decision on the application once it has been submitted and examined. If the Environment Agency has concerns about the proposal on flood risk grounds, the applicant is encouraged to discuss these concerns with the Environment Agency and look to agree ways in which the proposal might be amended, or additional information provided, which would satisfy the Environment Agency's concerns, preferably before the application for development consent is submitted.'*	The Consultation Report (TR010064/APP/5.1) sets out the engagement that has taken place to date with Bury Metropolitan Borough Council (as the LLFA) and the Environment Agency. Statements of Common Ground (SoCGs) with Bury Metropolitan Borough Council and the Environment Agency will be prepared and submitted during the course of the Examination.
5.97	*'For local flood risk (surface water, groundwater and Ordinary Watercourse flooding), local flood risk management strategies and surface water management plans provide useful sources of information for consideration in Flood Risk Assessments. Surface water flood issues need to be understood and then account of these issues can be taken, for example flow routes should be clearly identified and managed.'*	The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) demonstrates that the Scheme is within Flood Zone 1 (Low Risk).

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.110	*'To satisfactorily manage flood risk and the impact of the natural water cycle on people, property and ecosystems, good design and infrastructure may need to be secured using requirements or planning obligations. This may include the use of sustainable drainage systems but could also include vegetation to help to slow runoff, hold back peak flows and make landscapes more able to absorb the impact of severe weather events.'*	An Outline Surface and Ground Water Management Plan is provided at Appendix H of the First Iteration Environmental Management Plan (EMP) (TR010064/APP/6.5). The First Iteration EMP will be developed into the Second Iteration EMP for implementation during construction and is secured by Requirement 4 of the draft DCO (TR010064/APP/3.1). SuDS have been incorporated into the drainage design. Details of the SuDS measures included in the Scheme are included in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)). During operation, the Scheme would result in an increase in impermeable area due to the additional carriageway. Runoff from such areas would drain to new attenuation ponds that would restrict outflows to rates that do not increase flood risk (as detailed in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)), therefore ensuring no increase to flood risk and no significant adverse effect. The Scheme drainage would mitigate any significant effects from surface water.
5.111	*'In this document the term Sustainable Drainage Systems (SuDS) is frequently used and taken to cover the whole range of sustainable approaches to surface water drainage management including:* • *source control measures including rainwater recycling and drainage;* • *infiltration devices to allow water to soak into the ground, that can include individual soakaways and communal facilities;* • *filter strips and swales, which are vegetated features that hold and drain water downhill mimicking natural drainage patterns;* • *filter drains and porous pavements to allow rainwater and run-off to infiltrate into permeable material below ground and provide storage if needed;* • *basins and ponds to hold excess water after rain and allow controlled discharge that avoids flooding; and* • *flood routes to carry and direct excess water through developments to minimise the impact of severe rainfall flooding.'*	

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.112	*'Site layout and surface water drainage systems should cope with events that exceed the design capacity of the system, so that excess water can be safely stored on or conveyed from the site without adverse impacts.'*	
5.113	*'The surface water drainage arrangements for any project should be such that the volumes and peak flow rates of surface water leaving the site are no greater than the rates prior to the proposed project, unless specific off-site arrangements are made and result in the same net effect.'*	
5.114	*'It may be necessary to provide surface water storage and infiltration to limit and reduce both the peak rate of discharge from the site and the total volume discharged from the site. There may be circumstances where it is appropriate for infiltration attenuation storage to be provided outside the project site, if necessary through the use of a planning obligation.'*	
5.115	*'The sequential approach should be applied to the layout and design of the project. Vulnerable uses should be located on parts of the site at lower probability and residual risk of flooding. Applicants should seek opportunities to use open space for multiple purposes such as amenity, wildlife habitat and flood storage uses. Opportunities can be taken to lower flood risk by improving flow routes, flood storage capacity and using SuDS.'*	

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
Water quality and resources		
5.221	*'Applicants should make early contact with the relevant regulators, including the Environment Agency, for abstraction licensing and with water supply companies likely to supply the water. Where a development is subject to EIA and the development is likely to have significant adverse effects on the water environment, the applicant should ascertain the existing status of, and carry out an assessment of the impacts of the proposed project on water quality, water resources and physical characteristics as part of the environmental statement.'*	The Applicant is having ongoing discussion with the Environment Agency and United Utilities (see the Consultation Report (TR010064/APP/5.1) for full details of the engagement undertaken to date with the Environment Agency and United Utilities). Details of licenses and permits for the construction and operation of the Scheme, including those required from United Utilities and the Environment Agency, are available in the Consents and Agreements Position Statement (TR010064/APP/3.3). Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5) details how water will be managed during construction and to reduce the overall impact on potable water resources. An assessment of the potential impacts on water quality and water resources has been considered within this chapter. A detailed assessment of the impact of the Scheme on operational water quality is included in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3). Appendix 13.3: Hydromorphology Baseline Report of the Environmental Statement Appendices (TR010064/APP/6.3) details existing characteristics of each watercourse scoped into the assessment. This is then referred to in the assessment in this chapter.

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.222	*'For those projects that are improvements to the existing infrastructure, such as road widening, opportunities should be taken, where feasible, to improve upon the quality of existing discharges where these are identified and shown to contribute towards Water Framework Directive commitments.'*	Routine runoff assessments and spillage risk assessments have been undertaken. Full details of the methodology, data used and results are presented in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3). As stated in paragraph 13.10.13 of this chapter, there would be a neutral effect on all outfalls except for outfall 1 and 2. For these two outfalls (outfall 1 and 2), water quality treatment does not exist under the present situation and therefore the provision of treatment measures for these two drainage catchments leads to a slight beneficial effect.
5.223	*'Any environmental statement should describe:* • *the existing quality of waters affected by the proposed project;* • *existing water resources affected by the proposed project and the impacts of the proposed project on water resources;* • *existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project, and any impact of physical modifications to these characteristics;* • *any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive and source protection zones (SPZs) around potable groundwater abstractions; and* • *any cumulative effects.'*	The existing quality of waters, water resources and physical characteristics of the water environment are described in Section 13.7 of this chapter. Impacts on water bodies or protected areas under the Water Framework Directive and source protection zones (SPZs) around potable groundwater abstractions are assessed in Section 13.10 of this chapter. Cumulative effects on water environment receptors (for example from contamination and vegetation clearance) are assessed in this chapter and supporting appendices. Cumulative effects arising from the Scheme in combination with other reasonably foreseeable developments are assessed in Chapter 15: Assessment of Cumulative Effects of this Environmental Statement (TR010064/APP/6.1).

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.228	*'The impact on local water resources can be minimised through planning and design for the efficient use of water, including water recycling.'*	Section K.4 of Appendix K: Outline Energy and Resource Use Management Plan of the First Iteration EMP (TR010064/APP/6.5) contains details of water minimisation techniques that would be implemented and managed during construction through the application of the water hierarchy.
5.229	*'The Secretary of State should consider whether the mitigation measures put forward by the applicant which are needed for operation and construction (and which are over and above any which may form part of the project application) are acceptable. A construction management plan may help codify mitigation.'*	Section 13.9 of this chapter describes embedded and essential mitigation measures and enhancement measures that have been identified. These measures are included in the Register of Environmental Actions and Commitments (REAC), contained within the First Iteration EMP (TR010064/APP/6.5). An Outline Surface and Ground Water Management Plan is also provided at Appendix H of the First Iteration EMP (TR010064/APP/6.5). The First Iteration EMP will be developed into the Second Iteration EMP for implementation during construction and is secured by Requirement 4 of the draft DCO (TR010064/APP/3.1).
5.230	*'The project should adhere to any National Standards for sustainable drainage systems (SuDs). The National SuDs Standards will introduce a hierarchical approach to drainage design that promotes the most sustainable approach but recognises feasibility, and use of conventional drainage systems as part of a sustainable solution for any given site given its constraints.'*	SuDS have been incorporated into the drainage design. Details of the SuDS measures included in the Scheme are included in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)). All SuDS and drainage networks would be fully maintained and managed as per standard National Highways guidance and practice in accordance with the SuDS Manual C753 (Construction Industry Research and Information Association (CIRIA), 2015a). Requirements for maintenance and management of vegetated drainage systems are described in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)).

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.231	*'The risk of impacts on the water environment can be reduced through careful design to facilitate adherence to good pollution control practice. For example, designated areas for storage and unloading, with appropriate drainage facilities, should be marked clearly.'*	Section 13.9 of this chapter describes the mitigation measures that have been identified. These measures would reduce impacts on the water environment from pollution, for example pollution from maintenance activities during the operational phase. These measures are included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5).

Draft National Policy Statement for National Networks

13.3.4 The Government has published a draft of the NPS NN in March 2023 (DfT, 2023). The consultation closed in June 2023 and the draft NPS NN has not yet been designated. However, it is potentially capable of being an important and relevant consideration in the decision-making process. The Environmental Statement continues to reference the 2014 NPS NN though, as it remains the relevant Government policy. Notwithstanding that position, Table 13.3 summarises the policy requirements from the draft NPS NN relating to the applicant's assessment and mitigation requirements for RDWE and how these have been addressed in the assessment. See also the Draft NPS NN Accordance Tables (TR010064/APP/7.3) for an assessment of the Scheme's compliance with the draft NPS NN.

Table 13.3 Draft NPS NN requirements for RDWE

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
4.37	*'The Secretary of State should be satisfied that applications for new national networks infrastructure have taken into account the potential direct and indirect impacts of climate change. This should include using the latest UK Climate Projections and associated research and expert guidance (such as the Environment Agency's Climate Change Allowances for Flood Risk Assessments) applicable at the time the environmental assessment was prepared as part of their Development Consent Order application, to ensure they have identified mitigation or adaptation measures. This should cover the estimated lifetime of the new infrastructure, with a high level of climate resilience built-in from the outset. The applicant should also be able to demonstrate how proposals can be adapted over their predicted lifetimes to remain resilient to a credible maximum climate change scenario. Should a revised set of UK Climate Projections or associated research be applicable after the preparation of the environmental assessment, the Examining Authority should consider whether they need to request further information from the applicant.'*	Details of how the Environmental Statement has taken into account the potential direct and indirect impacts of climate change can be found in Section 14.3 of Chapter 14: Climate of this Environmental Statement (TR010064/APP/6.1). Climate change has been considered as part of the RDWE assessment, with the 0.1% (1 in 1000) AEP event flood extents from surface water flood mapping used as part of the assessment. It is considered likely that the 0.1% (1 in 1000) AEP flood extents give a reasonable approximation of potential future 1% (1 in 100) AEP extents in a credible maximum climate change scenario.
4.39	*'Any adaptation measures should be based on the latest set of UK Climate Projections, the government's latest UK Climate Change Risk Assessment, when available and in consultation with the Environment Agency's Climate Change Allowances for Flood Risk Assessments. Any adaptation measures must themselves also be assessed as part of any environmental assessment, which should set out how and where such measures are proposed to be secured.'*	No adaptation measures have been identified.

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
Flood risk		
5.122	*'Applications for projects in the following flood zone locations should be accompanied by a Flood Risk Assessment:* • *Applications in flood Zones 2 and 3, which represent a medium and high probability of river and sea flooding* • *Applications in flood Zone 1 which represent a low probability of river and sea flooding. This includes projects of 1 hectare or greater, projects which may be subject to other sources of flooding (local watercourses, surface water, groundwater or reservoirs), or where the Environment Agency has notified the local planning authority that there are critical drainage problems* • *Applications where there is less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs)'*	The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) demonstrates that the Scheme is wholly located within Flood Zone 1 (Low Risk).
5.123	*'The Flood Risk Assessment should identify and assess the risks of all forms of flooding and coastal erosion to and from the project and demonstrate how these flood risks will be managed, taking climate change into account.'*	The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) demonstrates that the Scheme would not increase flood risk elsewhere and is appropriately flood resilient to increases in rainfall intensity as a result of climate change. It would remain operational and safe for users in times of flood.
5.124	*'In preparing a Flood Risk Assessment the applicant should:* • *consider the risk of all forms of flooding arising from the project (including in adjacent parts of the United Kingdom), in addition to the risk of flooding to the project, and demonstrate how these risks*	The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) includes the following: • An assessment of flood risk to the Scheme from all sources

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
	will be managed and, where relevant, mitigated, so that the development remains safe throughout its lifetime • *take the impacts of climate change into account, clearly stating the development lifetime over which the assessment has been made* • *demonstrate how residual risks to and from reservoirs will be safely managed and/ or mitigated* • *consider the vulnerability of those using the infrastructure including arrangements for safe access and escape* • *include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular project* • *consider if there is a need to remain operational during a worst-case flood event over the development's lifetime* • *provide the rationale for the Secretary of State on the application of the Sequential Test and Exception Test, as appropriate'*	• An assessment of change in flood risk from all sources as a result of the Scheme • Appropriate consideration of the impacts of climate change on flood risk using the latest UK Climate Projections available • An initial assessment of mitigation measures to prevent adverse impact on flood risk • Details of completion of the Sequential and Exception Tests. The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) demonstrates that the Scheme would not increase flood risk elsewhere and is appropriately flood resilient to increases in rainfall intensity as a result of climate change. It would remain operational and safe for users in times of flood.

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.125	*'Applicants for projects which may be affected by, or may add to, flood risk should seek sufficiently early pre-application discussions, before the official pre-application stage of the NSIP process with the Environment Agency, and, where relevant, other flood risk management bodies such as lead local flood authorities, Internal Drainage Boards, sewerage undertakers, and highways authorities. Such discussions can be used to identify the likelihood and possible extent and nature of the flood risk, to help scope the Flood Risk Assessment, and identify the information that will be required by the Secretary of State to reach a decision on the application once it has been submitted and examined. If the Environment Agency has concerns about the proposal on flood risk grounds, the applicant should discuss these concerns with the Environment Agency and look to agree ways in which the proposal might be amended, or additional information provided, which would satisfy the Environment Agency's concerns, before the application for development consent is submitted.'*	The Consultation Report (TR010064/APP/5.1) sets out the engagement that has taken place to date with BMBC as the LLFA and with the Environment Agency. SoCGs will be prepared with BMBC and the Environment Agency and submitted during the course of the Examination.
5.126	*'For local flood risk (surface water, groundwater and Ordinary Watercourse flooding), local flood risk management strategies and surface water management plans provide useful sources of information for consideration in Flood Risk Assessments. Surface water flood issues need to be understood and then account of these issues can be taken, for example, flow routes should be clearly identified and managed.'*	Surface water risk and flow routes have been identified in Appendix 13.6: FRA of the Environmental Statement Appendices (TR010064/APP/6.3).
5.127	*'Proposals should prioritise the use of sustainable drainage systems unless there is clear evidence that this would be inappropriate. A drainage strategy should also be produced and submitted as part of the Flood Risk Assessment.'*	SuDS have been incorporated into the drainage design. Details of the SuDS measures included in the Scheme are included in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)).

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.128	*'Preference should be given to locating projects in areas of lowest flood risk. The Secretary of State should not consent development in flood risk areas (including flood zones 2 and 3 and locations at risk of flooding from local watercourses, surface water, groundwater or reservoirs) accounting for the predicted impacts of climate change unless they are satisfied that the sequential test requirements have been met. The Secretary of State should not consent development in Flood Zone 3 unless they are satisfied that the Sequential and Exception Test requirements have been met. All projects should apply the sequential approach to locating development within the site.'*	The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) demonstrates that the Scheme is wholly located within Flood Zone 1 (Low Risk). The Scheme is wholly located within Flood Zone 1, and therefore passes the Sequential Test based on being located in the area of lowest flood risk. Additionally, elements of the Scheme susceptible to other sources of flooding have been located in areas at low risk from these sources.
5.129	*'If, following application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the project to be located in zones of lower probability of flooding than Flood Zone 3a, the Exception Test can be applied. Flood Zone 3a applies when land has a 1 in 100 or greater annual probability of river flooding. The Exception Test provides a method of managing flood risk while still allowing necessary development to occur.'*	The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) demonstrates that the Scheme is wholly located within Flood Zone 1. and that susceptible elements of the Scheme have been located within areas at low risk of surface water and groundwater flooding. Therefore the Scheme passes the Sequential Test based on being located in the area of lowest flood risk , and application of the Exception Test is not required.
5.130	*'The Exception Test should only be applied once the Sequential Test has been satisfactorily applied.'*	
5.131	*'Both elements of the test will have to be passed for development to be consented. For the Exception Test to be passed:* • *it must be demonstrated that the project provides wider sustainability benefits to the community that outweigh flood risk* • *a Flood Risk Assessment must demonstrate that the project will be safe for its lifetime, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall'*	

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.132	*'In addition, any project that is classified as 'essential infrastructure' and proposed to be located in Flood Zone 3a or b should be designed and constructed to remain operational and safe for users in times of flood; and any project in Flood Zone 3b should result in no net loss of floodplain storage and not impede water flows.'*	
5.133	*'To satisfactorily manage flood risk and the impact of the natural water cycle on people, property and ecosystems, good design and infrastructure may need to be secured using requirements or planning obligations. This may include the use of Sustainable Drainage Systems but could also include vegetation to help to slow runoff, hold back peak flows and make landscapes more able to absorb the impact of severe weather events.'*	An Outline Surface and Ground Water Management Plan is provided at Appendix H of the First Iteration EMP (TR010064/APP/6.5). The First Iteration EMP will be developed into the Second Iteration EMP for implementation during construction and is secured by Requirement 4 of the draft DCO (TR010064/APP/3.1). SuDS have been incorporated into the drainage design. Details of the SuDS measures included in the Scheme are included in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)). During operation, the Scheme would result in an increase in impermeable area due to the additional carriageway. Runoff from such areas would drain to new attenuation ponds that would restrict outflows to rates that do not increase flood risk (as detailed in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)), therefore ensuring no increase to flood risk and no significant adverse effect. The Scheme drainage would mitigate any significant effects from surface water.
5.134	*'Site layout and surface water drainage systems should cope with events that exceed the design capacity of the system, so that excess water can be safely stored on or conveyed from the site without adverse impacts.'*	
5.135	*'The surface water drainage arrangements for any project should be such that the volumes and peak flow rates of surface water leaving the site are no greater than the rates prior to the proposed project unless specific off-site arrangements are made and result in the same net effect.'*	
5.136	*'If there are no viable Sustainable Drainage Systems options available, it may be necessary to provide surface water storage and infiltration to limit and reduce both the peak rate of discharge from the site and the total volume discharged from the site. There may be circumstances where it is appropriate for infiltration attenuation storage to be provided outside the project site, if necessary, through the use of a planning obligation.'*	

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.137	*'The sequential approach should be applied to the layout and design of the project. Vulnerable uses should be located on parts of the site at lower probability and residual risk of flooding. Applicants should seek opportunities to use open space for multiple purposes such as amenity, wildlife habitat and flood storage uses. Opportunities can be taken to lower flood risk by improving flow routes, flood storage capacity and using Sustainable Drainage Systems.'*	The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) demonstrates that the Scheme is wholly located within Flood Zone 1, and therefore passes the Sequential Test based on being located in the area of lowest flood risk, and susceptible elements of the Scheme have been located within areas at low risk of surface water and groundwater flooding. SuDS have been incorporated into the drainage design. Details of the SuDS measures included in the Scheme are included in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)). During operation, the Scheme would result in an increase in impermeable area due to the additional carriageway. Runoff from such areas would drain to new ponds that would restrict outflows to rates that do not increase flood risk (as detailed in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)), therefore ensuring no increase to flood risk and no significant adverse effect. The Scheme drainage would mitigate any significant effects from surface water.

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
Water quality and resources		
5.245	*'Applicants should make early contact with the relevant regulators, including the Environment Agency, for abstraction licensing or water quality activity or groundwater activity permits, and with water supply companies likely to supply the water. Where development is likely to have adverse effects on the water environment, the applicant should undertake an assessment of the existing status and impacts of the proposed project on water quality, water resources and physical characteristics of the water environment as part of the Environmental Statement or equivalent. The assessment should also include how this might change due to the impact of climate change on rainfall patterns and consequently water availability across the water environment (see paragraphs 4.30 to 4.41).'*	The Applicant is having ongoing discussion with the Environment Agency and United Utilities (see the Consultation Report (TR010064/APP/5.1) for full details of the engagement undertaken to date with the Environment Agency and United Utilities). Details of licenses and permits for the construction and operation of the Scheme, including those required from United Utilities and the Environment Agency, are available in the Consents and Agreements Position Statement (TR010064/APP/3.3). Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5) details how water will be managed during construction and to reduce the overall impact on potable water resources. An assessment of the potential impacts on water quality and water resources has been considered within this chapter. A detailed assessment of the impact of the Scheme on operational water quality is included in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3). Appendix 13.3: Hydromorphology Baseline Report of the Environmental Statement Appendices (TR010064/APP/6.3) details existing characteristics of each watercourse scoped into the assessment. This is then referred to in the assessment in this chapter.

