MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.20, Environmental Statement, Volume 2, Chapter 17 Water Resources, Drainage and Flood Risk
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Date: November 2019

Notice

Document history

Project	Portishead Branch Line (MetroWest Phase 1) Development Consent Order Scheme
Planning Inspectorate Scheme Reference	TR040011
Part and Application Document Reference	6, 6.20
Document title	Environmental Statement, Volume 2, Chapter 17 Water Resources, Drainage and Flood Risk
Regulation Number	Regulation 5(2)(a)
Applicant	North Somerset District Council
Lead Author	CF at CH2M

Version	Date	Status of Version
Rev: 01	08/11/19	Application Issue

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CHAPTER 17

Water Resources, Drainage and Flood Risk

17.1 Introduction

17.1.1 The Portishead Branch Line (MetroWest Phase 1) Development Consent Order Scheme ("the DCO Scheme") has the potential to give rise to significant effects on water resources, drainage and flood risk. This Chapter:

- describes the relevant legal and policy framework which informs the undertaking of the assessment;
- describes the methodology used for the identification and assessment of likely significant effects on water resources, drainage and flood risk in this Environmental Statement ("ES");
- describes the water resources, drainage and flood risk baseline having regard to existing information;
- describes the measures that have been adopted as part of the DCO Scheme;
- identifies and assesses the likely significant effects that could result from the DCO Scheme during the construction and operation phases;
- considers mitigation of likely significant effects and assesses those residual effects that will result;
- considers the cumulative effects of other developments in combination with the DCO Scheme on water;
- identifies the limitations encountered in compiling the ES; and
- provides a summary of the residual effects for the mitigated DCO Scheme.

17.1.2 This topic covers water quality and water quantity relating to surface water features such as rivers, streams, ponds, lakes, estuaries and coastal waters, and to groundwater bodies. Groundwater is also considered with respect to its interaction with surface water resources, whilst impacts upon hydrogeology are considered in Chapter 10 Geology, Hydrogeology, Ground Conditions and Contaminated Land (DCO Document Reference 6.13). Water quantity considers water as a resource (e.g. availability for consumption and dilution of discharges). The physical impacts upon surface water features (e.g. river morphology) have also been considered. All of these aspects are referred to in this assessment as the "water environment".

17.1.3 The assessment is supported by a Flood Risk Assessment ("FRA") which is presented in this ES at Volume 4, Appendix 17.1 (DCO Document Reference 6.25) and DCO Document Reference 5.6. The FRA summarises the existing flood risk relevant to the DCO Scheme and constraints arising from flood risk considerations for the DCO Scheme. The FRA has been developed in consultation with the Environment Agency ("EA"), the North Somerset Levels Internal Drainage Board ("NSLIDB"), North Somerset

District Council ("NSDC") and Bristol City Council ("BCC") and other stakeholders. This has established design constraints relating to flood risk, appropriate risk assessment methods and assessment criteria, and identified information available to support the FRA (e.g. EA flood maps and hydraulic model results). The FRA has also drawn from other readily available information such as the National Planning Policy Framework ("NPPF") (Ministry of House, Communities and Local Government, 2019), Strategic Flood Risk Assessments ("SFRA"), and Shoreline Management Plans ("SMP"). Appendix O to the FRA contains information on temporary drainage of construction compounds and haul roads and permanent drainage design for the highway modifications, structures and railway. This material includes the Surface Water Drainage Strategy for Portishead and Pill stations, haul roads and compounds (referred to as the "Surface Water Drainage Strategy"), extracts on drainage from design reports for Portishead and Pill Stations, a culvert survey report, and a track drainage report and figures. The Surface Water Drainage Strategy is also provided in DCO Document Reference 6.26. Appendix T to the FRA includes the Outline Flood Plan (Construction Phase) ("OFP Construction") for the Clanage Road construction compound at Bower Ashton in Flood Zone 3b and the Outline Flood Plan (Operations Phase) ("OFP Operations").

17.1.4 A Water Framework Directive ("WFD") Assessment (WFD compliance screening assessment) was requested by the EA (see their letter reference WX/2014/125769/01-L01 of 28 July 2014). This has been undertaken and is presented in the ES Volume 4 Appendix 17.2 (DCO Document Reference 6.25).