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.246	*'For those projects that are improving the existing infrastructure, such as road widening, opportunities should be taken, where feasible, to improve the quality of existing discharges where these are identified and shown to contribute towards Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 ("Water Framework Regulations") commitments. A permit under the Environmental Permitting Regulations may also be required where improvements are being made to existing infrastructure, for example, the discharge of contaminated water from roads.'*	Routine runoff assessments and spillage risk assessments have been undertaken. Full details of the methodology, data used and results are presented in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3). As stated in paragraph 13.10.13 of this chapter, there would be a neutral effect on all outfalls except for outfall 1 and 2. For these two outfalls (outfall 1 and 2), water quality treatment does not exist under the present situation and therefore the provision of treatment measures for these two drainage catchments leads to a slight beneficial effect. Details of licenses and permits for the construction and operation of the Scheme, including those required from United Utilities and the Environment Agency, are available in the Consents and Agreements Position Statement (TR010064/APP/3.3).
5.247	*'Under Environmental Permitting Regulations, applicants are required to manage surface water during construction by treating surface water runoff from exposed topsoil prior to discharging and to limit the discharge of suspended solids. For example, from car parks or other areas of hard standing, during operation. Consent may be required for working near to a river from the Environment Agency and a pollution incident response plan is recommended.'*	Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5) details how water will be managed during construction and to reduce the overall impact on potable water resources. Details of licenses and permits for the construction and operation of the Scheme are available in the Consents and Agreements Position Statement (TR010064/APP/3.3).

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.248	*'Applicants should consider protective measures to control the risk of pollution to groundwater beyond those outlined in Environmental Management Plans - this could include, for example, the use of protective barriers.'*	Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5) includes Scheme-specific measures manage the risk of pollution to surface waters and groundwater by capturing and treating construction site runoff, to ensure that it can be discharged into the existing networks or directly to a watercourse.
5.249	*'Any assessment for both the construction and operational phases of the development should describe:* • *the existing quality of waters affected by the proposed project, and how climate change will impact on this* • *existing water resources affected by the proposed project, the impacts of the proposed project on water resources, and how climate change will impact on this* • *existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project, and any impact of physical modifications to these characteristics* • *any impacts of the proposed project on water bodies or protected areas under the Water Framework Regulations and source protection zones around potable groundwater abstractions; and how climate change will impact on this* • *any cumulative effects'*	The existing quality of waters, water resources and physical characteristics of the water environment are described in Section 13.7 of this chapter. Impacts on water bodies or protected areas under the WFD and SPZs around potable groundwater abstractions are assessed in Section 13.10 of this chapter. Climate change has been considered as part of the assessment, with 0.1% (1 in 1000) AEP event flood extents from surface water flood mapping used as part of the assessment. It is considered likely that the 0.1% (1 in 1000) AEP flood extents give a reasonable approximation of potential future 1% (1 in 100) AEP extents in a credible maximum climate change scenario. Cumulative effects on water environment receptors (for example from contamination and vegetation clearance) are assessed in this chapter and supporting appendices. Cumulative effects arising from the Scheme in combination with other reasonably foreseeable developments are assessed in Chapter 15: Assessment of Cumulative Effects of this Environmental Statement (TR010064/APP/6.1).

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.250	*'The assessment should also identify protected areas and other water usages within the vicinity of any discharge, such as bathing waters, abstractions and fisheries at risk from proposed works and the permits/consents required. It should also identify opportunities to improve water quality, for example, through nature-based approaches or solutions, and as part of environmental and biodiversity net gain.'*	Section 13.7 of this chapter identifies protected areas and other water usages within the vicinity of any discharge. Details of licenses and permits for the construction and operation of the Scheme are available in the Consents and Agreements Position Statement (TR010064/APP/3.3). For two outfalls (outfall 1 and 2), water quality treatment does not exist under the present situation and the provision of treatment measures for these two drainage catchments leads to a slight beneficial effect.
5.251	*'The impact on local water resources can be minimised through planning and design for the efficient use of water, including water recycling. If an applicant needs new water infrastructure, significant supplies or impacts other water supplies, the applicant should consult with the local water company and the Environment Agency.'*	Section K.4 of Appendix K: Outline Energy and Resource Use Management Plan of the First Iteration EMP (TR010064/APP/6.5) contains details of water minimisation techniques that would be implemented and managed during construction through the application of the water hierarchy. The Applicant is having ongoing discussion with the Environment Agency and United Utilities (see the Consultation Report (TR010064/APP/5.1) for full details of the engagement undertaken to date with the Environment Agency and United Utilities).

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.252	*'The Secretary of State should consider whether the mitigation measures put forward by the applicant which are needed for operation and construction (and which are over and above any which may form part of the project application) are acceptable. A construction management plan may help codify mitigation.'*	Section 13.9 of this chapter describes embedded and essential mitigation measures and enhancement measures that have been identified. These measures are included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5). An Outline Surface and Ground Water Management Plan is also provided at Appendix H of the First Iteration EMP (TR010064/APP/6.5). The First Iteration EMP will be developed into the Second Iteration EMP for implementation during construction and is secured by Requirement 4 of the draft DCO (TR010064/APP/3.1).
5.253	*'The project should adhere to any National Standards for Sustainable Drainage Systems. The Sustainable Drainage Systems Technical Standards introduced a hierarchical approach to drainage design that promotes the most sustainable approach but recognises feasibility and use of conventional drainage systems as part of a sustainable solution for any given site given its constraints.'*	SuDS have been incorporated into the drainage design. Details of the SuDS measures included in the Scheme are included in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)). All SuDS and drainage networks would be fully maintained and managed as per standard National Highways guidance and practice in accordance with the SuDS Manual C753 (Construction Industry Research and Information Association (CIRIA), 2015a). Requirements for maintenance and management of vegetated drainage systems are described in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)).

Paragraph reference	Applicant's assessment / mitigation requirement	How this is addressed in the assessment
5.254	*'The project should identify opportunities and secure measures to protect and improve water quality and resources through green and blue infrastructure, sustainable drainage and environmental and biodiversity net gain. This will help to achieve 25 Year Environment Plan objectives and potentially provide greater capacity to support infrastructure needs.'*	The Applicant has identified opportunities and secured measures to improve water quality. For two outfalls (outfall 1 and 2), water quality treatment does not exist under the present situation and the provision of treatment measures for these two drainage catchments leads to a slight beneficial effect. SuDS have been incorporated into the drainage design. Details of the SuDS measures included in the Scheme are included in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)). The drainage design is secured through Requirement 8 of the draft DCO (TR010064/APP/3.1).
5.255	*'The risk of impacts on the water environment can be reduced through careful design to facilitate adherence to good pollution control practice. For example, designated areas for storage and unloading, with appropriate drainage facilities, should be marked clearly. This may also include the need for treatment of water, which may need a permit under the Environmental Permitting Regulations.'*	Section 13.9 of this chapter describes embedded and essential mitigation measures and enhancement measures that have been identified. These measures would reduce impacts on the water environment from pollution, for example pollution from maintenance activities during the operational phase. These measures are included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5). Details of licenses and permits for the construction and operation of the Scheme are available in the Consents and Agreements Position Statement (TR010064/APP/3.3).

Other relevant policy

13.3.5 In addition to the NPS NN, other relevant policy has been considered as part of the RDWE assessment. Table 13.4 sets out other relevant policy and how the assessment has considered/addressed these policies.

Table 13.4 Other national, regional and local policy relevant for RDWE

Plan / Policy document	Key requirements and objectives	How this has been considered/addressed in the assessment
National		
National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities (DLUHC), 2023)	Section 14 Paragraphs 153 to 169 of the NPPF contains a number of statements which are relevant to water resources and flood risk. In summary, these cover the following: • Making use of undeveloped land in mitigating flood risk • Taking a proactive approach to mitigating and adapting to climate change taking into account the long-term implications for flood risk, coastal change and water supply • Taking full account of flood risk in the planning system including planning for climate change	The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) demonstrates that the Scheme would not increase flood risk elsewhere and is appropriately flood resilient and resistant. Climate change has been considered as part of the assessment, with the 0.1% (1 in 1000) AEP event flood extents from surface water flood mapping used as part of the assessment. It is considered likely that the 0.1% (1 in 1000) AEP flood extents give a reasonable approximation of potential future 1% (1 in 100) AEP extents in a credible maximum climate change scenario.

Plan / Policy document	Key requirements and objectives	How this has been considered/addressed in the assessment
	Paragraph 174 states that *"development should, wherever possible, help to improve local environmental conditions such as air and water quality"*	The assessment of water quality impacts has been considered in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3). This has considered the existing highways drainage and where practicable provide improvement to those existing discharges in terms of water quality. Where there would be new discharges, appropriate treatment is applied to ensure that the water quality of receiving watercourses are not negatively impacted.
Planning Practice Guidance for Flood Risk and Coastal Change (DLUHC and Ministry of Housing, Community and Local Government (MHCLG), revised 2022)	Provides guidance on assessing the significance of flood risk and coastal change and sets out the steps to be taken for assessment of a proposed development in terms of flood risk.	An FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) has been prepared for the Scheme.
Planning Practice Guidance for Water Supply, Wastewater and Water Quality (DLUHC and MHCLG, revised 2019)	Sets out how concerns related to water can be addressed and mainly focuses on residential and commercial developments	The assessment of water quality impacts has been considered in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).
Future water: The Government's water strategy for England (Department for Environment, Food and Rural Affairs (Defra), 2011a)	Sets out the Government's long-term vision for water and the framework for water management in England, and includes advice and guidance for the sustainable management of the water environment and water quality to ensure no compromise in environmental quality of future generations.	The assessment of water quality impacts has been considered in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

Plan / Policy document	Key requirements and objectives	How this has been considered/addressed in the assessment
A Green Future: Our 25 Year Plan to Improve the Environment (Defra, 2018)	Includes specific goals to: • Reduce the environmental impact of water abstraction; • Meet the objectives of RBMPs under the WFD Regulations; and • Do more to protect communities and businesses from the impact of flooding, coastal erosion and drought.	The assessment of the Scheme to not preclude the RBMP objectives being met is detailed in Appendix 13.1: WFD Compliance Assessment Report of the Environmental Statement Appendices (TR0100064/APP/6.3). An FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3) (TR010064/APP/6.3)) has been prepared for the Scheme.
North West RBMP (Environment Agency, 2018)	Sets out how organisations, stakeholders and communities should work together to improve the water environment.	The assessment of the Scheme against the objectives of the WFD Regulations and the North West RBMP is detailed in Appendix 13.1: WFD Compliance Assessment Report of the Environmental Statement Appendices (TR0100064/APP/6.3).
Environmental Improvement Plan (2023)	Part of the 25 Year Environment Plan refresh. Sets out 10 key goals and progress, targets and commitments made against these goals. The following goals are specific to the water environment: • Goal 3: Clean and plentiful water • Goal 8: Reduced risk of harm from environmental hazards	The assessment of operational water quality impacts has been considered in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3). Measures to protect the water environment during construction are detailed in Section 13.9 of this chapter and included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5).

Plan / Policy document	Key requirements and objectives	How this has been considered/addressed in the assessment
Local policy		
Bury Local Plan (Bury Council, 2018) The Bury Local Plan guides the future growth, development and appearance of the Borough. It includes policies for the development and allocation of land, while introducing constraints for some areas. The document is currently under preparation.	Topic Paper 6 – Flood Risk The key issues in the Borough include the risk of river and surface water flooding in significant areas, inadequate capacity in the sewer and drainage network to accommodate increasing amounts of surface water, escalating conflicts between climate change scenarios and future development goals, and the need for land to construct new flood defences, implement natural flood management measures, and establish flood water storage areas.	An FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) has been prepared for the Scheme. The assessment of the Scheme against the objectives of the WFD Regulations and the North West RBMP is detailed in Appendix 13.1: WFD Compliance Assessment Report of the Environmental Statement Appendices (TR0100064/APP/6.3).
Bury Local Plan (Bury Council, 2018) The Bury Local Plan guides the future growth, development and appearance of the Borough. It includes policies for the development and allocation of land, while introducing constraints for some areas. The document is currently under preparation.	Topic Paper 7 – Natural Environment Paragraphs 3.40, 3.44 – 3.45. The key issues include a need to protect, enhance, and restore water bodies while also establishing Blue Infrastructure, which entails dedicating land to mitigate flood risks and improve the quality of water bodies and watercourses.	An FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) has been prepared for the Scheme. The assessment of the Scheme against the objectives of the WFD Regulations and the North West RBMP is detailed in Appendix 13.1: WFD Compliance Assessment Report of the Environmental Statement Appendices (TR0100064/APP/6.3).

Plan / Policy document	Key requirements and objectives	How this has been considered/addressed in the assessment
Adopted Bury Unitary Development Plan (Bury Council, 1997) The Adopted Bury Unitary Development Plan is a strategic blueprint that guides the growth of the Bury Borough, incorporating land use policies and addressing constraints for sustainable development.	<u>EN5 – Flood Protection and Defence</u> The Council will not permit new development, including the raising of land and the intensification of development, where such development would be at risk from flooding, would be likely to increase the risk of flooding elsewhere, or would adversely affected river flood defences. <u>EN7 – Pollution Control</u> The Council will seek to control environmental nuisance and minimise pollution levels associated with development by limiting the environmental impact of pollution, wherever possible, in conformity with current legislation and prescribed standards. <u>EN10 – Environmental Improvement</u> The Council will seek to improve the environmental quality of the Borough, within which priority will be given to an on-going environmental improvement programme.	The Scheme is located within Flood Zone 1 and susceptible infrastructure located in areas at low risk of groundwater and surface water flooding. The Scheme has included embedded mitigation to alleviate any increase in flood risk elsewhere. This is detailed in Section 13.9 of this chapter. An assessment of water quality impacts from routine runoff during operation of the Scheme is presented in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3). An assessment of construction impacts and any enhancement to the water environment has been detailed throughout this chapter in Sections 13.8 to 13.10.

Plan / Policy document	Key requirements and objectives	How this has been considered/addressed in the assessment
Manchester's Local Development Framework (Manchester City Council, 2012) Manchester's Local Development Framework, a key document in the Local Plan, guides the city's development with strategic policies on land use, housing, transportation, and environmental protection.	Policy EN 14: Flood Risk Development should be directed away from high-risk flood sites and towards low-risk areas, following sequential approach contained within PPS25, considering all sources of flooding identified in the Manchester-Salford-Trafford SFRA, while also minimizing surface water run-off, utilizing sustainable drainage systems, and exploring opportunities to open hidden rivers to reduce flood risk and enhance biodiversity. Policy EN 17: Water Quality Development should prioritize the avoidance of adverse water quality impact, enhance water quality, minimize surface water run-off, utilize sustainable drainage systems, prevent waste or litter from entering watercourses, and consider opening up hidden watercourses to improve ecological status.	The Scheme is located within Flood Zone 1, and susceptible infrastructure located in areas at low risk of groundwater and surface water flooding. Therefore, NPPF does not require the Sequential Test to be applied (see Appendix 13.6: FRA of the Environmental Statement Appendices (TR010064/APP/6.3) for further details). The Scheme seeks to minimize the rate of surface water run-off through the use of ponds, oversized pipes, underground geocellular storage units, filter trenches, or swales, as appropriate to the location, see Appendix 13.7: Drainage Strategy Report of the Environmental Statement Appendices (TR010064/APP/6.3) for full details.
Places For Everyone. Joint Development Plan Document (Greater Manchester Combined Authority, 2021) The Joint Development Plan Document by the Greater Manchester Combined Authority is a comprehensive document that outlines the strategic planning and development policies for the entire Greater Manchester region.	Policy JP-S 5: Flood Risk and the Water Environment Locate and design developments to minimize the impacts of current and future flood risk. Development to manage surface water runoff through sustainable drainage system and as close to source as possible (unless demonstrably inappropriate) so as to not exceed greenfield run-off rates or alternative rates specified in district local plans, such as those identified for areas with critical drainage issues.	The Scheme is located within Flood Zone 1. Embedded mitigation has been included in the design to minimize flood risk from the Scheme (see Section 13.9 of this chapter for further details). The Scheme minimises surface water run-off through the use of ponds, oversized pipes, underground geocellular storage units, filter trenches, or swales, as appropriate to the location, see Appendix 13.7: Drainage Strategy Report of the Environmental Statement Appendices (TR010064/APP/6.3) for full details.

13.4 Assessment methodology

Assessment scope

13.4.1 Table 13.5 summarises the scope of the RDWE assessment.

Table 13.5 Summary of RDWE scope

Matter	Scoped in	
	Construction	Operation
WFD Regulations compliance	✓	✓
Surface water quality	✓	✓
Hydromorphology	✓	✓
Groundwater	✓	✓
Flood risk	✓	✓

13.4.2 Certain matters of the RDWE aspect have been scoped out of the assessment, in line with the Scoping Opinion (TR010064/APP/6.7), see Table 13.6 for further details. All other matters are scoped into this assessment as shown in Table 13.5. This scope is in line with the Scoping Opinion (TR010064/APP/6.7), see Table 13.6 for further details.

Scoping Opinion

13.4.3 Table 13.6 summarises the key requirements from the Scoping Opinion (TR010064/APP/6.7) as relevant to the scope of the RDWE assessment, and identifies any matters scoped out of the assessment as agreed with the Planning Inspectorate and other stakeholders. This table also explains any changes to the assessment methodology as a result of this engagement.

Table 13.6 Scoping Opinion feedback for RDWE

Stakeholder	Comment	Response
The Planning Inspectorate	ID 4.9.1 – *'Tidal flood risk is proposed to be scoped out on the basis that none of the watercourses within the study area are tidal rivers and the Irwell Catchment Flood Management Plan does not identify tidal flooding as a source of flood risk in the catchment; the nearest tidal point is approximately 28km downstream. Based on this information, the Inspectorate is content to scope this matter out.'*	Noted. Tidal flood risk is scoped out of the assessment.
	ID 4.9.2 – '*The Applicant highlights that the potential extent of reservoir flooding (in accordance with Environment Agency guidance) reaches residential areas in Prestwich and Whitefield to the west of the M60 J18 but on the basis that the risk of failure is considered to be very low (due to their monitoring and inspection regime), reservoir flood risk should be scoped out. The Inspectorate agrees that this matter can be scoped out on this basis and taking into account the prevailing baseline and future baseline environment in and around the Proposed Development.'*	Noted. Reservoir flood risk is scoped out of the assessment.
	ID 4.9.3 – '*Canal flood risk is proposed to be scoped out of the assessment as no canals are identified in the study area with the closest canal located approximated 3km from the Proposed Development. Based on this information, the Inspectorate is content to scope this matter out.'*	Noted. Flood risk from canals is scoped out of the assessment.

Stakeholder	Comment	Response
	ID 4.9.4 – '*Table 14.8 displays the value of receptors as based on the DMRB LA 113 guidance. Scoping Report paragraph 14.3.88 states that ponds will be assigned a 'medium' value of importance on a precautionary basis as ponds are unlikely to be more than low importance. Scoping Report paragraph 14.3.87 states that the majority of ponds will not be affected and can be scoped out but does not specify which ponds are proposed to be scoped out.* *Scoping Report Chapter 9 Biodiversity, paragraph 9.3.12 states that whilst surveys are ongoing, notable results to date include the presence of great crested newts which are a European Protected Species. 'Protected species' are not included as criteria for designating receptor value in Scoping Report Table 14.8 although they are in included in the guidance used for assessment; DMRB LA113 Table 3.70 used presence of protected species as criteria for surface water receptors of high importance, therefore there remains potential for ponds to be high value receptors.* *The ES should provide an explanation where it diverges from appropriate guidance (that is referenced in the Scoping Report). The Inspectorate does not agree to scope out impacts to ponds based on the current information as there remains potential for the Proposed Development to impact high value receptors.'*	Noted. Where relevant, and applicable, ponds have been considered on their individual merit and assessed for impacts which may arise during the construction and operation of the Scheme. There are no ponds that appear to be hydrologically linked to the Scheme and therefore have not been considered within the assessment. The value of receptors relating to protected species and ponds are considered in Chapter 8: Biodiversity of this Environmental Statement (TR010064/APP/6.1).
	ID 4.9.5 – '*This matter is proposed to be scoped out on the basis that the working area for construction is likely to be relatively small in comparison to the aquifers being crossed and therefore effects would be negligible.* *Scoping Report paragraph 2.4.2 states that currently, total areas required for temporary and permanent land take in the Order Limits will be defined in the DCO application.*	A full assessment of groundwater impacts arising during construction can be found in Appendix 13.4: Groundwater Assessment Report and Appendix 13.5: GWDTE Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3). The conclusions from these assessments have informed the assessment of likely significant effects in Section 13.10 of this chapter.

Stakeholder	Comment	Response
	Whilst the Inspectorate cannot agree to scope out this matter due to a lack of evidence based on current information, should evidence be provided in the application to support this statement, the Inspectorate would be content to scope out this matter. Such evidence would include results of any site investigation to ascertain whether sand bands within superficial drift soils have the potential to provide a source of water, the value of such a resource and the extent to which there may or may not be impact pathways from the Proposed Development as the design evolves.'	
	ID 4.9.6 – '*Table 14.10 proposes to scope out impacts on floodplains but provides little or no explanation as to why. There are multiple references to construction activities potentially taking place in floodplains Figure 14.5 identifies Parr Brook floodplain (zones 2 and 3) as located within the 1km study area where impacts to and from flood risk may occur.* *Based on this information, the Inspectorate considers that there is potential for impacts to floodplains and insufficient evidence has been provided to suggest they will not be impacted. Therefore, the Inspectorate does not agree to scope this matter out.'*	Noted. This chapter is supported by an FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) which details the risk of flooding to and from the Scheme. Potential impacts during construction and operation of the Scheme are outlined in Section 13.8 of this chapter.
	ID 4.9.7 – '*Currently the extent of peatland within the study area and the amount of peat to be removed to construct the Proposed Development is unknown. Potential impacts listed in Scoping Report section 14.4 do not include potential hydrological impacts due to the removal of peat.* *The ES should provide baseline data as to the locations of the peat present within the study area and describe the extent that is proposed to be removed and the method by which this will be done. The ES should assess significant effects from disturbance to peat where they are likely to occur on hydrology, groundwater and flood risk.'*	Noted. As reported in Chapter 9: Geology and Soils of this Environmental Statement (TR010064/APP/6.1), ground investigations (GI) have concluded that there is no thick contiguous peat located within the study area, as such no hydrological effects from disturbance are likely to occur.

Stakeholder	Comment	Response
Environment Agency (Appendix 2 of the Scoping Opinion)	Flood Risk – *'The scoping report states that a flood risk assessment will be undertaken to support the proposals. The proposed option would not appear to directly impact on designated "Main River" watercourses but also recognises that control of surface water runoff will be an issue to address in design.* *The Lead Local Flood Authority should be consulted with regards to the proposals given their statutory role on surface water flood risk under the Flood and Water Management Act 2010.'*	This chapter is supported by an FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)). The FRA states that the Scheme is wholly located within Flood Zone 1 and the Scheme does not impact on river or floodplain storage and fluvial flood risk remains unchanged. The LLFA have also been consulted as part of the FRA.
	Water Quality – *'As noted in this section, there is a requirement under the National Policy Statement to demonstrate compliance with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. In particular there should be no deterioration of any waterbody and measures to meet the overall objective of 'good' ecological status/potential should be addressed where possible. As such a specific compliance assessment against the Water Framework Directive is welcome.* *Surface water from the motorway network flows into a number of tributaries in the surrounding area from current motorway outfalls. These ultimately flow into the River Roch and River Irk watercourses which monitored by the Environment Agency for compliance against the EU Water Framework Directive, namely:* • *River Irk (Wince - Irwell) (Ref: GB112069061131), Moderate Status* • *Whittle Bk (Irwell) (Ref: GB112069061250), Moderate Status* • *River Roch (Spodden -Irwell) (GB112069064600), Moderate Status*	A WFD Compliance Assessment Report and a Water Quality Assessment Report have been prepared and these form Appendix 13.1 and Appendix 13.2 of the Environmental Statement Appendices (TR010064/APP/6.3), respectively. These outline the potential impacts arising from the Scheme (including essential mitigation) to WFD designated watercourses. Vegetative SuDS have been incorporated into the drainage design which provide attenuation and water quality treatment to surface water runoff. No infiltration to ground is proposed as part of the Scheme.

Stakeholder	Comment	Response
	The scoping report identifies that mitigation will be required for existing outfalls (Para 14.3.24) and the potential for Sustainable Urban Drainage System (SUDs) is noted. We support the opportunities to incorporate environmental best practice in the form of multifunctional and above ground SUDs where feasible. Further best practice can be found on the CIRIA website: https://www.ciria.org//Memberships/The SuDs Manual C753 Chapters.aspx *If any infiltration to ground is proposed, included unlined storage lagoons we would require a thorough risk assessment to identify risks from road drainage particularly with regards to hydrocarbons and micro plastics. We would expect at the planning stages this detailed drainage design be completed in line with current guidance including SUDS guidance the LA113 guidance and the Environment Agency's approach to groundwater protection available from gov.uk.'*	
	Environmental Permitting Requirements – *'The nearest Main River watercourses to the junction are Castle Brook to the north east of the junction and Whitefield Brook between Derwent Ave and the eastbound approach carriageway. Any works that would impact on these watercourses may require a flood risk activity permit which is separate to and in addition to any planning permission granted. Further details and guidance are available on the GOV.UK website: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits* *Any dewatering activities on-site could have an impact upon local wells, water supplies and/or nearby watercourses and environmental interests. This activity was previously exempt from requiring an abstraction licence. Since 1 January 2018, most cases of new planned dewatering operations above 20 cubic metres a day will require a water abstraction licence from us prior to the commencement of dewatering activities at the site. More information is available on gov.uk: https://www.gov.uk/guidance/water-management-apply-for-a-water-abstraction-or-impoundment-licence#apply-for-a-licence-for-a-previously-exempt-abstraction'*	The Applicant acknowledges the permitting arrangements that must be in place when working in or in close proximity to Main River watercourses or when undertaking dewatering activities. Further details regarding consents, licenses and permits can be found in the Consents and Agreements Position Statement (TR010064/APP/3.3).

Statutory consultation

13.4.4 Table 13.7 identifies the key feedback received from statutory bodies during the the statutory consultation. All comments raised during the statutory consultation, as well as the Applicant's responses, are included in Annex Q of the Consultation Report Annexes (TR010064/APP/5.2).

Table 13.7 Key statutory consultation feedback for RDWE

Stakeholder	Comment	Response
Environment Agency	For Flood Risk: *'Assess the capacity of minor watercourses to handle additional runoff in a flood risk assessment. Consult the Lead Local Flood Authority (LLFA) for proposed drainage arrangements, including "Ordinary Watercourses." Works impacting Castle Brook and Whitefield Brook may require a separate flood risk activity permit in addition to planning permission. Detailed guidance on flood risk activities and permits is available on the GOV.UK website.'*	The DCO application is supported by an FRA and a Drainage Strategy Report (Appendix 13.6 and 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3), respectively). The Scheme, for the most part, comprises of modifications to the existing highway alignment. Where an existing outfall would be used, the discharge rate is based on the existing discharge rates as established in a drainage model. Where the discharge is to a new outfall, the discharge is limited to the greenfield runoff rate or 2l/s/ha whichever is higher. In order to restrict flows at outfalls at these rates, attenuation is provided in the design through the use of ponds, oversized pipes, filter trenches or swales. The FRA has considered the above design in terms of the potential for the Scheme to impact flooding. It is concluded that the risk to Ordinary Watercourses from fluvial flood risk and surface water drainage is low.

Stakeholder	Comment	Response
		The Applicant acknowledges the permitting arrangements that must be in place when working in or in close proximity to Main River watercourses. Further details regarding consents, licenses and permits can be found in the Consents and Agreements Position Statement (TR010064/APP/3.3). The same consideration applies when dealing with Ordinary Watercourses and the need to apply for necessary permits and licences under the Land Drainage Act.
	For SuDS Infiltration of surface water into ground: *'Permission is required from the local planning authority for surface water infiltration drainage systems, supported by a risk assessment of controlled waters. The development must adhere to the approved details. The goal is to prevent water pollution caused by contaminants and ensure the development is not at risk, aligning with the National Planning Policy Framework.'*	The drainage design has been developed on the basis that all ponds will be lined, and linear drainage features will be sealed. It has therefore been assumed there would be no discharges to ground as part of the Scheme's temporary and permanent drainage design. Further details can be found in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)).
	For Groundwater: *'The site is divided into two sections by an unnamed fault: the "northern loop" area to the north with an associated lagoon, and the southern area representing the cuttings for the new motorway junction. The preferred option for the final design is the Northern Loop configuration that includes a new loop structure connecting the Eastern bound M60 with the southern bound M60, widening of junctions, and new free-flow links between M60 Northbound and westbound.'*	A programme of GI has been carried out across the Scheme. The findings from the GI have been utilised in characterising the baseline conditions across the Scheme. The Ground Investigation Report (GIR) (Appendix 9.3 of the Environmental Statement Appendices (TR010064/APP/6.3)) has been submitted with the DCO application. The impacts of the Scheme are considered in Appendix 13.4: Groundwater Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

General approach

13.4.5 The assessment of the Scheme's impact on RDWE follows that set out in Table 3.2 of DMRB LA 113, augmented by professional judgement where required. The RDWE assessment considers the potential impact during construction and operation on surface water (quality, resources and hydromorphology), groundwater (quality, levels, flows and GWDTE), and flood risk.

13.4.6 In addition, the assessment considers hydromorphological impacts, and compliance with the WFD Regulations. The significance of effects has been assessed in line with Table 3.7 of DMRB LA 104 (Highways England, 2020b).

13.4.7 As discussed in Chapter 4: Environmental Assessment Methodology of this Environmental Statement (TR010064/APP/6.1), the water environment can be impacted from multiple sources. Consideration of these combined effects is an integral part of assessing the effect on the water environment. The assessment of significance therefore factors in all elements of the construction and operation of the Scheme that could impact the water environment.

Surface water quality

13.4.8 The assessment of potential impacts as a result of the Scheme upon surface water quality has been undertaken using the methodology outlined in DMRB LA 113 for both construction and operation. For potential construction impacts, a qualitative assessment based upon a source-pathway-receptor approach has been carried out.

13.4.9 Potential operational impacts have been assessed for routine runoff and accidental spillage risk. Routine runoff has been assessed using the simple-level assessment methodology as outlined in DMRB LA 113. Simple-level assessments for routine runoff and accidental spillage have been undertaken using the Highways England Water Risk Assessment Tool (HEWRAT) in line with the methodology outlined in DMRB LA 113.

13.4.10 Assessment methodologies and data used in the assessments are detailed in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

Hydromorphology

13.4.11 The assessment of potential impacts on hydromorphology used a combination of guidance in DMRB LA 113 and professional judgement to assess morphological changes within each watercourse scoped into the Environmental Assessment. The effects to construction and as a result of operation are considered, and recommendations of mitigation where practicable have also been included. The approach followed the simple assessment of hydromorphological change (as outlined in Appendix E of DMRB LA 113) informed by a combination of site survey and desk study.

13.4.12 The site survey (see Appendix 13.3: Hydromorphology Baseline Report of the Environmental Statement Appendices (TR010064/APP/6.3) for further details) identified baseline information on each watercourse, including channel form and character, sediment descriptors, flow processes, floodplain and riparian habitat, information on morphological and catchment-channel connectivity and examination of the setting of the watercourse within the wider catchment context.

13.4.13 The desk study assessment considered morphological changes to both the upstream and downstream sections of watercourses crossed, which have the potential to be affected by the Scheme. This included potential changes in the bed substrate and bedform, changes to fluvial processes both within the channel and adjacent floodplain zones and overall change to morphological continuity.

13.4.14 Information from this assessment was also used to inform Appendix 13.1: WFD Compliance Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

Groundwater

13.4.15 The assessment to determine the significance of effects for the groundwater environment (covering aquifer layering and hydraulic characteristics), encompassed the following:

- Construction activities such as earthworks, piling (sheet and bored) and accidental spills and releases
- Groundwater levels and flow relating to altered drainage, permanent barriers or dewatering
- Groundwater quality, relating to routine runoff and spillage
- Secondary receptors such as GWDTE or groundwater abstractions impacted by any of the above.

13.4.16 The assessment is informed by conceptual site models (CSMs) presented in Appendix 13.4: Groundwater Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3), which are used to determine how the construction and operation of the Scheme could impact on identified groundwater receptors, including variations over time and between construction and operation. The CSMs have been developed with both desk-based information and GI information undertaken within the Order Limits. This is consistent with the approach outlined in Appendix A of DMRB LA 113.

13.4.17 Impacts relating to existing groundwater quality or impacts from contaminated land are covered in Chapter 9: Geology and Soils of this Environmental Statement (TR010064/APP/6.1).

13.4.18 For the dewatering assessment an initial screening was undertaken to assess the likelihood of the excavation to intercept groundwater. A conservative approach was undertaken using maximum excavation depths and shallowest groundwater elevations recorded during the recent GI in the vicinity of the works. Following this, the Sichardt method (e.g. Preene *et al.*, 2016) was used to estimate the zone of influence of dewatering around each of the cuttings, and excavations considered likely to intercept groundwater, using the estimated drawdown of groundwater levels due to the excavation. The effect on receptors (including licenced and unlicenced groundwater abstractions, GWDTE and surface water receptors) was then assessed in relation to each excavation.

13.4.19 The identification, prioritisation and impact assessment associated with GWDTE sites follows the UK Technical Advisory Group (UKTAG) guidance (UKTAG, 2005). A phased screening approach was followed, described in detail in Appendix 13.4: Groundwater Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3). This identified nature and conservation areas, along with areas identified by site visits carried out by ecologists and subsequently verified and complemented by specific GWDTE site walkovers. Following this screening assessment, CSM for each GWDTE potentially impacted by the Scheme were established to categorise the likely degree of groundwater dependency at each location. These CSM were the basis to determine potential changes in groundwater levels, flows, and quality, which could result from the Scheme.

Flood risk

13.4.20 The assessment of flood risk both to and from the Scheme have been informed by data that is publicly available from the Environment Agency and the British Geological Society (BGS).

13.4.21 The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) has been produced in accordance with the technical guidance to the NPPF and demonstrates compliance with the requirements of the NPS NN (DfT, 2014) and draft NPS NN (DfT, 2023), specifically that the Scheme would:

- Remain operational and safe for users in times of flood
- Not increase flood risk elsewhere.

13.4.22 The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) demonstrates the Scheme's compliance with the NPS NN (DfT, 2014) and draft NPS NN (DfT, 2023) by including the following:

- An assessment of flood risk to the Scheme from all sources
- An assessment of change in flood risk from all sources as a result of the Scheme
- Appropriate allowances for climate change according to the latest published guidance

- An assessment of mitigation measures to prevent adverse impacts on flood risk
- Details of completion of the Sequential and Exception Tests.

Assessment criteria

13.4.23 The significance of effect has been derived through a combination of the importance of a receptor affected (value or importance) and the magnitude of impact (amount of change).

Value (importance)

13.4.24 Table 13.8 sets out the water-specific criteria for determining value (importance).

13.4.25 The importance classifications presented for GWDTE, are based on the Water Framework Directive; and aligns with UKTAG guidance. The UKTAG guidance brings together the degree of groundwater dependency (low, moderate, and high), and the level of ecological designation / protection of a site, to determine the overall importance of each potential GWDTE. This deviates from the importance definitions in Table 3.70 of LA 113 (as outlined in the Environmental Scoping Report (TR010064/APP/6.6)), although the impact magnitude criteria in DMRB LA 113 are used for GWDTE.

Table 13.8 Estimating the importance of water environment attributes (adapted from Table 3.70 of DMRB LA 113)

Value (importance)	Typical criteria	Typical descriptors	
Very high	Nationally significant attribute of high importance	Surface water	WFD Regulations classified water body achieving 'High' physico-chemical and biological elements status, 'Pass' for specific pollutants and /or priority substances. Q95 likely to be ≥ 1.0m³/s. Watercourse part of a site protected/ designated under UK legislation (SAC, SPA, SSSI, and Ramsar site). Non-WFD Regulations classified watercourses may be applicable if part of a protected site.
		Hydromorphology	A watercourse that appears to be in complete natural equilibrium and exhibits a natural range of morphological features. There is a diverse range of fluvial processes present, free from any modification or anthropogenic influence.
		Groundwater	Principal bedrock and superficial aquifers. Groundwater flow and yield associated with licensed groundwater abstractions. Groundwater quality associated with Source Protection Zone (SPZ) 1 (Inner Protection Zone) associated with licensed abstractions. Buildings of regional or national importance, such as grade I listed buildings, scheduled monuments, hospitals, power stations and large industrial sites. Water feeding GWDTEs with a high or moderate groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, SACs, SPAs and SSSIs.
		Flood risk	Essential infrastructure or highly vulnerable development* (e.g., essential transport infrastructure (the Scheme has been classified as 'essential infrastructure') which must cross the area at risk)

Value (importance)	Typical criteria	Typical descriptors	
High	Locally significant attribute of high importance	Surface water	WFD Regulations classified water body achieving or having established RBMP objectives (for a later RBMP cycle) to achieve 'Good' physico-chemical and biological elements status ('Good potential' for HMWBs), 'Pass' for specific pollutants and /or priority substances. Q95 likely to be <1.0m³/s. Contains species protected under EC or UK legislation Ecology and Nature Conservation but is not part of a protected site. Non-WFD Regulations classified water bodies may be applicable if protected species are present, indicating good water quality and supporting habitat.
		Hydromorphology	A watercourse that appears to be in natural equilibrium and exhibits a natural range of morphological features. There is a diverse range of fluvial processes present, with very limited signs of modification or other anthropogenic influences.
		Groundwater	Secondary A aquifers. Groundwater flow and yield and quality associated with extensive non-licensed private water abstractions (i.e. feeding ten or more properties or supplying large farming / animal estates). Groundwater quality associated with SPZ2 (Outer Protection Zone) associated with licensed abstractions. Residential and commercial properties and Grade II listed buildings. Water feeding GWDTEs of low groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, SACs, SPAs and SSSIs; or water feeding highly or moderately GWDTE with a national non-statutory UK Biodiversity Action Plan (BAP) priority.
		Flood risk	More vulnerable development* (e.g., Residential properties, other residential institutions, hospitals and non-residential uses for health services, nurseries and educational establishments)
Medium	Of moderate quality and rarity	Surface water	Water body not classified under WFD Regulations. May have a number of anthropogenic pressures and/or pollutant inputs from discharges and/or surrounding land-use relative to flow volume. Q95 likely to be >0.001m³/s.

Value (importance)	Typical criteria	Typical descriptors	
		Hydromorphology	A watercourse showing signs of modification, recovering to a natural equilibrium, and exhibiting a limited range of morphological features (such as pools and riffles). The watercourse is one with a limited range of fluvial processes and is affected by modification or other anthropogenic influences.
		Groundwater	Secondary B and Secondary Undifferentiated aquifers. Groundwater flow and yield and quality associated with small scale private water abstractions (i.e. feeding fewer than ten properties). Groundwater quality associated with SPZ3 (associated with licensed abstractions and unlicensed abstractions for which no SPZ is defined. Unoccupied residential and commercial properties and buildings. Water feeding GWDTEs of low groundwater dependence with a national non-statutory UK BAP priority; or water feeding highly or moderately groundwater dependent GWDTE sites with no conservation designation
		Flood risk	Less vulnerable development* (e.g., buildings used for shops, offices, storage and distribution, restaurants)
Low	Lower quality	Surface water	Water body not having a WFD Regulations classification shown in a RBMP. May have a large number of anthropogenic pressures and/or pollutant inputs from licensed discharges and/or surrounding land-use relative to flow volume. Q95 likely to be ≤0.001m³/s.
		Hydromorphology	A highly modified watercourse that has been changed by channel modification or other anthropogenic pressures. The watercourse exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes and not likely to be affected by modification.

Value (importance)	Typical criteria	Typical descriptors	
		Groundwater	Very poor groundwater quality and / or very low permeability make exploitation of groundwater unfeasible. No active groundwater supply. Industrial buildings that are currently not utilised, all derelict buildings and infrastructure that serves a single dwelling. Water feeding GWDTEs of low groundwater dependence with no designation or groundwater that supports a wetland not classified as a GWDTE, although may receive some minor contribution from groundwater.
		Flood risk	Water compatible development* (e.g., flood control infrastructure, water/sewage transmission infrastructure and pumping stations, amenity open space, nature conservation and biodiversity, outdoor sports and recreation)

*Vulnerable development, less vulnerable development and water compatible development are defined in the Flood Risk section of the Technical Guidance to the NPPF (DLUHC and MHCLG, 2022).

Magnitude of impact

13.4.26 Table 13.9 sets out the water-specific criteria for magnitude of impact (adapted from Table 3.71 of DMRB LA 113).

Table 13.9 Estimating the magnitude of an impact on a water environment attribute (adapted from Table 3.71 of DMRB LA 113)

Magnitude	Criteria	Typical descriptors	
Major adverse	Results in loss of attribute and/or quality and integrity of the attribute	Surface water quality	Construction works in-channel and/or extensive construction works adjacent to a watercourse which are therefore likely to risk a major, measurable shift from baseline water quality and/or risk of adverse impacts on protected aquatic species. Construction works on multiple tributaries of a watercourse resulting in the risk of a significant cumulative impacts on water quality. Loss or major change to a designated nature conservation site. Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT and compliance failure with EQS values. Calculated risk of pollution from a spillage ≥2% annually (spillage assessment). Loss of regionally important public water supply. Loss or major change to a designated nature conservation site. Reduction in water body WFD Regulations classification.
		Groundwater	Major or irreversible change to groundwater aquifer(s) flow, water level, quality or available yield which endangers the resources currently available. Groundwater resource use / abstraction is irreparably impacted upon, with a major or total loss of an existing supply or supplies. Changes to water table level or quality would result in a major or total change in, or loss of, a groundwater dependent area, where the value of a site would be severely affected. Changes to groundwater aquifer(s) flow, water level and quality would result in major changes to groundwater baseflow contributions to surface water and / or alterations in surface water quality, resulting in a major shift away from baseline conditions such as change to WFD Regulations status. Dewatering effects create significant differential settlement effects on existing infrastructure and buildings leading to extensive repairs required.
		Hydromorphology	Loss or extensive damage to habitat due to extensive modification of natural channel planform, and/or sediment and flow processes. Replacement of a large extent of the natural bed and/or banks with artificial material.