17.1.5 This assessment on the water environment focuses on the DCO Scheme comprising the nationally significant infrastructure project ("NSIP") and associated development. This chapter should be read in conjunction with Chapter 4 Description of the Proposed Works (DCO Document Reference 6.7) and the Construction Strategy (DCO Document Reference 5.4) which describe aspects of temporary and permanent drainage design.

17.1.6 The assessment of the DCO Scheme in combination with other developments within 0.5 km and the effects of the other works required for the MetroWest Phase 1 project, namely the Parson Street Junction (including Liberty Lane Sidings), Parson Street Station, the Bedminster Down Relief Line, Avonmouth / Severn Beach signalling, and Bathampton Turnback, are considered as part of the cumulative effects assessment in Section 17.7 and in Chapter 18 In-combination and Cumulative Effects Assessment (DCO Document Reference 6.21).

17.2 Legislation and Policy Framework

European Union and National Legislation

17.2.1 Water resources are managed and protected under UK legislation and regulations consistent with European Community Directives. Where relevant, the assessment takes into account the legislative protection afforded to water resources. The main legal and policy framework is set by the following legislation.

Water Framework Directive (2000/60/EC) and Water Environment (Water Framework Directive) (England and Wales) Regulations 2003

17.2.2 The WFD has been transposed into English law by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The WFD introduced a new system for monitoring and classifying the quality of surface and groundwaters which involves establishing the existing ecological and chemical status of each water body, setting environmental objectives and devising programmes of measures to meet those objectives. The WFD requires that Environmental Objectives are set for all surface waters and groundwater so that management measures are put in place to achieve Good Ecological Potential ("GEP") / Good Ecological Status ("GES") by a defined date and also requires that ecological status or potential does not decline over time. The WFD sets out a number of key objectives, the delivery of which should be achieved on a river basin approach within member states. For the Severn River Basin District ("RBD"), an updated River Basin Management Plan ("RBMP") was published by the Department for the Environment and Rural Affairs ("Defra"), the Welsh Government, Natural Resources Wales and the EA in December 2015. The RBMP sets out the baseline classification of waterbodies, statutory objectives of protected areas within the river basin, statutory objectives for waterbodies and a summary programme of measures to achieve the statutory objectives. Overall, the RBMP provides a framework for protecting and enhancing the benefits provided by the water environment and informs decisions on land-use planning. Its classifications, objectives and programme of measures have been taken into account in considering the DCO Scheme, with a specific intent of ensuring that the construction and operation of the DCO Scheme will not lead to a deterioration in the current status of any waterbody or hinder the achievements of any statutory objectives in the Severn RBMP. As noted in 17.1.4, the WFD compliance screening assessment for the DCO Scheme is presented in Appendix 17.2 (DCO Document Reference 6.25).

The Floods Directive (2007/60/EC) and the Flood Risk Regulations 2009

17.2.3 The Floods Directive has been transposed into English law by the Flood Risk Regulations 2009, which aim to provide a consistent approach to managing flood risk across Europe. The approach is based on a six year cycle of planning (to be consistent with the WFD). The Regulations set out the duties of the EA and Lead Local Flood Authorities ("LLFA") in relation to flood risk management activities and planning. NSDC and BCC are the LLFAs for their respective local authority areas.

Water Resources Act 1991

17.2.4 The Water Resources Act 1991 (as amended) governs the quality and quantity of water. It sets out the functions of the EA. Part II of the Act provides the general structure for the management of water resources. Part III then explains the standards expected for controlled waters and what is considered as water pollution. Part IV provides information on mitigation through flood defence. The terms "controlled waters" and "main river" are defined in the Act at sections 104 and 113 respectively.

Land Drainage Act 1991

17.2.5 The Land Drainage Act 1991 (as amended 1994) requires that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded. The Act also sets out the restrictions and consents required for development within, over, under or adjacent to watercourses.

Water Act 2003

17.2.6 The Water Act 2003 amends the Water Resources Act 1991 and the Water Industry Act 1991 to make provision in connection with land drainage and flood defence and amends the Reservoirs Act 1975 to make provision about contaminated land in so far as it relates to the pollution of controlled waters. The Water Act set out the framework for abstraction licensing, regulates impoundments, increases competition in water supply and includes measures for drought management and flood defence works in England and Wales.