Magnitude	Criteria	Typical descriptors	
		Flood risk	Increase in peak flood level* (>100mm)
Moderate adverse	Results in effect on integrity of attribute, or loss of part of attribute	Surface water quality	Construction works adjacent to a watercourse which are therefore likely to risk a moderate, measurable shift away from baseline water quality. Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values. Calculated risk of pollution from spillages ≥1% annually and <2% annually. Moderate degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. Contribution to reduction in water body WFD Regulations classification.
		Groundwater	Moderate long term or temporary significant changes to groundwater aquifer(s) flow, water level, quality or available yield which results in moderate long term or temporarily significant decrease in resource availability. Groundwater resource use / abstraction is impacted slightly, but existing supplies remain sustainable. Changes to water table level or groundwater quality would result in partial change in or loss of a groundwater dependent area, where the value of the site would be affected, but not to a major degree. Changes to groundwater aquifer(s) flow, water level and quality would result in moderate changes to groundwater baseflow contributions to surface water and / or alterations in surface water quality, resulting in a moderate shift from baseline conditions upon which the WFD Regulations status rests. Dewatering effects create moderate differential settlement effects on existing infrastructure and buildings leading to consideration of undertaking minor repairs.
		Hydromorphology	Moderate deterioration from baseline conditions, with partial loss or damage to habitat due to modifications and/or changes to natural fluvial forms and processes. Replacement of the natural bed and/or banks with artificial material.
		Flood risk	Increase in peak flood level* (50-100mm)

Magnitude	Criteria	Typical descriptors	
Minor adverse	Results in some measurable change in attributes, quality or vulnerability	Surface water quality	Construction works within the watercourse catchment that may result in a risk of a minor, measurable shift from baseline water quality. Failure of either acute soluble or chronic sediment related pollutants in HEWRAT. Calculated risk of pollution from spillages ≥0.5% annually and <1% annually. Minor effects on water supplies.
		Groundwater	Minor changes to groundwater aquifer(s) flow, water level, quality or available yield leading to a noticeable change, confined largely to the Scheme area. Changes to water table level, groundwater quality and yield result in little discernible change to existing resource use. Changes to water table level or groundwater quality would result in minor change to groundwater dependent areas, but where the value of the site would not be affected. Changes to groundwater aquifer(s) flow, water level and quality would result in minor changes to groundwater baseflow contributions to surface water and / or alterations in surface water quality, resulting in a minor shift from baseline conditions (equivalent to minor but measurable change within WFD Regulations status). Dewatering effects create minor differential settlement effects on existing infrastructure and buildings which may need to be monitored but where repairs may be avoidable.
		Hydromorphology	Slight deterioration from baseline conditions, with partial loss/damage to habitat due to modifications and/or changes to natural fluvial forms and processes.
		Flood risk	Increase in peak flood level* (10-50mm)
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity.	Surface water quality	Construction works within the watercourse catchment that are not anticipated to result in a risk of a change in water quality. No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages <0.5%.

Magnitude	Criteria	Typical descriptors	
		Groundwater	Very slight change from groundwater baseline conditions approximating to a 'no change' situation. Dewatering effects create none or no noticeable differential settlement effects on existing infrastructure and buildings. No change situation would be discernable change from groundwater baseline conditions or no impact predicted on groundwater receptors from construction or operational effects of the Scheme.
		Hydromorphology	Very slight change from surface water baseline conditions, approximating to a 'no change' situation.
		Flood risk	Negligible change to peak flood level* (≤ +/- 10mm)
Minor beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Surface water quality	HEWRAT assessment of either soluble or sediment-bound pollutants becomes a 'pass' from an existing baseline of a 'fail' condition. Calculated reduction in existing spillage risk by 50% or more (when existing spillage is <1% annually).
		Groundwater	Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding.
		Hydromorphology	Slight improvement of baseline conditions through partial improvement/gain in riparian or in-channel habitat. Slight diversification of flow processes and/or sediment processes.
		Flood risk	Creation of flood storage and decrease in peak flood level* (10-50mm)
Moderate beneficial	Results in moderate improvement of attribute quality	Surface water quality	HEWRAT assessment of both soluble and sediment-bound pollutants becomes a pass' from an existing baseline of a 'fail' condition. Calculated reduction in existing spillage risk by 50% or more when existing spillage is >1% annually). Contribution to improvement in water body WFD Regulations classification.

Magnitude	Criteria	Typical descriptors	
		Groundwater	Contribution to improvement in water body WFD Regulations classification. Improvement in water body catchment abstraction management Strategy (or equivalent) classification. Support to significant improvements in damaged GWDTE.
		Hydromorphology	Moderate improvement from baseline conditions, with partial creation of both in-channel and riparian habitat. Removal of existing superfluous structure or artificial channel bed/bank. Moderate diversification of flow processes and/or sediment processes.
		Flood risk	Creation of flood storage and decrease in peak flood level* (50-100mm)
Major beneficial	Results in major improvement of attribute quality	Surface water quality	Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a water body. Improvement in water body WFD Regulations classification.
		Groundwater	Recharge of an aquifer. Improvement in water body WFD Regulations classification.
		Hydromorphology	Extensive enhancement in-channel habitat and/or riparian habitat, as well as diversification of flow and sediment processes. Removal of an existing superfluous structure or artificial channel bed/bank. Extensive diversification of flow processes and/or sediment processes.
		Flood risk	Creation of flood storage and decrease in peak flood level* (>100mm)
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.		

*All references to peak flood level are for a 1% (1 in 100) AEP event plus allowance for climate change.

Significance of effect

13.4.27 Significance of effect is derived by combining the value (importance) of a receptor (Table 13.8) against the magnitude of impact (Table 13.9). The significance matrix in Chapter 4: Environmental Assessment Methodology of this Environmental Statement (TR10064/APP/6.1), which is replicated from DMRB LA 104, has been used for this assessment.

13.5 Assessment assumptions and limitations

Scheme design and limits of deviation

13.5.1 This assessment has been undertaken for the Scheme design (as shown on Figure 2.2: Scheme Design of the Environmental Statement Figures (TR010064/APP/6.2)) and presents a reasonable worst-case basis afforded by the limits of deviation (see Section 2.5 of Chapter 2: The Scheme of this Environmental Statement (TR010064/APP/6.1)). While the limits of deviation (as shown on the Works Plans (TR010064/APP/2.2)) permit changes to the final positioning of ponds, for example, it is considered that such changes are minor and unlikely to result in new or different outcomes to those reported in this assessment.

Surface water quality

13.5.2 All SuDS and drainage networks would be fully maintained and managed as per standard National Highways guidance and practice in accordance with the SuDS Manual C753 (CIRIA, 2015a). Requirements for maintenance and management of vegetated drainage systems are described in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)).

13.5.3 The assumptions and limitations relating to the operational surface water quality assessments are presented in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

13.5.4 Information relating to surface water abstractions is limited and specific abstraction points have not been identified based on available information.

13.5.5 The ambient background concentration (ABC) for copper have not been included within the HEWRAT assessments. The reliability of the copper data available utilising site collected data or data freely available online from the Environment Agency was not considered robust to be included within the assessment. A programme of water quality sampling will be undertaken during the detailed design phase in advance of construction. This will allow refinement of the HEWRAT assessments to be undertaken.

Hydromorphology

13.5.6 Due to access issues the baseline assessment of the following watercourses have been carried out virtually, using aerial imagery:

- Tributary of Parr Brook 2
- Hollins Brook

13.5.7 Other watercourses within the study area where there are no hydrological pathways were identified were also surveyed using aerial imagery. These include:

- Western Tributary of Parr Brook
- Whittle Brook

- Brightley Brook
- Tributary of River Irk 2
- Unnamed Watercourse 1
- Heaton Park Reservoir.

13.5.8 It is possible that further changes to the drainage design will be implemented as the drainage design process evolves. Assessments will be updated to reflect any changes and reported and as appropriate.

13.5.9 A River Condition Assessment (Modular River Survey (MoRPh)) has been carried out to inform the Defra biodiversity net gain metric. The results are summarised in Chapter 8: Biodiversity of this Environmental Statement (TR010064/APP/6.1).

Groundwater

13.5.10 Both the design and groundwater assumptions are presented in Appendix 13.4: Groundwater Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

13.5.11 Estimated dewatering zones of influence and drawdown are based on simple calculations designed to provide a conservative steady-state assessment. This is likely to overestimate the impacts of the dewatering required for cuttings, widenings and excavations, particularly in permeable strata. Strata types are assumed to be continuous within the zone of influence whereas the geology often varies laterally across the Scheme.

13.5.12 The identification of potential GWDTE is based on UKHab mapping (see Chapter 8: Biodiversity of this Environmental Statement (TR010064/APP/6.1) for further details). National Vegetation Classification (NVC) surveys were not undertaken as the detail provided by the UKHab survey was sufficient to gather a sufficiently detailed baseline data set. A full list of assumptions and limitations relating specifically to GWDTE is provided in Appendix 13.5: GWDTE Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

13.5.13 Private water supply questionnaires were sent out in January 2022 and March 2023, however only 10 out of the 38 questionnaires were returned. In addition to this information, confirmation of PWS has been sought from the hydrogeological walk over survey of GWDTEs and Ordnance Survey (OS) map data.

13.5.14 GI is located along the line of the Scheme within the Order Limits. Groundwater monitoring data up to May 2023 have been included in the assessment. No further monitoring is currently taking place.

13.5.15 Geological maps and/or historical BGS records were used to assess the geology where there were no GI data. In some cases, groundwater level information is limited to groundwater strikes and seeps recorded in borehole logs provided by the BGS.

Flood risk

13.5.16 The assessment has been based on the most up to date readily available web-based data sources (predominantly Environment Agency flood maps and the Manchester-Salford-Trafford SFRA). No detailed hydraulic modelling of flood risk has been undertaken on the basis that the Environment Agency online flood mapping and local authority SFRA is reliable and provides a reasonable assessment of existing flood risk.

13.5.17 BGS groundwater flooding susceptibility mapping has also been used to gain an initial understanding of the potential for shallow groundwater emergence within the Order Limits.

13.6 Study area

13.6.1 The study area for the RDWE aspect has been based on professional judgement and defined by applying a 1km buffer around the Order Limits of the Scheme (see Figure 13.1: Surface Water Receptors of the Environmental Statement Figures (TR010064/APP/6.2)). This distance identifies receptors that could reasonably be affected by direct impacts associated with the Scheme (e.g. via a pathway between the Scheme and a water body). In this way impacts that may occur beyond the 1km extent would be considered.

13.6.2 In addition, there are RDWE element-specific considerations that have informed this distance:

- For hydromorphology, a study area of 500m in all directions around the Order Limits is considered appropriate (see Figure 13.1: Surface Water Receptors of the Environmental Statement Figures (TR010064/APP/6.2)). This is based on the anticipated distance of impact pathways associated with hydromorphological impacts.

- For the groundwater study area, a 2km buffer in all directions around the Order Limits is considered appropriate (see Figure 13.4: Superficial Aquifers and Groundwater Receptors and Features of the Environmental Statement Figures (TR010064/APP/6.2)). This is based on organisational experience regarding the maximum potential extent of effects likely on groundwater receptors in the type of aquifers present, and the uncertainties associated with the degree of heterogeneity of these aquifers. These include, for example, the extent of existing and historical mining shafts and adits, and their influence on the existing groundwater regimes present.

- For GWDTE, a buffer of 250m from the Order Limits has been applied based on SEPA guidance (SEPA, 2017) (see Figure 13.5: GWDTEs and Groundwater Dependency Classification of the Environmental Statement Figures (TR010064/APP/6.2)).

13.7 Baseline conditions

Baseline sources

13.7.1 The baseline conditions have been established based on the following sources:

- BGS Susceptibility to Groundwater Flooding mapping (BGS, 2021a)
- BGS Mapping (2023) at 1:10,000 scale and 1:50,000 scale
- BGS Historical borehole records, and permeability index/aquifer properties datasets (where required)
- BGS Baseline groundwater quality information for the Permo-Triassic Sandstones of Manchester and East Cheshire (Technical Report: NC/99/74/8) (Griffiths *et al.*, 2003)
- BGS Baseline groundwater quality information for the Pennine Coal Measures Group (Technical Report: OR/07/039) (Cheney, 2007)
- Bury Council Preliminary FRA (JBA Consulting, 2011)
- Defra Water Abstraction data sets (Defra, 2022)
- Designation data and mapping from Defra's MAGIC map application (Defra, 2023), including:
  - Environment Agency bedrock and superficial aquifer designations
  - Environment Agency groundwater SPZs
  - Environment Agency Nitrate Vulnerable Zones (NVZs) and Groundwater Vulnerability Map
  - Drinking Water Safeguard Zones (Surface Water)
  - NVZs (Surface Water)
- Statutory and non-statutory designated ecological sites, and Habitats of Priority Importance (HPI) register
- Environment Agency Statutory Main River Map dataset (Environment Agency, 2019).
- Environment Agency Catchment Data Explorer for Water Framework Directive surface water and groundwater bodies (Environment Agency, 2023a)
- Environment Agency Flood Map for Planning (Environment Agency, 2023b)
- Environment Agency Long Term Flood Risk Information Mapping (Environment Agency, 2023c)
- Environment Agency Risk of Flooding from Surface Water (RoFSW) Extent: 0.1, 1 and 3.3 percent annual chance datasets (Environment Agency, 2023d) datasets
- Environment Agency Risk of Flooding from Reservoirs (Environment Agency, 2023e)

- Environment Agency Historic Flood Map (Environment Agency, 2023f)
- Environment Agency Water Quality Data Archive (Environment Agency, 2023g)
- Environment Agency Licensed Surface Water and Groundwater Abstraction, electronic datasets (Environment Agency, 2023h)
- Environment Agency present and historical land uses, and contaminated land (part 2A) datasets
- Greater Manchester Surface Water Management Plan (JBA Consulting, 2012)
- Highways Agency Drainage Data Management System (National Highways, 2023a)
- GIR (Appendix 9.3 of the Environmental Statement Appendices (TR010064/APP/6.3))
- North West RBMP (Environment Agency, 2018)
- OS mapping for identifying the locations of springs, sinks, sources, spreads, collects, issues, wells
- PWS questionnaire results from landowners received in January 2022 and March 2023
- Sites of Biological Importance (SBI) register (Greater Manchester Ecological Unit, 2020)
- The Coal Authority Interactive Map Viewer (Coal Authority, 2018), including Mine Entry Points, Abandoned Mines Catalogue, Development High Risk Areas, Past Shallow Coal Mine Workings, Probable Shallow Coal Mine Workings, and Coal Outcrops

Baseline information

Surface water

13.7.2 The Scheme lies within the River Irwell catchment. All watercourses within the study area lie within this catchment. The River Irwell is a tributary of the River Mersey with headwaters on Deerplay Moor and flows in a general southernly direction to join the River Mersey near Irlam. Sections of the Irwell have been canalised to form part of the Manchester Ship Canal.

13.7.3 There are five Main Rivers (Environment Agency, 2019) within the 1km study area. These include:

- Brightly Brook
- Castle Brook
- Hollins Brook

- Parr Brook
- Whittle Brook

13.7.4 There are a number of Ordinary Watercourses, minor watercourses, unnamed ditches and other water bodies within the study area. All surface water features in the study area are shown in Figure 13.1: Surface Water Receptors of the Environmental Statement Figures (TR010064/APP/6.2).

13.7.5 The low flow (Q_{95}) values for each watercourse are detailed within Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

Surface water WFD catchments

13.7.6 The North West RBMP (Environment Agency, 2018) classifies WFD Regulations waterbodies according to their ecological and chemical status and whether they have been heavily modified or not. Waterbodies are required to achieve 'good' ecological and chemical status (or potential, if designated as heavily modified or artificial) by 2021 or 2027.

13.7.7 Full details of the overall, ecological, physico-chemical status of WFD designated waterbodies within the study area are presented in Appendix 13.1: WFD Compliance Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

13.7.8 In summary, each of the identified WFD Regulations waterbodies are classified has having an overall 'moderate' status. Each identified WFD Regulations waterbody also has a classification of 'moderate' for ecological and physico-chemical status. Every WFD Regulation waterbody identified has an overall chemical status of 'Fail'. The failures are primarily due to priority hazardous substances, notably: polybrominated diphenyl ethers (PBDE), mercury and its compounds and perfluorooctane sulphonate (PFOS). Vehicles and road runoff are not typically considered as significant sources of these pollutants. Several of these pollutants are banned in the UK with pollution levels due to historical use.

13.7.9 There are several other watercourses and waterbodies in the study area, including several brooks, unnamed tributaries and unnamed drains. These waterbodies are not designated under the WFD Regulations. The water quality status of these waterbodies is unknown. Existing water quality in these smaller watercourses is likely to be influenced by surrounding land uses (which are predominantly residential and agricultural), surface water runoff, road drainage, sewerage misconnections, nutrient inputs from agriculture and golf courses, accidental spillages and unlicensed discharges. There is likely to be a significant network of surface water sewers which discharge into the watercourses listed above.

13.7.10 There are no designated sites of ecological importance for surface water within the study area.

Existing drainage

13.7.11 The existing drainage arrangement is comprised of six drainage catchments, served by a variety of drainage features including cross-carriageway drains, filter drains, kerb inlets, carrier drains, gullies and surface water channels. Full details of the existing drainage system is available within the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)).

13.7.12 The Drainage Data Management System (DDMS) (National Highways, 2023a) assets programme classifies outfalls in accordance with their potential to pollute receiving waters. Outfalls can be classified as any of six categories which describe the level of risk to a receiving watercourse. Categories include A (very high), B (high), C (moderate), D (low), X (risk addressed) or 'Not Determined' for those lacking data.

13.7.13 According to DDMS information, there are no Category A or Category B outfalls, seven Category C, one Category D, and no Category X or 'Not determined' outfalls within the study area for those outfalls currently recorded on DDMS. The priority outfalls assessment is high-level based on a desk study. A summary of the risk categories is presented in Table 13.10. Some of the Outfall IDs represent more than one outfall.

Table 13.10 Outfalls within the study area recorded on DDMS (National Highways, 2023a)

Outfall ID	Risk	Location
SD8208_0858j SD8208_0858k SD8208_0858l	Category C	Situated approximately 290m south of the first slip road to the M66 J3 on the western side of the M66. Discharges indirectly into Hollins Brook via drains.
SD8208_1556o SD8208_1556p SD8208_1556q	Category C	Situated approximately 290m south of the first slip road to the M66 J3 on the eastern side of the M66. Discharges indirectly into Hollins Brook via drains.
SD8208_2232h	Category C	Discharges directly into Hollins Brook on the eastern side of the M66.
SD8306_4225b	Category D	Located on one of the un-named tributaries of Castle Brook. Outfall located on the south side of M62 on the northern edge of Simister.

Abstractions and discharges

13.7.14 Based on Environment Agency data, there are three surface water abstraction locations within the 1km study area, both for industrial, commercial and public services (Environment Agency, 2023h). These are shown on Figure 13.1: Surface Water Receptors of the Environmental Statement Figures (TR010064/APP/6.2).

13.7.15 There are 17 consents to discharge within the study area (Defra, 2022) as detailed in Table 13.11. These are shown on Figure 13.1: Surface Water Receptors of the Environmental Statement Figures (TR010064/APP/6.2).

Table 13.11 Discharge consents within the study area (Defra, 2022)

Date Effective	Long Name	National Grid Reference (NGR)	Discharge Type
10/06/1997	Castle Brook Farm Septic Tank	SD8260007650	Domestic property (single) (incl. farmhouse)
23/12/1985	Egypt Farm	SD8330006400	Domestic property (single) (incl. farmhouse)
01/04/1991	Park Lane Sewage Works	SD7998004962	Storm Tank/Combined Sewer Overflow (CSO) on Sewerage Network (water company)
14/07/1983	The Bungalow	SD8260007680	Wastewater Treatment Works (WwTW) (not water company) (not STP at a private premises)
27/01/1999	Pike Fold Golf Club Sewage Treatment Plant (STP)	SD8261007410	WwTW (not water company) (not STP at a private premises)
09/12/2005	Heaton Park Open Reservoir	SD8286004670	WTW/Water Collection/Treatment/Supply
19/03/1999	Castle Brook Business Park Pumping Station	SD8180008600	Pumping Station on unadopted sewerage network (not water company)
01/04/2018	Maple Avenue CSO	SD8072004880	Storm Tank/CSO on Sewerage Network (water company)
01/04/2018	Farm Hill CSO 091KO	SD8053003980	Storm Tank/CSO on Sewerage Network (water company)
09/06/2018	Clifton Rd Leach St CSO	SD8056003980	Storm Tank/CSO on Sewerage Network (water company)
10/06/2016	Simister Lane WW Ntwk Pumping Station	SD8337006210	Pumping Station on Sewerage Network (water company)
01/04/2018	Parr Brook CSO	SD8157007270	Storm Tank/CSO on Sewerage Network (water company)
01/10/1996	241 Heywood Old Road	SD8450005400	Domestic property (single) (incl. farmhouse)
01/05/1970	302-308 Heywood Old Rd	SD8440306430	Domestic property (multiple) (incl. farmhouses)

Date Effective	Long Name	National Grid Reference (NGR)	Discharge Type
05/05/1972	276 Heywood Old Rd	SD8442006330	Domestic property (single) (incl. farmhouse)
17/10/1972	395, 397 & 399 Heywood Old Rd	SD8437006520	Domestic property (multiple) (incl. farmhouses)
31/01/1973	296, 298 & 300 Heywood Old Rd	SD8440006490	Domestic property (multiple) (incl. farmhouses)

13.7.16 There are no Drinking Water Safeguard Zones (Surface Water) located within the study area (Defra, 2023).

13.7.17 The study area falls within two surface water NVZs (Defra, 2023). NVZs are areas designated as being at risk from agricultural nitrate pollution. Nitrate pollution is typically associated with agricultural land use rather than highways. The two NVZs in the study area are:

- Irwell/Manchester Ship Canal (Kearsley to Irlam Locks)
- River Irk (Moston Brook to River Irwell)

13.7.18 A small section of the southern end of the Scheme along the M60 lies within the River Irk NVZ.

Recreation

13.7.19 Within the study area, those waterbodies close to Public Rights of Way (PRoW), parks (i.e. Philips Park) and within golf courses have the potential to be utilised for recreational purposes and provide amenity value. Further details regarding the recreation baseline can be found in Chapter 12: Population and Human Health of this Environmental Statement (TR010064/APP/6.1).

Hydromorphology

13.7.20 The baseline conditions of the hydromorphological receptors can be found in Appendix 13.3: Hydromorphology Baseline Report of the Environmental Statement Appendices (TR010064/APP/6.3). The appendix describe watercourses identified within the study area which are hydrologically connected to the Scheme. Table 13.12 summarises the conditions and characteristics of each watercourse scoped in for assessment (see Figure 13.1: Surface Water Receptors of the Environmental Statement Figures (TR010064/APP/6.2) for the locations of the watercourses).

Table 13.12 Baseline summary of hydromorphological receptors

Receptor name	Description
Blackfish	Small and (largely) naturally straight watercourse originating north of Heaton Park (NGR: SD 8325 0536) and flows south-east towards its confluence with the River Irk at Higher Blackley (NGR: SD 8400 0429). North of Heaton Park, Blackfish comprises a heavily silted channel with no evidence of significant natural processes. In Heaton Park, the watercourse comprises silt, small gravels and organic matter, whilst also exhibiting some flow variation. However, the channel here remains absent of significant natural processes or depositional features. Numerous footbridges and culverts cross the watercourse, which also flows into several online ponds and reservoirs.
Castle Brook	A largely straightened watercourse originating from Unsworth Moss Farm (NGR: SD 83380 06910). From its source, the watercourse flows north towards Whittle Brook at Thurston Fold Farm (NGR: SD 8260 0800). The channel bed largely comprises silt and vegetation, whilst some locally sourced gravels provide some flow variation. The watercourse does not display any significant erosion, whilst some riffles are present along the northern reaches of the watercourse. Modifications include several footbridges and culverts, largely at the golf course, whilst the channel comprises a modified cross-section resulting from dredging.
Castle Brook Tributary	A straightened drainage channel originating from Pike Fold golf course (NGR: SD 82690 06410), east of the M66, and flows typically north-east towards a confluence with Castle Brook (NGR: SD 8288 0667). The channel exhibits no significant natural processes as surveys observed a largely dry channel with pockets of imperceptible flows. Modifications include online ponds, which offered an occasional supply of fine sediment and flow.
Hollins Brook	Originating from coal pits farm (NGR: SD 84020 09230), where it flowed as Brightley Brook. The watercourse then flows as Hollins Brook downstream of the confluence with Whittle Brook (NGR: SD 8239 0824). A meandering channel comprising irregular channel bends. Bank toe material suggests bank erosion and failure, whilst side and mid-channel bars make up depositional features. Numerous road crossings, weirs, outfalls and online ponds make up modifications.
Parr Brook	The source of Parr Brook is unclear, but it is assumed to be adjacent to Parrenthorn High School (NGR: SD 8260 0539). From its source, Parr Brook flows north towards the River Roch in Whitefield (NGR: SD 8221 0585). The watercourse is largely culverted and, where surveyable, exhibits a straightened and heavily poached channel comprising a silty and vegetated channel bed. In-channel vegetation facilitates flow variation. No significant natural processes are present along the open channel. Modifications include road crossings, extensive culverting beneath Whitefield, weirs and a reservoir.
Tributary of Parr Brook 2	A culverted watercourse originating in Whitefield (NGR: SD 8222 0581) and flows south-west to a culverted confluence with Parr Brook (NGR: SD 8222 0562). As the watercourse is entirely culverted, it is unlikely to exhibit any significant natural processes or depositional features.

Receptor name	Description
Tributary of Castle Brook Tributary	Straight drainage channel originating from Lower Droughts Farm (NGR: SD 83440 06290) and flows north-west towards Castle Brook Tributary (NGR: SD 8287 0661). The channel comprises a silt bed and is largely choked by vegetation causing imperceptible flows. The watercourse does not exhibit any significant natural processes or depositional features. Modifications include culverting beneath the M62 and an access track further north.
Whittle Brook	A sinuous channel originating north of Middleton (NGR: SD 84370 08860) and flows west to confluence with Hollins Brook (NGR: SD 8239 0824). Evidence of localised erosion and depositional features present. A road crossing makes up channel modifications.

Groundwater

13.7.21 Detailed baseline groundwater information is presented in Appendix 13.4: Groundwater Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3) with a summary presented in the following sections. Identified groundwater receptors are shown on Figure 13.5: GWTDEs and Groundwater Dependency Classification of the Environmental Statement Figures (TR010064/APP/6.2).

13.7.22 A review of lithological information provided in the GI (see Appendix 9.3: GIR of the Environmental Statement Appendices (TR010064/APP/6.3)), indicates that made ground deposits are extensive throughout the Order Limits, which is to be expected given the presence of the existing motorway and motorway junctions.

13.7.23 The study area is underlain by superficial deposits mainly comprising glacial till and hummocky (moundy) glacial deposits. Smaller deposits including head, glaciofluvial with areas of glaciofluvial ice contact deposits, glaciolacustrine deposits, peat, alluvium and river terrace deposits are present elsewhere (BGS, 2023).

13.7.24 Underlying the superficial deposits, the study area is underlain by the Pennine Lower Coal Formation, Pennine Middle Coal Measures Formation, Pennine Upper Coal Formation, Manchester Marls, Chester Formation, Collyhurst Sandstone and Rossendale Formation.

13.7.25 The superficial deposits within the groundwater study area are classified mainly as secondary A and secondary undifferentiated aquifers (Defra, 2023), with pockets of unproductive strata and a high degree of variation in permeability.

13.7.26 The Pennine Coal Measures Group (the ‘Coal Measures’) and the Rossendale Formation are designated as Secondary A bedrock aquifers, the former of which underlies a large part of the Scheme (see Figure 13.3: Bedrock Aquifer Designations of the Environmental Statement Figures (TR010064/APP/6.2)). The younger Permo-Triassic Chester and Collyhurst sandstone formations, present at depth beneath the southern and western parts of the groundwater study area, comprise Principal. Units of mudstone belonging to the Manchester Marls Formation of Permian age, have been thrust between the sandstone bearing strata of the Chester Formation, by extensive faulting in the area, and are classified as Secondary B aquifers.

Groundwater levels

13.7.27 Ground investigations have been undertaken as part of the Scheme between June 2021 and March 2023 with subsequent post site monitoring. Out of 144 boreholes 49 recorded groundwater during drilling, with most strikes/seepages being encountered within 6m of ground level. The groundwater strike data indicate that groundwater is typically encountered in sandy silty clay deposits associated with glacial till deposits and made ground.

13.7.28 Groundwater monitoring data from manual dipping is available between August 2021 and May 2023 in 47 locations, 11 of which are dual installations. During the monitoring period groundwater was encountered between -0.23 and 13.84m below ground level (bgl) across the site. Artesian conditions were only encountered in one borehole, WS-N02B, located north of M60 J18, west of Simister island. Groundwater levels up to 0.23m above ground level were recorded at this location.

13.7.29 BGS data shows that there are two main areas within the Order Limits for the Scheme with potential for groundwater flooding to occur at surface level or to property or infrastructure situated below ground level (BGS, 2021a). These two areas are shown on Figure 13.8: Areas Susceptible to Groundwater Flooding of the Environmental Statement Figures (TR010064/APP/6.2) and generally include; most of the area in and around M60 J18, extending north to Unsworth along the M66 and the area between M60 J17 and J18 around Besses' o' th' Barn and Oak Bank. The remainder of the area within the Order Limits is considered to have limited potential for groundwater flooding to occur.

Groundwater as a resource

13.7.30 There are no SPZs associated with Public Water Supplies within the groundwater study area or its vicinity (Defra, 2023).

13.7.31 Six licensed groundwater abstractions have been identified within the 2km groundwater study area for the Scheme (Environment Agency, 2023h). This number has reduced from seven which was reported in the Preliminary Environmental Information Report (PEIR) (Annex L of the Consultation Report Annexes (TR010064/APP/5.2)) due to amendments in the Order Limits leading to an altered 2km study area. All these abstractions are associated with industrial/commercial uses, primarily for spray irrigation (for golf courses), or food and drink processing water. Licensed groundwater abstraction information for Pilsworth Landfill/Quarry, indicates that active dewatering is currently taking place at this site. No further information was provided on licensed quantities at Pilsworth Landfill/Quarry following a Freedom of Information request sent by the Applicant to the Environment Agency in March 2023.

13.7.32 Groundwater abstractions of less than $20m^3$/day do not require a licence. As such, there may be PWSs which the local authority is not aware of. Therefore, private water supply questionnaires were sent out to landowners with land lying within the provisional Order Limits in January 2022. This was extended to include all land parcels within 250m of the Order Limits in April 2023, excluding large urban areas such as Whitefield and Prestwick. 10 out of 38 surveys were returned, five of which indicated a PWS of some sort on their land.

13.7.33 Within the study area three licensed discharges to groundwater have been identified, the closest of which lies 110m south of the Order Limits.

GWDTE

13.7.34 Three nature conservation sites with local ecological designations were identified as potential GWDTE within 250m of the Order Limits (Hazlitt Wood SBI, Hollins Vale LNR, SBI and Hollins Plantation SBI). Since production of the PEIR (Annex L of the Consultation Report Annexes (TR010064/APP/5.2)), a further six potential GWDTE (non-designated) have been identified through UKHab surveys undertaken by ecologists. A full assessment of GWDTE is presented in Appendix 13.5: GWDTE Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3). Their locations are shown on Figure 13.5: GWTDEs and Groundwater Dependency Classification of the Environmental Statement Figures (TR010064/APP/6.2), along with their groundwater dependency classification.

Groundwater quality

13.7.35 As part of the GI groundwater samples were only taken from the superficial deposits and no information on groundwater quality in the bedrock has been gathered during the ground investigations. Groundwater quality has been gathered and is presented in detail in Chapter 9: Geology and Soils of this Environmental Statement (TR010064/APP/6.1). The groundwater quality information for the bedrock aquifers and superficial deposits within the study area from the Environment Agency (Griffiths *et al.*, 2003; Cheney, 2007) are summarised in Appendix 13.4: Groundwater Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

Coal mining

13.7.36 Underground coal mining is described in Chapter 9: Geology and Soils of this Environmental Statement (TR010064/APP/6.1) and is summarised in Appendix 13.4: Groundwater Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

Groundwater vulnerability

13.7.37 The groundwater vulnerability map (Defra, 2023) shows that the majority of the Scheme lies on aquifers with medium-high or medium vulnerability. Small areas of low vulnerability are also present, which correlate with the mapped extent of peat deposits, and typically provide the greatest protection to groundwater from pollution due to the presence of low-leaching soils and/or low-permeability superficial deposits.

Flood risk

13.7.38 An FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) has been prepared for the Scheme in accordance with NPS NN requirements. A full description of the flood risk baseline is presented in the FRA and summarised below.

Fluvial flood risk

13.7.39 The Environment Agency's Flood Map for Planning (Environment Agency, 2023b) defines flood zones as:

- Flood Zone 3: areas with greater than a 1% (1 in 100 year) AEP of fluvial flooding
- Flood Zone 2: areas between 0.1% (1 in 1000 year) and 1% (1 in 100 year) AEP of fluvial flooding
- Flood Zone 1: areas with less than 0.1% (1 in 1000 year) AEP of fluvial flooding

13.7.40 Climate change uplifts have been applied where available based on the latest published Environment Agency guidance (Environment Agency, 2022) as of May 2022, taking into account the design life of the Scheme, which are based on UK Climate Projections 2018 (UKCP18).

13.7.41 The baseline fluvial flood risk from Main Rivers within the study area, from north to south is summarised in Table 13.13 and presented in Figure 13.6: Flood Zones of the Environmental Statement Figures (TR010064/APP/6.2).

Table 13.13 Summary of baseline fluvial flood risk from Main Rivers

Watercourse	Baseline fluvial flood risk
Hollins Brook	Hollins Brook flows in a north-westerly direction through the study area passing underneath the M66 approximately 2.5km north of M60 J18. The river has areas classified as Flood Zone 2 and 3 although they are typically within the river corridor. The M66 is raised at the crossing on an embankment so although the Environment Agency Flood Zone mapping suggests the carriageway is at risk of flooding, this is not considered to be likely and the risk is very low.
Brightley Brook	Brightley Brook flows eastwards into the study area to its confluence with Hollins Brook, approximately 300m upstream of the latter's crossing of the M66. There are areas of Flood Zone 2 and 3 associated with this watercourse.
Castle Brook	Castle Brook rises to the north-east of M60 J18 and flows northwards parallel and approximately 400m to the east of the M66. It is designated as a Main River from the confluence of three smaller watercourses approximately 800m north of M60 J18 to where it meets Whittle Brook approximately 1.4km downstream. There is no Flood Zone 2 or 3 attributed to this watercourse beyond the river channel.
Parr Brook	Parr Brook rises to the north of the M60 approximately 700m to the south-west of M60 J18. It flows northwards to its confluence with the River Roch approximately 3.3km downstream at Blackbridge. The river runs approximately 700m to the west of the M66. The majority of this watercourse has no Flood Zone 2 or 3 attributed to it beyond the river channel with the exception of the residential area between Parr Lane and Mersey Drive, Simister, although the majority of this stretch is culverted.

Watercourse	Baseline fluvial flood risk
Whittle Brook	Whittle Brook flows in a north-westerly direction through the study area to its confluence with the Castle Brook, downstream of which it becomes the Hollins Brook. The river has areas classified as Flood Zone 2 and 3 although they are typically within the river corridor.

13.7.42 The majority of the study area is located within Flood Zone 1 and there are no areas of the Scheme that interact with Flood Zones 2 or 3.

13.7.43 Ordinary Watercourse is the term used to define all remaining rivers/watercourses within the UK not designated as Main Rivers. Activities on these watercourses are administered by the LLFA, in this location that is Bury Metropolitan Borough Council. Environment Agency RoFSW mapping (Environment Agency, 2023d) and The Greater Manchester SWMP mapping (JBA Consulting, 2012) has also been reviewed to inform the assessment of the fluvial flood risk for the smaller watercourses not evident in the Environment Agency's Flood Map for Planning (Environment Agency, 2023b).

13.7.44 There are ten Ordinary Watercourses within the study area which are summarised in Table 13.14 along with their fluvial food risk.

Table 13.14 Summary of Ordinary Watercourses within the study area and fluvial flood risk

Watercourse	Fluvial flood risk
Ordinary Watercourse 1 (Tributary of Parr Brook)	This watercourse rises to the north of the M60 in Whitefield and flows northwards through the park adjacent to Thatch Leach Lane to join Parr Brook. There is no surface water flow path evident from the RoFSW (Environment Agency, 2023d) mapping in the vicinity of the Scheme attributable to this watercourse.
Ordinary Watercourse 2 (Castle Brook Tributary)	This watercourse rises to the north of M60 J18 and flows eastwards away from the M66 to join Ordinary Watercourse 3. The flood extents on the RoFSW (Environment Agency, 2023d) are not exclusively within the river channel, with some areas at medium risk flooding in the adjacent fields. An area of low flood risk crosses the location of the Northern Loop.
Ordinary Watercourse 3 (Tributary of Castle Brook Tributary)	This watercourse rises south of the M62 and flows northwards crossing the motorway approximately 530m north-east of the M60 J18 and flows north-westwards parallel to the M66 to join Ordinary Watercourse 2. Flood extents based on the RoFSW (Environment Agency, 2023d) are within the river channel except for an area south of Egypt Lane, although that is outside the Order Limits.
Ordinary Watercourse 4 (Tributary of Castle Brook)	This watercourse rises approximately 330m north-west of the M62 and flows south-westwards to join the Castle Brook at the same point as Ordinary Watercourses 2 and 3. It flows parallel and approximately 40 m north-west of Egypt Lane. Based on the RoFSW (Environment Agency, 2023d) flooding is retained in the river channel except for an area at the head of the watercourses approximately 1km north-east of M60 J18 and outside the Order Limits.

Watercourse	Fluvial flood risk
Ordinary Watercourses 5, 6 and 7 (Tributaries of the River Irk)	These three Ordinary Watercourses rise within the study area to the east of the M60 south-east of M60 J18 and join to flow through farmland south-eastwards away from the Scheme to their confluence with the River Irk approximately 500m east of M60 J19. Based on the RoFSW (Environment Agency, 2023d) there are areas of flood risk attributed to these watercourses but not that intersect the Order Limits.
Ordinary Watercourse 8 (Tributary of Bradley Brook)	This watercourse rises to the north of the M60 in Whitefield Golf Club at the western end of the Scheme. It flows southwards crossing under the motorway approximately 700m to the west of M60 J17. Continuing southwards it joins Bradley Brook 250m south-east of the M60. The RoFSW (Environment Agency, 2023d) indicates areas of flood risk to the north of the M60 in the golf course, outside the Order Limits and areas of low risk across the carriageway south of Philips Park Road associated from a flow path to the east rather than the watercourse itself from the M60 carriageway.
Ordinary Watercourse 9 (Tributary of Bradley Brook)	This watercourse rises to the north of the M60 in Park Lane at the western end of the Scheme. It flows southwards crossing under the motorway approximately 1.5km to the west of M60 J17. Continuing southwards it joins Bradley Brook 600m south-east of the M60. The RoFSW (Environment Agency, 2023d) indicates some small areas of flood risk attributed to this watercourse but outside of the Order Limits.
Ordinary Watercourse 10 (Tributary of Bradley Brook)	The main channel flows in a south westerly direction under the M60 in culvert through the residential area to join the River Irwell approximately 1.3km downstream of Outfall 6. Based on the RoFSW (Environment Agency, 2023d) there are few areas of flood risk attributed to this watercourse beyond the river corridor and none within the study area.

Surface water flood risk

13.7.45 Surface water (water accumulating and/or flowing across the ground surface) also presents a risk within the study area based on the Environment Agency RoFSW mapping (Environment Agency, 2023d).

13.7.46 Figure 13.7: Areas at Risk From Surface Water Flooding of the Environmental Statement Figures (TR010064/APP/6.2) shows that there are areas shown to be at risk of surface water flooding immediately adjacent to all of the Main Rivers and Ordinary Watercourses. However, these areas are largely located within the fluvial floodplain extent associated with those watercourses and are therefore likely to be associated with flows from these watercourses, and consequently are discussed in the fluvial flood risk sub-section above.

13.7.47 Other areas of surface water flood risk are located mainly within localised topographic depressions or against existing road embankments.

13.7.48 It should be noted that the high-level models often used for large-scale surface water mapping do not take full account of the influence of existing drainage and culverts and may therefore overestimate flood risk in some areas.

13.7.49 There are several significant overland flow routes and other areas of high surface water flood risk within the study area. The FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)) provides further information on the location and extent of surface water flood risk across the study area.

Groundwater flood risk

13.7.50 BGS data shows that there are areas within the Order Limits with potential for groundwater flooding to occur at surface level, or to property or infrastructure situated below ground level (BGS, 2021). These areas include most of M60 J18 and its immediate vicinity, and to the north of Simister, along the M66. However, there are no historical records of groundwater flooding in the study area (as discussed in Appendix 13.6: FRA of the Environmental Statement Appendices (TR010064/APP/6.3)).

13.7.51 A review of groundwater level information from the GI (see Appendix 9.3: GIR of the Environmental Statement Appendices (TR010064/APP/6.3)) and subsequent monitoring has been undertaken to determine groundwater levels across the Scheme. A full summary of information on groundwater from the GI is presented in Appendix 13.4: Groundwater Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3), with a summary provided here to inform the FRA (Appendix 13.6 of the Environmental Statement Appendices (TR010064/APP/6.3)).

13.7.52 During the ground investigations groundwater was encountered in 49 out of 144 GI locations during drilling, with some locations having multiple strikes at different depths. Where encountered, groundwater was primarily struck within 6m of ground level in sandy silty clay associated with glacial till, with some groundwater strikes recorded in the sandy layers of made ground.

13.7.53 In five locations groundwater was encountered at less than 1mbgl during drilling, i.e., at a relatively shallow depth. Additionally, during subsequent monitoring, 15 out of 46 boreholes had groundwater recorded at a depth of less than 1mbgl, with one location (WS-N02B) presenting artesian conditions throughout the monitoring period. These areas of shallow groundwater (less than 1mbgl) indicates areas where groundwater flooding could occur.

Reservoir flood risk

13.7.54 The Environment Agency's Risk of Flooding from Reservoirs mapping (Environment Agency, 2023e) presented in Figure 13.9: Areas at Risk of Flooding From Reservoirs of the Environmental Statement Figures (TR010064/APP/6.2) indicates that the M60 J18 and its northern and southern slip roads are at risk of flooding due to failure of large, raised reservoirs, as defined under the Reservoir Act 1975. The potential extent of reservoir flooding also reaches residential areas in Prestwich and Whitefield to the west of M60 J18. The source of the risk is the Heaton Park Reservoir to the south-west of M60 J18. The flow path flows north-eastwards and then follows the course of the Castle Brook.

13.7.55 All large, raised reservoirs, as defined by the Reservoirs Act 1975, are regularly inspected and maintenance is supervised by reservoir engineers. Therefore, the risk of failure is considered to be very low due to their monitoring and inspection regime and therefore reservoir flood risk will not be considered further.

Utilities

13.7.56 The Bury Preliminary FRA (PFRA) (JBA Consulting, 2011) presents mapping to aid understanding of the volume of water discharging from the modelled sewer system during a 3.3% (1 in 30 year) AEP rainfall event. The map indicates the land and receptors in the south-west of the study area are at greater probability of sewer flooding than land in the north and east.

Historic flood events

13.7.57 The Environment Agency's Historic Flood Map (Environment Agency, 2023f) identifies the maximum extent of recorded flood outlines from the rivers, sea and groundwater springs. A review of the mapping indicates there are no areas of historical flooding identified within the study area.

Future baseline

Surface water

13.7.58 The future baseline conditions for water quality could alter due to changes in land use. Measures to improve watercourses in line with legislative objectives may result in an improvement away from baseline water quality over time.

13.7.59 Climate change may lead to a change in both low and high flows in watercourses, leading to subsequent changes in dilution capacity.

Hydromorphology

13.7.60 Over the anticipated lifetime of the Scheme baseline conditions are likely to change locally, given the onset of climate change driven weather events. Such changes may include localised lateral adjustment where unconfined, channel incision where watercourses comprise of a steep gradient and other natural processes.

Groundwater

13.7.61 Impacts on baseline conditions for groundwater resources and associated receptors could be significantly altered during the anticipated lifetime of the Scheme. In general, any new dewatering activities have the potential to reduce groundwater levels in the study area. Conversely, if existing dewatering regimes or abstractions cease, then groundwater levels may rise.

13.7.62 Over the medium term and long term, groundwater resources in the study area may be affected by climate change. However, any changes would be complex and may result in:

- A long-term decline in groundwater storage due to higher soil moisture deficits due to warmer, drier summers

- Increased frequency and severity of groundwater droughts leading to reduction in base flow to watercourses or GWDTE
- Increased groundwater flooding from high intensity summer storms

13.7.63 Baseline conditions for water quality could change over the anticipated lifetime of the Scheme, as a consequence of land use changes and measures to improve water bodies in line with WFD objectives. It is likely that groundwater quality would generally improve, as historical pollution sources are removed, and better water quality management measures are put into place.

13.7.64 However, based on currently available information, there is unlikely to be a significant change in the baseline groundwater quality. Changes to the groundwater regime brought about by climate change are unlikely to affect groundwater quality.

Flood risk

13.7.65 Over the anticipated lifetime of the Scheme changes to the baseline as a consequence of climate change would likely occur, including a likely increase in the frequency and magnitude of flood events.

13.7.66 Future baseline accounting for climate change has been assessed in line with the latest Environment Agency guidance for increases in fluvial flows and rainfall intensity (Environment Agency, 2022), which can be found in Appendix 13.6: FRA of the Environmental Statement Appendices (TR010064/APP/6.3).

Value (importance) of receptors

13.7.67 The value (importance) of all receptors within the study area have been assessed based on criteria in DMRB LA 113 augmented with professional judgement based upon the information presented in the baseline and associated technical appendices to this chapter, and are presented in Table 13.15. The value (importance) of receptors may have been changed since the publication of the PEIR (Annex L of the Consultation Report Annexes (TR010064/APP/5.2)) following further investigation and the assessment of baseline sensitivities.

13.7.68 DMRB LA 113 does not include criteria for assessing the value of ponds, lakes and reservoirs. As such, these have all been valued as low importance receptors unless they have specific uses and/or designations that would indicate increased importance. Ponds in relation to protected species have been assessed within Chapter 8: Biodiversity of this Environmental Statement (TR010064/APP/6.1).

Table 13.15 Importance of receptors in the study area for RDWE

Importance	RDWE matter	Description	Examples within the study area
Very High	Surface water quality	WFD Regulations classified water body achieving 'High' physico-chemical and biological elements status, 'Pass' for specific pollutants and /or priority substances. Q95 likely to be ≥ 1.0m³/s. Watercourse part of a site protected/ designated under UK legislation (SAC, SPA, SSSI, and Ramsar site). Non-WFD Regulations classified watercourses may be applicable if part of a protected site.	None
	Hydromorphology	A watercourse that appears to be in complete natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, free from any modification or anthropogenic influence. Morphological features and processes would be highly sensitive to change as a result of temporary or permanent works.	None
	Groundwater	Principal bedrock and superficial aquifers. Groundwater flow and yield associated with licensed groundwater abstractions. Groundwater quality associated with Source Protection Zone (SPZ) 1 (Inner Protection Zone) associated with licensed abstractions. Buildings of regional or national importance, such as grade I listed buildings, scheduled monuments, hospitals, power stations and large industrial sites. Water feeding GWDTEs with a high or moderate groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, SACs, SPAs and SSSIs.	Bedrock Aquifers (Chester Formation and Collyhurst Sandstone Formation)
	Flood risk	Essential infrastructure or highly vulnerable development (e.g. essential transport infrastructure which must cross the area at risk (the Scheme has been classified as 'essential infrastructure')).	Existing M60, M62 and M66 roads.

Importance	RDWE matter	Description	Examples within the study area
High	Surface water quality	WFD Regulations classified water body achieving or having established RBMP objectives (for a later RBMP cycle) to achieve 'Good' physico-chemical and biological elements status ('Good potential' for HMWBs), 'Pass' for specific pollutants and /or priority substances. Q95 likely to be <1.0m³/s. Contains species protected under EC or UK legislation Ecology and Nature Conservation but is not part of a protected site. Non-WFD Regulations classified water bodies may be applicable if protected species are present, indicating good water quality and supporting habitat.	River Irk, River Irwell
	Hydromorphology	A watercourse that appears to be in natural equilibrium and exhibits a natural range of morphological features. There is a diverse range of fluvial processes present, with very limited signs of modification or other anthropogenic influences. Morphological features would be sensitive to change as a result of temporary or permanent works.	None
	Groundwater	Secondary A aquifers. Groundwater flow and yield and quality associated with extensive non-licensed private water abstractions (i.e. feeding ten or more properties or supplying large farming / animal estates). Groundwater quality associated with SPZ2 (Outer Protection Zone) associated with licensed abstractions. Residential and commercial properties and Grade II listed buildings. Water feeding GWDTEs of low groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, SACs, SPAs and SSSIs; or water feeding highly or moderately GWDTE with a national non-statutory UK Biodiversity Action Plan (BAP) priority.	Secondary A aquifers (Glacio-fluvial deposits, alluvium, river terrace deposits) Secondary A aquifers (Pennine Lower Coal Measures Formation, Pennine Middle Coal Measures Formation, Pennine Upper Coal Measures Formation, Rossendale Formation) Areas of Hazlitt Wood SBI GWDTE Areas of Hollins Vale LNR, SBI and Hollins Plantation SBI GWDTE

Importance	RDWE matter	Description	Examples within the study area
			Areas of Philips Park LNR and SBI GWDTE
	Flood risk	More vulnerable development (e.g. residential properties, other residential institutions, hospitals and non-residential uses for health services, nurseries and educational establishments).	Residential properties
Medium	Surface water quality	Water body not classified under WFD Regulations. May have a number of anthropogenic pressures and/or pollutant inputs from discharges and/or surrounding land-use relative to flow volume. Q95 likely to be >0.001m³/s.	Castle Brook, Parr Brook
	Hydromorphology	A watercourse showing signs of modification, recovering to a natural equilibrium, and exhibiting a limited range of morphological features (such as pools and riffles). The watercourse is one with a limited range of fluvial processes and is affected by modification or other anthropogenic influences. Morphological features and processes could be sensitive to change as a result of temporary or permanent works.	Castle Brook, Blackfish, Hollins Brook, Parr Brook, Whittle Brook
	Groundwater	Secondary B and Secondary Undifferentiated aquifers. Groundwater flow and yield and quality associated with small scale private water abstractions (i.e. feeding fewer than ten properties). Groundwater quality associated with SPZ3 (associated with licensed abstractions and unlicensed abstractions for which no SPZ is defined. Unoccupied residential and commercial properties and buildings. Water feeding GWDTEs of low groundwater dependence with a national non-statutory UK BAP priority; or water feeding highly or moderately groundwater dependent GWDTE sites with no conservation designation.	Secondary Undifferentiated aquifers (Glacial till (diamicton), hummocky glacial deposits, head) Secondary B (Manchester Marls Formation) Areas of Hazlitt Wood SBI GWDTE Areas of Hollins Vale LNR, SBI and Hollins Plantation SBI GWDTE Areas of Philips Park LNR and SBI GWDTE

Importance	RDWE matter	Description	Examples within the study area
			Areas of Cowl Gate Farm GWDTE Castle Brook South GWDTE Egypt Lane South GWDTE Areas of Simister Allotment Gardens GWTDE PWS (Whitefield Golf Club, Pike Fold Golf Club, Castle Road) Wells
	Flood risk	Less vulnerable development (e.g. building used for shops, offices, storage and distribution, restaurants).	Commercial properties within the study area
Low	Surface water quality	Water body not having a WFD Regulations classification shown in a RBMP. May have a large number of anthropogenic pressures and/or pollutant inputs from licensed discharges and/or surrounding land-use relative to flow volume. Q95 likely to be ≤0.001m³/s.	None
	Hydromorphology	A highly modified watercourse that has been changed by channel modification or other anthropogenic pressures. The watercourse exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes and not likely to be affected by modification.	Castle Brook Tributary, Tributary of Castle Brook Tributary, Tributary of Parr Brook 2
	Groundwater	Very poor groundwater quality and / or very low permeability make exploitation of groundwater unfeasible. No active groundwater supply. Industrial buildings that are currently not utilised, all derelict buildings and infrastructure that serves a single dwelling. Water feeding GWDTEs of low groundwater dependence with no designation or groundwater that supports a wetland not classified as a GWDTE, although may receive some minor contribution from groundwater.	Unproductive strata (peat, glacio-lacustrine deposits) Areas of Cowl Gate Farm GWDTE The Hills South GWDTE

Importance	RDWE matter	Description	Examples within the study area
			Areas of Simister Allotment Gardens GWTDE Park Wood Cottages South GWDTE PWS (Heaton North, Cowl Gate Farm)
	Flood risk	Water compatible development (e.g. flood control infrastructure, water/sewage transmission infrastructure and pumping stations, amenity open space, nature conservation and biodiversity, outdoor sports and recreation).	Open amenity space (Heaton Park Golf Course, Pike Fold Golf Club, Unsworth Cricket Club)

13.8 Potential impacts

13.8.1 Potential impacts on the water environment could arise from several direct and indirect sources during the construction and operational phases of the Scheme. This section summarises these potential impacts.

Construction

Surface water

13.8.2 During construction, there are generally two sources of pollutants to the water environment: sediments and other potentially polluting substances.

13.8.3 There would likely be an increased pollution risk from mobilised sediments in runoff. These could reach watercourses directly via overland flow or the drainage network, to impact water quality. This could occur through a variety of construction-related activities such as: earthworks (i.e. regrading and construction of new embankments and cuttings); vegetation clearance and topsoil stripping; piling; the movement of heavy machinery/vehicles; and runoff from stockpiles. There is high likelihood of silt being generated from construction activities which would be greater after rainfall events.

13.8.4 During construction, there is a risk of surface water contamination from the accidental spillage of fuels, lubricants, cements, grouts, hydraulic fluids or other harmful substances. These could be stored and used throughout the Scheme. Although the main storage areas would be in the construction compounds. Leaks and spills of these substances could migrate from the ground surface into surface watercourses via runoff or directly enter watercourses.

13.8.5 The use of cementitious materials, such as concrete, has the potential to contaminate surface waters, including altering its pH (becoming more alkaline). This is most likely to occur if concrete is used within a watercourse, such as for new outfalls.

13.8.6 The risks of pollution are greater where works occur within or immediately adjacent to a watercourse, such as during the construction or modifications of outfall structures. There is also a higher risk where works would take place close to existing gullies or drains forming part of the existing highways drainage network, which can be some distance from a watercourse. The drainage network creates a pathway for pollutants to reach the watercourse.

Hydromorphology

13.8.7 The greatest risks to hydromorphology are during the construction phase. Potential impacts to the hydromorphology of each watercourse within the study area could include:

- Potential increase in fine-sediment delivery due to runoff from construction activities, bare earth surfaces and following site clearance. Additional sediment delivery could smother the channel’s bed and alter morphological features.

- Potential increase in impermeable area (hardstanding, compacted soil) during construction which could alter drainage to the channels increasing overland flow and fine sediment delivery.
- Potential clearance of riparian vegetation increasing fine sediment delivery and destabilising the banks.
- Potential for temporarily altering existing drainage channels and hydrological connectivity within the catchment affecting hydromorphological processes in downstream receptors e.g., altered flow velocities, altered discharge and sediment volumes.
- Potential dewatering activities to enable construction would reduce groundwater levels and could reduce the baseflow of watercourses.
- Potential discharge of dewatered groundwater to watercourses.
- Potential bankside working increasing bank erosion and fine sediment delivery and risk of failure altering channel morphology and hydromorphological processes.

Groundwater

13.8.8 During construction it is considered that potential impacts to groundwater features including superficial and bedrock aquifers, and associated groundwater receptors such as licensed abstractions, PWS, and GWDTEs could arise from the following:

- Increased pollution risks, including the accidental spillage of fuels, lubricants, cements, hydraulic fluids or other harmful substances, which may be stored on site during the construction phase, and which could migrate into groundwater bodies.
- Physical contamination of groundwater from ground disturbance could lead to the potential for increased sediment in aquifers reaching groundwater features. This includes activities such as soil stripping; construction of cuttings; foundations for embankments, bridge abutments/gantries; other excavations required for example, attenuation ponds and drainage, and piling. The pollution risk to groundwater bodies, from the disturbance of contaminated ground specifically, is covered in Chapter 9: Geology and Soils of this Environmental Statement (TR010064/APP/6.1).
- The construction of cuttings, foundations, and piling activities (sheet and bored) could create vertical pathways for contaminated groundwater to migrate between aquifers. Even if groundwater is not contaminated, there is potential for mixing of different groundwater chemistries, which could be significant for WFD groundwater body status, as well as for any sensitive groundwater receptors.
- Impedance of groundwater flow from temporary below ground structures, and the potential corresponding impact on groundwater levels and/or quality.

- Dewatering during construction works is likely to locally lower groundwater levels and promote groundwater flow laterally and vertically towards the works. This can in turn impact on groundwater receptors such as:
  - Nearby groundwater abstractions, surface water receptors and GWDTEs potentially resulting in loss of supply for a groundwater abstraction user or a reduction of baseflow contribution to a watercourse or loss of recharge for a GWDTE
  - Mobilising groundwater from areas with pre-existing poor groundwater quality towards the work sites. This would apply for example to any areas with known contamination, petrol stations etc. and may pose contamination risk to discharge to nearby surface water
  - Buildings have the potential to be affected by dewatering which may cause localised settlement.

Flood risk

13.8.9 Temporary works located within or adjacent to watercourses could affect the frequency, depth, extent and duration of fluvial flooding. It is not anticipated that works will take place within the floodplains of Main Rivers, however there is a floodplain associated with all watercourses including minor watercourses and ditches. Construction activities taking place in floodplains have the potential to create a loss of floodplain storage.

13.8.10 Surface-water flow paths could be altered due to construction activities or haul roads blocking existing flow paths or creating new flow paths which could result in an increased surface water flood risk.

13.8.11 The temporary increase in impermeable surfaces due to haul routes and construction compounds could lead to increased runoff volumes and velocities, as opportunity for infiltration to groundwater could be reduced. This could lead to an increase in the risk of flooding downstream.

13.8.12 Temporary drainage could increase both the rate and volume of surface water runoff to a receiving watercourse and has the potential to transfer sediment to the receiving watercourse (potentially affecting flooding mechanisms).

13.8.13 Activities that could cause changes to groundwater flood risk, and its contribution to other flood sources and mechanisms, due to groundwater levels and flows being altered are as follows:

- Temporary dewatering activities (for cuttings, and/or excavations required for embankment foundations, drainage assets, bridge abutments etc.), drawing down the level of the groundwater table and temporarily reducing groundwater flood risk.
- The release of artesian groundwater pressures within bedrock aquifers and/or mine groundwater stored in mine workings/adits.
- The potential discharge to ground of dewatered groundwater could cause local groundwater levels to rise.

- Impedance of groundwater flow from temporary below ground structures, which could cause groundwater levels to rise on the upgradient side and fall on the downgradient site (i.e. resulting in an increase and decrease in groundwater flood risk, respectively).

Operation

Surface water

13.8.14 There are two main types of pollution from roads during the operational phase: road runoff and accidental spillage risk. During routine operation, pollutants such as suspended solids, heavy metals, hydrocarbons, herbicides and de-icing materials can be present in the routine runoff from the road surface. These come from a variety of sources such as the following:

- Fuel and other oil deposits on the road surface due to leakage
- Hydrocarbons from exhaust deposits
- Lead, copper, zinc, iron and cadmium deposits from exhaust emissions, brake dust and tyre wear
- Synthetic rubber deposits from tyre wear
- Herbicides from vegetation management activities
- Chemicals used in windscreen washes such as detergents or de-icer
- De-icing agents such as road salt, but also potentially including trace amounts of impurities such as cyanide, metals and clays.

13.8.15 These pollutants, when combined with rainfall, can run into the highway drainage system which discharges to a watercourse. This can directly or indirectly impact the water quality and aquatic habitat within a receiving watercourse. The following potential impacts to water quality could occur:

- Suspended solids could smother substrate and increase turbidity with a consequent reduction in light penetration and lowering of oxygenation.
- Heavy metals in soluble form would be more ‘bio-available’ and particularly toxic; some heavy metals would also be sediment-bound.
- Hydrocarbons and herbicides would have direct impacts and are toxic to freshwater organisms.
- De-icing agents could cause high levels of Biochemical Oxygen Demand (BOD) where de-icing agents other than rock salt are used.

Hydromorphology

13.8.16 During operation, potential impacts to hydromorphology could arise from the following:

- Impacts resulting from new outfall structures and discharge from outfalls to a watercourse (including changes to local flow dynamics and localised bed and bank scour).
- Impacts resulting from new impermeable surfaces on catchment drainage, which will likely be transferred as part of highway drainage.
- Permanently excavated land for attenuation ponds, swales, gantries and piling could impact groundwater flow and alter baseflow of watercourses.

Groundwater

13.8.17 During operation, potential impacts to groundwater features could arise from the following:

- Increased pollution risks from routine runoff during the operational life of the Scheme.
- Increased pollution risks from accidental spillages of fuels and chemicals during the operational phase, for example due to road traffic accidents. The magnitude of change in groundwater quality could be important for sensitive groundwater receptors, such as groundwater abstractions and GWDTEs.
- Changes to groundwater levels, flows and quality, due to the presence of permanent below ground structures, such as foundations for bridge abutments and sheet piles, resulting in barriers to sub-surface flows, and/or providing new pathways for groundwater migration. This could lead to subsequent changes to groundwater levels, flows, quality, and locations of discharge points, for example to GWDTEs.
- Potential ongoing de-watering effects from cuttings and widenings may cause the groundwater table to fall, impacting on GWDTEs, surface water flows and water users. Where there will be cuttings, additional assessment of the long-term dewatering requirements will be needed. However, as part of the Scheme no long-term dewatering is expected to be required, with any excess groundwater being collected through the drainage system.
- The increase in areas of hardstanding has the potential to reduce recharge to the superficial aquifer potentially impacting on groundwater levels and flows.

Flood risk

13.8.18 The modification of existing associated infrastructure, the interception of overland flows, and the realignment of watercourses could potentially disrupt local flow routes and result in an increase in flood risk.

13.8.19 Significant cuttings may result in long term discharges of dewatered groundwater to watercourses.

13.8.20 Roads are designed to drain freely in order to prevent a build-up of standing water on the carriageway, whilst avoiding exposure to, or causing, flooding. A permanent increase in impermeable area could result in an increased amount of runoff volume and the rate of discharge from the road surface, and a subsequent increase in flood risk elsewhere.

13.9 Design, mitigation and enhancement measures

13.9.1 Mitigation is included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5). The First Iteration EMP will be developed into the Second Iteration EMP for implementation during construction and is secured by Requirement 4 of the draft DCO (TR010064/APP/3.1). This section sets out the embedded and essential mitigation and enhancement measures identified for the RDWE aspect.

Embedded mitigation

13.9.2 The environment team has worked in close collaboration with the infrastructure design team to avoid or reduce environmental impacts through the Scheme design. This is referred to as embedded (or design) mitigation. Chapter 3: Assessment of Alternatives of this Environmental Statement (TR010064/APP/6.1) details the design alternatives that have been considered, including the environmental factors which have influenced the decision making.

Surface water quality

13.9.3 HEWRAT assessments of each iteration have been undertaken with the results of the assessments informing the need and extent of further mitigation. This has then been incorporated into subsequent design iterations.

13.9.4 The Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)) and Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3) set out the treatment train specifications for drainage catchment within the extent of the Scheme.

13.9.5 The Scheme would consist of six separate road drainage catchments for road runoff (see Figure 13.2: Outfall Locations of the Environmental Statement Figures (TR010064/APP/6.2)). Attenuation storage would be provided in the form of attenuation ponds, swales, and oversized pipes depending on the site constraints.

13.9.6 Where required, discharge rates for the permanent drainage design will be restricted to achieve the allowable discharge rates and ensure no increase in flood risk. The associated attenuation storage will be sized for the 1% (1 in 100) AEP storm event including an allowance for climate change as described in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)) (Commitment W4 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)).

13.9.7 Where practicable, permanently wet ponds are the preferred method of attenuation storage. In general, the maximum depth of the attenuation ponds has been limited to 1.20m (comprising 0.9m peak water depth plus 0.3m freeboard). However, there may be a need to depart from this criterion due to site specific constraints such as the topography, reducing the excavation depth, and earthworks balancing between cut and fill. An additional permanent water depth of 0.3m is to be designed at the bottom of the attenuation ponds (i.e. below the attenuation pond outlet pipe invert level) to create a permanently wet pond. This will provide water quality treatment and biodiversity benefits (Commitment W5 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)).

13.9.8 Sediment forebays are to be provided at the inlet of all attenuation ponds which will provide effective pre-treatment (i.e. removal of coarse sediments) and ensure ease of maintenance during the removal of any such collected coarse sediments. The main storage compartment, after the sediment forebay, for all of the attenuation ponds is to have a 0.3m depth permanent water pool which will act as the main surface water treatment zone. Where required the attenuation ponds can also be cascaded (i.e. contain multiple storage compartments) to increase the residence time and enable the additional sedimentation of particulate matter to occur. In addition, attenuation ponds will be planted with vegetation sufficiently robust to withstand the potential pollutants suspended in the surface water runoff which will provide additional water quality treatment benefits. Perennial ryegrass and fescues are typical for this purpose (CIRIA, 2015a) (Commitment W5 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)).

13.9.9 The vegetation in swales / vegetated ditches will slow the surface water flow rate provided the flow is at or below the level of the vegetation. This will increase water residence time in the swale and force sediments and other potential pollutants to settle out (Commitment W5 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)). Check dams can also be provided to maximise the level of treatment. Check dam provision will be assessed at the detailed design stage. Where feasible swales / vegetated ditches are provided from some attenuation ponds (where practicable) as an added level of treatment prior to the surface water discharging to the receiving watercourse .

13.9.10 Filter drains will filter out some fine sediments, metals, hydrocarbons and other pollutants as the surface water percolates down through the trench fill material overlying the perforated filter drain (Commitment W5 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)).

13.9.11 Silt traps in chambers and gullies will provide suspended particulate matter retention with regular maintenance (Commitment W5 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)).

13.9.12 The treatment efficiencies of the SuDS which have been used in the assessments are taken from DMRB CG 501 (National Highways, 2022). Details of the drainage design and SuDS are presented in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)). Details of the treatment trains for each drainage catchment and the treatment efficiencies used in the HEWRAT assessments are presented in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

13.9.13 Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR10064/APP/6.3) also includes an assessment of spillage risk. This assessment has concluded that the risk of a serious chemical spillage from all road catchments is low and within the standards set out in DMRB LA 113. Isolation chambers fitted with penstock valves will be located at the downstream end of the highway drainage systems (Commitment W5 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)). This will allow isolation of the pollutants within the highway drainage system thereby avoiding pollution to receiving watercourses.

13.9.14 Pollution from maintenance activities during the operational phase, such as the use of herbicides and de-icing salts as a result of responsive activities, are difficult to predict and design for. It can however be controlled through good operational management regimes by the road operator. The prevention of ice formation and the de-icing of highways within the UK is carried out almost exclusively using rock salt complying with BS3247: Specification for salt for spreading on highways for winter maintenance. Road salt is applied typically in the winter months and therefore only spread on the highway on a small number of days per year. In the Memorandum of Understanding (MoU) between National Highways (formerly Highways Agency) and the Environment Agency (Highways Agency and Environment Agency, 2009) Annex 1 Water Environment it is agreed that:

- Prior to the use of de-icing agents other than rock salt, National Highways should consult with the Environment Agency.
- The Environment Agency does not require National Highways to apply for consent for normal routine maintenance operations, including the application of de-icing agents. However, the parties are aware that the application of de-icing agents can have impacts on water quality in receiving watercourses, particularly high levels of BOD and hence the parties are committed to investigating alternatives to conventional products currently in use.

13.9.15 If required, permits will be obtained for controlled discharges to surface waters during construction (such as those from dewatering activities) from either the Environment Agency (environmental permit) or LLFA (Ordinary Watercourse Consent) (commitment W2 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)). Therefore, controlled discharges to surface waters have not been considered further as these will be required to comply with the Environment Agency or LLFA (see Appendix A of the Consents and Agreements Position Statement (TR010064/APP/3.3) for further details).

13.9.16 An abstraction licence from the Environment Agency may be required for any surface water abstractions during construction. The location, timing, duration and quantities of water required are not known at this stage. Any licence conditions will be met as a requirement of the licence and so surface water abstractions have not been considered further (see Appendix A of the Consents and Agreements Position Statement (TR010064/APP/3.3) for further details) (Commitment W3 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)).

Hydromorphology

13.9.17 No embedded mitigation has been identified.

Groundwater

13.9.18 The Scheme drainage system will be designed to collect any groundwater seepages that may occur within the widenings and cuttings. Long-term drainage of cuttings is required to protect flood sensitive receptors (including the new road) from groundwater flooding during the operational phase. All attenuation ponds will be lined and there will be no discharges to ground. Furthermore, the drainage development during the detailed design phase will continue to be aligned with the “Protect groundwater and prevent groundwater pollution” guidance (Environment Agency, 2018) to protect groundwater (Commitment W6 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5))).

13.9.19 The following embedded mitigation measures in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5) will reduce impacts to groundwater flow and quality to GWDTE:

- Commitment W27 – Bored piles associated with the Simister Pike Fold Viaduct will be designed to ensure that there is no permanent residual pathway for potential contamination at Cowl Gate Farm GWDTE.
- Commitment W27 – Clay bunds will be used to prevent backfilled open-cut trenches from acting as a groundwater drain within the Order Limits. This will mitigate against long term potential impacts to Cowl Gate Farm, Castle Brook South, and Egypt Lane South GWDTEs.

Flood risk

13.9.20 Embedded mitigation for flood risk includes commitment W7 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5):

- Storage and attenuation of additional runoff within the drainage network will be provided to ensure there will be no increased risk of flooding, designed to the 1 in 100 year exceedance event plus climate change allowance (30%).
- No out of manhole flooding from the highway drainage system during the 1 in 5 year return period rainfall event.
- Maintaining of existing discharge rates from existing outfalls. Limiting of discharges from new outfalls to the greenfield runoff rate or 2l/s/ha, whichever is higher.

- Provision of a maintenance regime for all drainage assets.
- Long-term drainage of embankments and sheet piles to prevent flooding at the surface. Where pre-existing groundwater conditions are known to be shallow, drainage systems will be installed to limit the build-up of water.
- Long-term drainage of cuttings. Groundwater seepages will be collected by the road drainage system. This is to protect flood sensitive receptors (including the new road) from groundwater flooding during the operational phase.

Essential mitigation

13.9.21 Essential mitigation would occur as a matter of course due to legislative requirements or standard sector practices. Mitigation measures are also required to reduce and if possible offset likely significant adverse environmental effects.

Construction

13.9.22 The First Iteration EMP (TR010064/APP/6.5) includes a range of measures, which accord with legal compliance and good practice guidance when working within or around sensitive water resources. These measures include the following commitments in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5), relating to surface water, groundwater and flood risk, where appropriate and practicable:

- Commitment W1 – Temporary construction drainage will be used to ensure the collection of rainfall run-off from construction areas, compounds and haul roads. The Surface and Ground Water Management Plan will be developed from the Outline Surface and Ground Water Management Plan (Appendix H of the First Iteration EMP (TR010064/APP/6.5)) to detail measures that will be implemented to collect and treat potentially contaminated runoff.
- Commitment W8 – The Surface and Ground Water Management Plan will be developed from the Outline Surface and Ground Water Management Plan (Appendix H of the First Iteration EMP (TR010064/APP/6.5)) to detail measures that will be implemented to control the storage, handling, spillages and disposal of potentially polluting substances during construction, in accordance with legislation and best practice guidance.

- Commitment W9 – Where practicable, construction site layout will ensure material stockpiles and storage areas are not located within 10m from adjacent watercourses, ponds, boreholes and site drainage. Where this cannot be achieved, stockpiles will be limited such that they can be moved upon receipt of any flood warning/adverse weather conditions, or on-site additional mitigation measures (such as silt fencing~~bunds~~) will be implemented to provide an adequate barrier between the potential source of contaminated runoff and receptors. In the event that the location of material stockpiles cannot be avoided within 10m of a watercourse, the stockpile will be seeded to help reduce the risk of erosion and siltation of the watercourse. This is detailed in the Outline Surface and Ground Water Management Plan (Appendix H of the First Iteration EMP (TR010064/APP/6.5)).

- Commitment W10 – Storage of excavated soils and made ground will be managed in such a way that soil storage periods are minimised in duration and all storage areas will be managed in accordance with the Soil Management Plan (to be developed from the Outline Soil Management Plan (Appendix F of the First Iteration EMP (TR010064/APP/6.5))), to ensure that no polluted water percolates into the ground and no contaminated runoff is generated.

- Commitment W11 – Fuel, oil and chemicals that have the potential to cause significant damage to the environment will be stored in a safe and secure bunded area or container from which they cannot leak, spill or be open to vandalism.

- Commitment W12 – Where practicable, permanent attenuation ponds will be constructed early in the programme. Permanent attenuation ponds will be used for settlement of construction discharge water, however, some additional temporary attenuation ponds may be required in certain areas. The management and use of the ponds will be in accordance with the Surface and Ground Water Management Plan (to be developed from the Outline Surface and Ground Water Management Plan (Appendix H of the First Iteration EMP (TR010064/APP/6.5))). Where the permanent attenuation ponds are used during construction for drainage and treatment, any sediment accumulated will be removed prior to the end of the construction period so as to maintain the capacity of the ponds for attenuation and water quality treatment purposes during operation.

- Commitment W13 – Water will be pumped into attenuation ponds when required and water bowsers will use them as a water source when dust suppression is required.

- Commitment W14 – Vegetation clearance will be limited along riparian corridors and floodplains to prevent sediment disturbance in surface waters.

- Commitment W15 – Construction outfalls, where and when required, will incorporate good practice, as per CIRIA guidance.

- Commitment W16 – New outfalls will be installed to reduce impacts on the bed and banks. Best practice guidance will be followed as set out in DMRB CD 529 (National Highways, 2021) and CIRIA (CIRIA, 2019) in relation to design and positioning of outfalls to reduce scour to the bed and banks. To summarise, the following will be incorporated, if practicable, into the design:
  - Align the outfall downstream at a 45° angle.
  - Set the outfall back so that it does not protrude into the channel – ideally excavating a channel that acts as an intermediary between the outfall and the watercourse.
  - Set the level of the outfall so that it is submerged beneath the water level, if practicable.
- Commitment W17 – Risk from groundwater flooding (during excavation) will be managed through appropriate working practices and with adequate processes and equipment in place for dewatering to ensure safe and dry working environments.
- Commitment W18 – Where there will be discharge from dewatering operations to surface water, discharge rates will be carefully controlled to achieve no environmentally significant change to flood risk associated with the receiving watercourses. If required, dewatering discharge will be temporarily paused during flood events to prevent any increased flood risk during the flood event.
- Commitment W19 – Discharge of water from dewatering may require an Environmental Permit or discharge licence from the Environment Agency, which will be subject to conditions including specific water quality requirements. Typically, any dewatering over 20m^3/d will also be subject to an abstraction licence issued by the Environment Agency.
- Commitment W20 – Any groundwater of poor quality intercepted during construction, and which cannot be treated adequately to appropriate quality standards, will be disposed of off-site at an appropriate licensed location.
- Commitment W21 – Temporary site drainage (incorporating SuDS measures) will be planned to manage the risks associated with heavy rainfall or flood events appropriate to the risk during construction such as the topography, catchment size and duration of the works. Where temporary drainage is required, it will be sized to provide an appropriate standard of flood protection, with a 10% (1 in 10) AEP event standard. This will be identified within the Surface and Ground Water Management Plan (to be developed from the Outline Surface and Ground Water Management Plan (Appendix H of the First Iteration EMP (TR010064/APP/6.5))) prior to commencement of applicable works in that catchment, for example earthworks.

- Commitment W22 – Construction of haul roads will be designed to reduce risk of erosion. Where this is not practicable, bed and bank reinforcement will be placed along areas that are at risk of or have evidence of erosion during the construction of haul roads. This will help mitigate construction impacts and aim to reduce the likelihood of increased bed and bank erosion. The type of bed and bank protection will be determined during the detailed design stage.

- Commitment W23 – CIRIA guidance will be adopted as standard mitigation as appropriate including from the following publications:

  - Environmental Handbook for Building and Civil Engineering Projects (3 Parts: C512, C528 and C529) (CIRIA, 2000a-c)

  - Control of water pollution from construction sites. Guidance for consultants and contractors (C532) (CIRIA, 2001)

  - Control of water pollution from linear construction projects. Technical guidance (C648) (CIRIA, 2006a) and site guide (C649) (CIRIA, 2006b)

  - Groundwater control: design and practice, second edition (C750) (CIRIA, 2016)

  - Environmental good practice on site guide (fourth edition) (C741) (CIRIA, 2015b).

- Commitment W24 – A Piling Risk Assessment will be undertaken to ensure that no preferential flow paths will be created during piling works.

- Commitment W25 – A compensation strategy will be developed for Castle Brook Tributary to help prevent the drying up of this feature in the event it is impacted during construction. This may comprise pumping groundwater from the excavations directly into the brook as a necessary measure to help maintain flow in the brook.

- Commitment W26 – Due to being unable to identify the exact location of Castle Road PWS or its use, further survey works in advance of construction will be undertaken at Castle Road PWS to ensure that it is not impacted by the Scheme. This will include further discussions with the landowner and mapping of the supply infrastructure to determine its location and use. An assessment will then be undertaken to ensure it is not impacted by the Scheme or identify mitigation if it is impacted.

- Commitment W29 –Sediment and pollution management measures will be implemented in accordance with the Surface and Ground Water Management Plan (to be developed from the Outline Surface and Ground Water Management Plan (Appendix H of the First Iteration EMP (TR010064/APP/6.5))).

- Commitment W30 – A Water Quality Monitoring Plan will be developed prior to construction by the Principal Contractor covering the pre-construction phase, during construction and potentially post-construction. This will be to ensure that surface water quality is monitored during the construction phase of the Scheme. The duration of baseline monitoring should be of sufficient duration to allow comparison with the monitoring being undertaken during the construction of the Scheme.

13.9.23 Topsoil stripping methods and measures to reduce the impacts of topsoil stripping on the water environment are set out in Appendix F: Outline Soil Management Plan of the First Iteration of the EMP (TR010064/APP/6.5).

13.9.24 With respect to habitats that will be lost, including GWDTEs at Cowl Gate Farm, Castle Brook South, and Egypt Lane South, the Scheme aims to create new habitats of equal or greater value than those that will be lost. Biodiversity calculations using Defra Metric v.3.1 indicate that the Scheme will result in a biodiversity net gain for the Scheme (see Appendix 8.12: Biodiversity Net Gain Report of the Environmental Statement Appendices (TR010064/APP/6.3) for further details).

Operation

Surface water

13.9.25 The current drainage design criteria are outlined in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)).

13.9.26 Maintenance and management of the drainage network and assets will be undertaken as part of the operation of the Scheme as per standard National Highways guidance and practice as outlined in the SuDS Manual (CIRIA, 2015a) (commitment W28 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)).

Hydromorphology

13.9.27 Mitigation measures, which will be implemented to avoid, prevent and reduce possible impacts upon hydromorphology during the operation phase of the Scheme, comprise the following commitments included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5):

- Commitment W16 – New outfalls will be installed to reduce impacts on the bed and banks. Best practice guidance will be followed as set out in DMRB CD 529 (National Highways, 2021) and CIRIA (CIRIA, 2019) in relation to design and positioning of outfalls to reduce scour to the bed and banks.

- Commitment W32 – Flow rates will be attenuated from outfalls following the upgrade of the highways drainage network, to reduce the impacts on receptors. Attenuation will also act as sediment management to reduce the quantity of fine sediment entering receptors via the drainage network.

Groundwater

13.9.28 No essential mitigation measures are required following embedded mitigation during operation.

Flood risk

13.9.29 No essential mitigation measures are required following embedded mitigation during operation.

Enhancement

Surface water

13.9.30 Surface water quality may be improved by using ponds to treat road runoff where HEWRAT assessments already indicate discharges comply with legal requirements and DMRB standards without such features in place.

13.9.31 Mitigation for spillage risk is not deemed to be required; however, the ponds may provide additional containment facilities where none currently exist, leading to an enhancement.

13.9.32 The drainage design includes a number of new features that will offer treatment and therefore an improvement in surface water quality enhancing the existing situation. This includes the provision of vegetative treatment solutions for water quality improvement.

Groundwater

13.9.33 No opportunities for enhancement to groundwater has been identified.

Flood risk

13.9.34 No opportunities for enhancement to flood risk has been identified.

13.10 Assessment of likely significant effects

13.10.1 The assessment of likely significant effects upon RDWE takes into account the application of the mitigation measures included in Section 13.9 of this chapter.

Construction

Surface water

13.10.2 There is a risk of suspended solids and polluting substances used during the construction process (i.e. fuel, cement etc) discharging to watercourses through the surface water highway drainage system or directly via overland flow, with works adjacent to watercourses posing the greatest risk. There is always a residual risk of accidents or spillage incidents occurring that would have an adverse effect on surface waterbodies. Works within close proximity of the receptors, such as the construction or modification of outfalls, and compounds located near to watercourses pose the greatest risk.

13.10.3 However, adherence to the mitigation measures included in Section 13.9 (and included in the First Iteration EMP (TR010064/APP/6.5) and best practice methods would reduce any likely impact. For high importance receptors, a negligible magnitude of impact would lead to a **slight adverse effect**. For medium and low value (importance) receptors a negligible magnitude of impact would lead to a **neutral effect**.

Hydromorphology

13.10.4 **No significant adverse effects** were identified as a result of construction activities following implementation of essential mitigation measures. The key interactions between the Scheme and hydromorphological receptors is outfall construction and dewatering. Through the implementation of mitigation, the effects arising from the above would be insignificant. Table 13.16 summarises impacts and effects on hydromorphological receptors within the study area.

Table 13.16 Hydromorphological assessment of likely significant effects during construction

Receptor	Receptor value	Description of potential impact	Summary of mitigation in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Duration of impact	Significance of residual effect
Blackfish	Medium	Sediment mobilised during excavation of pond could smother local bed substrate once transported via silt-laden runoff.	Commitment W30 – Implementation of sediment and pollution management measures in accordance with Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5).	Negligible	Temporary	Neutral
		Construction drainage would result in a localised changes to flow dynamics, where flow is present. Changes would initiate scour of bed and bank material leading to the localised smothering of downstream bed material, as well as potential stilling of upstream flows depending on the location of any outfall.	Commitment W15 – Construction outfalls, where and when required, will incorporate good practice, as per CIRIA guidance.	Negligible	Temporary	Neutral

Receptor	Receptor value	Description of potential impact	Summary of mitigation in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Duration of impact	Significance of residual effect
		Fine sediment transported via the construction drainage network would smother local bed substrate material upon release via construction outfalls. Impact only likely if discharge where the channel is laden with gravels instead of silt.	Commitment W30 – Implementation of sediment and pollution management measures in accordance with Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5).	Negligible	Temporary	Neutral
		Dewatering, associated with excavations and piling, could alter groundwater pathways and therefore lead to negligible changes in baseflow rates.	None required.	Negligible	Temporary	Neutral
Castle Brook	Medium	Residual impacts related to accidental sediment release during the construction of outfalls could lead to localised smothering of bed substrate material, once deposited. Impacts likely to occur at the confluence between Castle Brook and Castle Brook Tributary.	Commitment W30 – Implementation of sediment and pollution management measures in accordance with Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5).	Negligible	Temporary	Neutral

Receptor	Receptor value	Description of potential impact	Summary of mitigation in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Duration of impact	Significance of residual effect
		Construction drainage would result in a localised changes to flow dynamics. Consequently, initiating scour of bed and bank material, which will later lead to localised smothering of downstream bed material, and potential stilling of upstream flows.	Commitment W15 – Construction outfalls, where and when required, will incorporate good practice, as per CIRIA guidance.	Negligible	Temporary	Neutral
		Fine sediment transported via the construction drainage network would smother local bed substrate material upon release via construction outfalls.	Commitment W30 – Implementation of sediment and pollution management measures in accordance with Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5).	Negligible	Temporary	Neutral
Castle Brook Tributary	Low	Construction of the two outfalls would require bankside working and likely disturbing both bed and bank material as they are tied into the channel. Once disturbed, any entrained fine sediment would smother local bed substrate material, once deposited.	Commitment W30 – Implementation of sediment and pollution management measures in accordance with Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5).	Minor adverse	Temporary	Neutral

Receptor	Receptor value	Description of potential impact	Summary of mitigation in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Duration of impact	Significance of residual effect
		Vegetation clearance would lead to substantial loss of vegetation along the right-hand riparian corridor. Consequently, facilitating bank erosion and fine sediment release, as well as temporarily altering the local riparian structure. Over time however, riparian vegetation will re-establish itself.	Commitment W14 – Vegetation clearance will be limited along riparian corridors and floodplains to prevent sediment disturbance in surface waters.	Moderate adverse	Temporary	Slight adverse
		Construction drainage would result in a localised changes to flow dynamics. Consequently, initiating scour of bed and bank material. Any released fine sediment would only add to the already observed silt bed, but when active drainage may cause a stilling of flow upstream.	Commitment W15 – Construction outfalls, where and when required, will incorporate good practice, as per CIRIA guidance.	Minor adverse	Temporary	Neutral
		Fine sediment transported via the construction drainage network would only add to the silt bed observed along the channel.	Commitment W30 – Implementation of sediment and pollution management measures in accordance with Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5).	Negligible	N/A	Neutral

Receptor	Receptor value	Description of potential impact	Summary of mitigation in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Duration of impact	Significance of residual effect
		The watercourse comprises an ephemeral flow regime, largely dependent on surface waters, but dewatering may further impact the annual flow regime. Consequently, prolonging periods where the channel remains dry.	Commitment W25 – A compensation strategy will be developed for Castle Brook Tributary to help prevent the drying up of this feature in the event it is impacted during construction.	Minor adverse	Temporary	Neutral
Hollins Brook	Medium	No direct or indirect effects anticipated at the watercourse because of the Scheme, given downstream distance from it (~1km downstream).	None required.	No change impact	N/A	N/A
Parr Brook	Medium	Construction of the outfall will be carried out in an existing manhole. If bed or bank material is disturbed due to bankside working, the resultant released fine sediment would be negligible in quantity and unlikely to be transported downstream of the existing M60 culvert.	Commitment W30 – Implementation of sediment and pollution management measures in accordance with Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5).	Negligible	Temporary	Neutral

Receptor	Receptor value	Description of potential impact	Summary of mitigation in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Duration of impact	Significance of residual effect
		Fine sediment transported via the construction drainage network would smother local gravels along the bed substrate upon release at construction outfalls. However, it would largely only add to the silt already present along the channel bed.	Commitment W30 – Implementation of sediment and pollution management measures in accordance with Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5).	Negligible	Temporary	Neutral
		Construction drainage would result in a localised changes to flow dynamics. Consequently, initiating scour of bed and bank material and potential stilling of upstream flows.	Commitment W15 – Construction outfalls, where and when required, will incorporate good practice, as per CIRIA guidance.	Minor adverse	Temporary	Slight adverse
		Dewatering, associated with excavations and piling, could alter groundwater pathways and therefore lead to negligible changes in baseflow rates.	None required.	Negligible	Temporary	Neutral

Receptor	Receptor value	Description of potential impact	Summary of mitigation in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Duration of impact	Significance of residual effect
		Vegetation clearance would lead to a localised loss of vegetation along the riparian corridor. Consequently, facilitating bank erosion and fine sediment release, as well as temporarily altering the local riparian structure. Over time however, riparian vegetation will re-establish itself.	Commitment W14 – Vegetation clearance will be limited along riparian corridors and floodplains to prevent sediment disturbance in surface waters.	Minor adverse	Temporary	Slight adverse
Tributary of Parr Brook 2	Low	Construction of the outfall would be unlikely to have any impact on the watercourse as it is completely culverted. Therefore, no changes anticipated.	None required.	No change impact	N/A	N/A
Tributary of Castle Brook Tributary	Low	Fine sediment transported via the construction drainage network would only add to the silt bed observed along the channel.	Commitment W30 – Implementation of sediment and pollution management measures in accordance with Appendix H: Outline Surface and Ground Water Management Plan of the First Iteration EMP (TR010064/APP/6.5).	Negligible	Temporary	Neutral

Receptor	Receptor value	Description of potential impact	Summary of mitigation in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Duration of impact	Significance of residual effect
		Construction drainage would result in a localised changes to flow dynamics. Consequently, initiating scour of bed and bank material and potential stilling of upstream flows.	Commitment W15 – Construction outfalls, where and when required, will incorporate good practice, as per CIRIA guidance.	Minor adverse	Temporary	Neutral
		Dewatering, associated with excavations and piling, could alter groundwater pathways and therefore lead to negligible changes in baseflow rates.	None required.	Negligible	Temporary	Neutral
Whittle Brook	Medium	No direct or indirect effects anticipated at the watercourse because of the Scheme, given downstream distance from it (~700m downstream).	None required.	No change impact	N/A	N/A

Groundwater

13.10.5 An assessment of likely significant effects to groundwater receptors in the absence of mitigation is presented in Appendix 13.4: Groundwater Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3).

13.10.6 This pre-mitigation assessment identified potentially significant adverse impacts on Castle Brook Tributary, Issue South of Pike Fold Golf Club, and Castle Road PWS, and non-significant impacts on other groundwater receptors.

13.10.7 Following the application of the mitigation measures detailed in Section 13.9 of this chapter, there would be **no significant adverse effects** on groundwater receptors aside from GWDTEs.

13.10.8 Appendix 13.5: GWDTE Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3) presents an assessment of the groundwater dependency of each identified GWDTE and the associated impacts to existing groundwater levels, flows and quality supporting the GWDTE. In conclusion there are **no significant adverse effects** on identified GWDTEs following the implementation of the mitigation measures outlined in Section 13.9 of this chapter, except for the following sites:

- Cowl Gate Farm
- Castle Brook South
- Egypt Lane South

13.10.9 These three sites are expected to experience a **large adverse (significant) effect** due to potential changes in groundwater flows, levels and quality from ground disturbance. In part, this is a consequence of partial or total habitat loss caused by soil stripping and vegetation clearance within the GWDTE footprint. By removing the topsoil and vegetation shallow aquifers can become more exposed leading to more direct impacts to quality, levels and flows which in turn impact the GWDTE. Measures to compensate for this loss are outlined in paragraph 13.9.24 of this chapter as well as in Chapter 8: Biodiversity of this Environmental Statement (TR010064/APP/6.1).

Flood risk

13.10.10 The Order Limits are wholly within Flood Zone 1, therefore no fluvial flood risk impacts are anticipated relating to Main Rivers. Temporary drainage would ensure that any impacts as a result of displacement of floodwaters from Ordinary Watercourses due to construction activities within the watercourse or its floodplain would have a negligible magnitude of impact leading to a **neutral effect**.

13.10.11 Subject to the implementation of all mitigation measures outlined in Section 13.9 it is anticipated that the residual effects on flood risk during the construction phase would be **neutral**.

Operation

Surface water

13.10.12 Routine runoff assessments and spillage risk assessments have been undertaken using HEWRAT. Full details of the methodology, data used and results are presented in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR010064/APP/6.3). The results of the HEWRAT assessment have been used to inform the magnitude of impact.

13.10.13 With embedded mitigation measures incorporated into the assessment, each of the outfalls achieve the DMRB LA 113 standards. As such, the magnitude of impact, with embedded mitigation, is negligible for all outfalls except for outfalls 1 and 2, leading to a **neutral effect**. For these two outfalls (outfall 1 and 2), water quality treatment does not exist under the present situation and therefore the provision of treatment measures for these two drainage catchments leads to a minor beneficial magnitude of impact, resulting in a **slight beneficial effect**.

13.10.14 Pollution from maintenance activities during the operational phase, such as the use of de-icing salts as a result of responsive activities, are difficult to predict and design for. When temperatures are around 4°C or lower, de-icing salts would likely be applied (when required) to the Scheme to maintain a safe driving surface and to help clear away any snowfall. The application of de-icing salts tends to be intermittent and can be very variable between years depending on how many cold days there are, and how long the cold period lasts. During this time, highway runoff (that may also include snowmelt) may contain sodium chloride (NaCl) and lesser amounts of clay, cyanide, sediment, and a number of metals. De-icing salts can also be corrosive to metals and may potentially increase the mobilisation of heavy metals in sediments (such as in highway treatment ponds). Similarly, NaCl can potentially trigger the release into solution of accumulated nutrients and heavy metals absorbed to suspended solids.

13.10.15 It should be noted that the existing road network will be subject to the seasonal application of de-icing salts as well as the surrounding urban area. SuDS systems, where there are currently none, would provide some dilution of runoff. Overall, it is considered that there would be a negligible impact on Main Rivers (those of high value) and temporary minor adverse impacts on all other receiving watercourses. This would result in a **slight adverse effect** on all receiving watercourses.

Hydromorphology

13.10.16 **No significant adverse effects** on hydromorphology receptors have been identified during operation. The only interaction between the operational elements of the Scheme and hydromorphological receptors is outfalls. Through the implementation of the essential mitigation outlined in Section 13.9 of this chapter, any effects arising from the outfalls would remain not significant. Table 13.17 summarises the impacts and effects on each hydromorphology receptor within the study area.

Table 13.17 Hydromorphological assessment of likely significant effects during operation

Receptor	Receptor value	Description of potential impact	Summary of mitigation in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Duration of impact	Significance of residual effect
Blackfish	Medium	No impacts identified because of the Scheme, given the absence of any structures, or existing permanent outfalls discharging runoff into the channel.	None required	No change impact	N/A	N/A
Castle Brook	Medium	Pond 2 would attenuate routine road drainage to match the existing discharge rate. Therefore, local flow regimes will not change.	None required	No change impact	N/A	N/A
		Routine road drainage will utilise an existing outfall (Outfall 2); therefore, given flow attenuation, flow dynamics will not change as a result of the Scheme. Any changes would be negligible.	None required	Negligible adverse	Permanent	Neutral
Castle Brook Tributary	Low	Pond 1 would attenuate routine road drainage so that discharge rates, from the two new outfalls (Outfalls 1A and 1B), match the greenfield runoff rate. Therefore, leading to negligible changes in the flow regime.	None required	Negligible adverse	Permanent	Neutral

Receptor	Receptor value	Description of potential impact	Summary of mitigation in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Duration of impact	Significance of residual effect
		Two new outfalls (Outfalls 1A and 1B) discharging routine road drainage into the watercourse will lead to localised changes in flow dynamics. Consequently, such changes may initiate localised scour of bed and bank material and potentially still flows upstream of the outfall.	Appropriate design of the outfall structure, as per essential mitigation (Commitment W16)	Minor adverse	Permanent	Slight adverse
Hollins Brook	Medium	No direct or indirect effects anticipated at the watercourse because of the Scheme, given the downstream distance from it (~1km downstream).	None required.	No change	N/A	N/A
Parr Brook	Medium	Outfall 4 would discharge directly into an existing artificial manhole. Therefore, any changes in flow dynamics would occur along the M60 culvert rather than the open channel.	None required.	Negligible adverse	Permanent	Neutral
		Pond 4 would attenuate routine road drainage so that discharge rates from the new outfall match the greenfield runoff rate. Therefore, leading to negligible changes in the flow regime.	None required.	Negligible adverse	Permanent	Neutral

Receptor	Receptor value	Description of potential impact	Summary of mitigation in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Duration of impact	Significance of residual effect
Tributary of Parr Brook 2	Low	Outfall 7 would discharge directly into the culverted channel. Therefore, any changes in flow dynamics would occur along the M60 culvert and not on natural features of an open channel.	None required.	Negligible adverse	Permanent	Neutral
		Pond 7 would attenuate routine road drainage so that discharge rates from the new outfall match the greenfield runoff rate. Therefore, leading to negligible changes in the flow regime.	None required.	Negligible adverse	Permanent	Neutral
Tributary of Castle Brook Tributary	Low	No impacts identified because of the Scheme, given the absence of any structures, or existing permanent outfalls discharging runoff into the channel.	None required.	No change	N/A	N/A
Whittle Brook	Medium	No direct or indirect effects anticipated at the watercourse because of the Scheme, given the downstream distance from it (~700m downstream).	None required	No change	N/A	N/A

Groundwater

13.10.17 **No significant adverse effects** on groundwater receptors, except for GWDTEs, have been identified during operation, following application of the mitigation measures identified in Section 13.9 of this chapter.

13.10.18 Three GWDTE sites (Cowl Gate Farm, Castle Brook South and Egypt Lane South) would experience **moderate adverse (significant) effects** during operation. This is due to permanent below ground structures including drainage, piles and backfilled open-cut trenches leading to changes in groundwater levels and flows.

Flood risk

13.10.19 The Order Limits are wholly within Flood Zone 1, therefore the Scheme would be expected to have no fluvial flood risk impact and therefore there would be **no significant adverse effects** during operation.

13.10.20 The Scheme would result in an increase in impermeable area due to the additional carriageway. Runoff from such areas would drain to new ponds that would restrict outflows to rates that do not increase flood risk, as detailed in the Drainage Strategy Report (Appendix 13.7 of the Environmental Statement Appendices (TR010064/APP/6.3)), therefore ensuring no increase to flood risk and no significant effect. The Scheme drainage would mitigate any significant effects from surface water.

13.11 Monitoring

Surface water

13.11.1 There are no residual significant effects upon surface water quality which require monitoring.

13.11.2 However, in line with best practice, surface water quality would be monitored throughout the construction phase of the Scheme.

13.11.3 A Water Quality Monitoring Plan would be prepared prior to construction by the Principal Contractor covering the pre-construction phase, during construction and potentially post-construction where considered appropriate (commitment W31 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)). The duration of the baseline monitoring should be of sufficient duration to allow comparison with the monitoring undertaken during the construction of the Scheme.

13.11.4 This may include the monitoring of certain parameters:

- Hydrocarbon, suspended solids and heavy metals
- Physio-chemical parameters
- Visual inspections to be conducted by an Environmental Clerk of Works.

13.11.5 Locations, frequencies and parameters to be monitored would be developed in consultation with the Environment Agency prior to construction.

13.11.6 Additional monitoring, as specified by regulatory authorities, would be undertaken in line with relevant obtained licences, consents or permits.

13.11.7 Ambient background copper concentrations were not applied during the preparation of the assessment due to data limitations. Full details are provided in Appendix 13.2: Water Quality Assessment Report of the Environmental Statement Appendices (TR0100064//APP/6.3). This data will be obtained and applied to the detailed design screening round for HEWRAT (commitment W31 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)).

Hydromorphology

13.11.8 No monitoring is required for hydromorphological receptors within the study area.

Groundwater

13.11.9 No monitoring is required for groundwater receptors within the study area.

Flood risk

13.11.10 No monitoring would be required during the construction or operational phase as it would be highly unlikely that significant flooding would occur.

13.12 Summary

13.12.1 It is considered that the Scheme would be compliant with the NPS NN (DfT, 2014) and draft NPS NN (DfT, 2023) requirements for the RDWE aspect.

13.12.2 Table 13.18 summarises residual significant effects identified for the RDWE aspect.

Table 13.18 Summary of residual significant effects for RDWE

Matter	Summary of residual significant effects	
	Construction	**Operation**
Surface water	No significant effects identified.	No significant effects identified.
Hydromorphology	No significant effects identified.	No significant effects identified.
Groundwater	There would be significant effects on the following groundwater dependent terrestrial ecosystem (GWDTE) sites from potential changes to groundwater flows, levels and quality due to ground disturbance (associated with ground compaction, piling, soil stripping, vegetation clearance, and construction of haul roads, compounds, and temporary works areas): • Cowl Gate Farm • Castle Brook South • Egypt Lane South.	There would be long-term disturbance of groundwater levels and flows) on the following GWDTE sites due to the presence of permanent underground infrastructure: • Cowl Gate Farm • Castle Brook South • Egypt Lane South
Flood risk	No significant effects identified.	No significant effects identified.

Acronyms and initialisms

Acronym or initialism	Term
ABC	Ambient background concentration
AEP	Annual Exceedance Probability
BAP	Biodiversity Action Plan
Bgl	Below ground level
BGS	British Geological Survey
BOD	Biological Oxygen Demand
CIRIA	Construction Industry Research and Information Association
C.WEM	Chartered Water and Environmental Manager
CIWEM	The Chartered Institution of Water and Environmental Management
CmarSci	Chartered Marine Scientist
CScI	Chartered Scientist
CSM	Conceptual site models
CSO	Combined Sewer Overflow
DCO	Development Consent Order
DDMS	Drainage Data Management System
DfT	Department for Transport
DLUHC	Department for Levelling Up, Housing and Communities
DMRB	Design Manual for Road and Bridges
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EQS	Environmental Quality Standard
FRA	Flood Risk Assessment
GI	Ground Investigation
GIR	Ground Investigation Report
GWDTE	Groundwater Dependent Terrestrial Ecosystems
HEWRAT	Highways England Water Risk Assessment Tool
HMWB	Heavily Modified Water Body
LLFA	Lead Local Flood Authority

Acronym or initialism	Term
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MHCLG	Ministry of Housing, Communities and Local Government
MoRPh	Modular River Survey
NGR	National Grid Reference
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NPS NN	National Policy Statement for National Networks
NSIP	Nationally Significant Infrastructure Project
NVC	National Vegetation Classification
NVZ	Nitrate vulnerable zone
OS	Ordnance Survey
PAH	Polyaromatic Hydrocarbons
PEIR	Preliminary Environmental Information Report
PFOS	Perfluorooctane sulphonate
RBMP	River Basin Management Plan
RDWE	Road Drainage and Water Environment
REAC	Register of Environmental Actions and Commitments
RoFSW	Risk of Flooding from Surface Water
RST	Runoff Specific Threshold
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SFRA	Strategic Flood Risk Assessment
SoCG	Statement of Common Ground
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSIs	Sites of Special Scientific Interest
STP	Sewage Treatment Plant
SuDS	Sustainable Drainage Systems

Acronym or initialism	Term
SWMP	Surface Water Management Plan
UK	United Kingdom
UK TAG	United Kingdom Technical Advisory Group
UWWTD	Urban Wastewater Treatment Directive
WFD	Water Framework Directive
WwTW	Wastewater Treatment Works

Glossary

Term	Definition
Acute impact	Occurs as a result of a severe, usually transient, event. For road runoff, acute pollution is usually the result from a spillage of pollutants, but can result from routine runoff.
Annual Exceedance Probability (AEP)	Annual Exceedance Probability e.g. 1% AEP is equivalent to 1% (1 in 100) probability of flooding occurring in any one year (or, on average, once in every 100 years).
AStGWF	Areas Susceptible to Groundwater Flooding is a strategic scale map showing groundwater flood areas on a 1km square grid. It was developed specifically by the Environment Agency for use by LLFAs for use in Preliminary Flood Risk Assessment (PFRA) as required under the Flood Risk Regulations.
Baseflow Index	The proportion of the flow in a watercourse made up of groundwater and discharges. Base flow sustains the watercourse in dry weather.
Bed substrate	The material that rests at the bottom of a stream and along the channel margins.
Chronic impact	The result of ongoing low levels of pollution which can result in the transport and accumulation of sediment-bound pollutants over a longer period of time (months/years)
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions.
Discharge	The volume of flow passing a point in a given time period.
Environmental Quality Standard	The maximum permissible concentration of a potentially hazardous chemical. The Environmental Quality Standard is used to assess the risk to the health of aquatic flora and fauna.
Floodplain	A floodplain is flat, or nearly flat, land adjacent to a stream or river, stretching from the banks of its channel to the base of the enclosing valley walls and (under natural conditions) experiences periods of flooding.

Term	Definition
Flow dynamics	The manner in which flow behaves, i.e., turbulent flows, non-energetic and laminar flows.
Fluvial flooding	Flooding resulting from water levels exceeding the bank level of a Main River
Greenfield (land)	Undeveloped parcel of land
Hydromorphology	The scientific study of the form and function of rivers and the interaction between streams and the landscape around them.
Lead Local Flood Authority (LLFA)	Local Authority responsible for taking the lead on local flood risk management. The duties of LLFAs are set out in the Floods and Water Management Act
Local Planning Authority (LPA)	The local authority or Council that is empowered by law to exercise planning functions for a particular area. This is typically the local study area or study area Council
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers. N.B. Main River designation is not an indication of size, although it is often the case that they are larger than Ordinary Watercourses.
National Planning Policy Framework (NPPF)	National planning policy, published by the Government in March 2012. It replaces most of the previous Planning Policy Statements, including that regarding flood risk (PPS25).
National Planning Practice Guidance (NPPG)	Supporting guidance to the NPPF, published by the Government in March 2014 as an online resource, available at: (http://planningguidance.planningportal.gov.uk/). It replaces previously published Government guidance, including that regarding flood risk.
Ordinary Watercourse	All watercourses that are not designated Main River, and which are the responsibility of Local Authorities or, where they exist, Internal Drainage Boards. Note that Ordinary Watercourse does not imply a “small” river, although it is often the case that Ordinary Watercourses are smaller than Main Rivers.
Outfall	Point of discharge into a waterbody.
Q_{95}	The flow rate of the watercourse that is exceeded for 95% of the time.
Reach	A length of river along which the channel controls are sufficiently uniform to allow a fairly consistent morphological structure to be maintained.
Residual Risk	A measure of the outstanding flood risks and uncertainties that have not been explicitly quantified and/or accounted for as part of the design process.
Riparian zone	The corridor of land which runs along the banks of a river channel. If vegetated, it is known as the vegetated riparian zone.
Routine runoff	The normal runoff from roads including any contaminants washed off the surface in rainfall events which can result in either acute or chronic

Term	Definition
	impacts. Routine runoff excludes the effect of spillages and major leaks which usually result in acute impacts.
Runoff	The movement of water above and below the surface.
Runoff Specific Threshold	Time dependent (24 hour or six hour) soluble pollutant concentration above which adverse effects may be observed in aquatic fauna.
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
Strategic Flood Risk Assessment (SFRA)	Strategic Flood Risk Assessment – considers local flood risk and informs the planning process information on the future risk over a wide spatial area.
Surface water flooding	Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity, thus causing what is known as surface water or pluvial flooding.
Surface water runoff	Rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer.
Sustainable Drainage System (SuDS)	Sustainable Drainage Systems - Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques

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