Flood and Water Management Act 2010

17.2.7 Part 1 of the Flood and Water Management Act gives the EA a strategic overview of the management of flood and coastal erosion risk in England. It also gives upper tier local authorities in England responsibility for preparing and putting in place strategies for managing flood risk from groundwater, surface water and ordinary watercourses in their areas. The EA, local authorities and other bodies are given duties and powers that relate to these responsibilities directly by this Act, and by way of amendments made by this Act to the Water Resources Act 1991 and the Land Drainage Act 1991. Part 2 includes provisions on sustainable drainage, reservoirs, special administration, provision of infrastructure, temporary bans on non-essential uses of water, civil sanctions, and incidental flooding of land, flood resistant repairs to property, compulsory works orders and agreements on new drainage systems.

Environmental Permitting (England and Wales) Regulations 2016

17.2.8 The Environmental Permitting (England and Wales) Regulations 2016 (as amended) ("the EP Regulations") provide for the regulation of specified installations and controls over emissions to the environment. The EP Regulations replace those parts of the Water Resources Act 1991 that relate to the regulation of discharges to controlled waters (including groundwater). Under the EP Regulations, groundwater activities relate to inputs of pollutants to groundwater. The EP Regulations also replace the Groundwater Regulations 2009 and provide for controls over flood risk activities (see 17.2.10 below).

Nitrates Directive (91/676/EEC)

17.2.9 The Nitrates Directive (91/676/EEC) requires areas of land that drain into water polluted by nitrates to be designated as a Nitrate Vulnerable Zone ("NVZ") in an attempt to reduce the level of nitrates in drinking water.

Consents For Works To Watercourses

17.2.10 The EP Regulations extend the requirement for an environmental permit to flood risk activities for works or activities in, on or within 8 m of a main river

and within 16 m of a tidal river or on the floodplain. The EP Regulations identify exempt and excluded activities.

17.2.11 In April 2012, each LLFA became the consenting authority for works within or near to an ordinary watercourse (as defined at 17.2.13) within its area NSDC and BCC are the LLFAs in connection with works affecting ordinary watercourses within their respective areas. The EA remains the consenting authority for main rivers.

17.2.12 The Portbury Ditch, Drove Rhyne, Markham Brook, Colliter's Brook and the River Avon are main rivers. An environmental permit will be required from the EA where specified regulated flood risk activities are proposed to be undertaken. Such activities include the erection of any permanent temporary or permanent structure in, over or under a main river (e.g. a culvert) the alteration, repairing or maintaining of any temporary or permanent structure in, over or under a main river where the work could upset the flow of water and any activity within 8 m of a bank of a main river or 16 m of bank of a tidal main river.

17.2.13 Watercourses that are not main rivers are ordinary watercourses. Land Drainage Consent ("LDC") is required to construct or alter a culvert or flow control structure on any ordinary watercourse. Within the area managed by the NSLIDB, LDCs are required for works within 9 m of an ordinary watercourse.

17.2.14 Consent is required for both temporary crossings and works to watercourses during construction, as well as for the design of the permanent structures and works.

Environmental Permits and Licences

17.2.15 Discharges into surface waters and groundwater are controlled by the EP Regulations and require the approval of the EA. Discharges must comply with the conditions imposed on the environmental permit. Environmental permits can combine several activities into one permit. There are standard permits supported by 'rules' for straightforward situations and bespoke permits for complex situations.

17.2.16 Under the Water Resources Act 1991 (as amended), anyone who wishes to abstract more than 20 m^3/day of water from a surface source such as a river or stream or an underground source, such as an aquifer, will normally require an abstraction licence from the EA. Some low risk abstractions are exempt from abstraction licensing requirements under the Water Abstraction Impounding (Exemptions) Regulations 2017. Defra has proposed to bring abstraction licensing within the scope of the EP Regulations. However, these proposals are not expected to progress in the near future.

National Policy

National Policy Statement for National Networks

17.2.17 The Planning Act 2008 Section 104(3) requires the Secretary of State to determine the application for the DCO Scheme in accordance with the National Policy Statement for National Networks (2014) ("NPSNN"), unless specified factors provide otherwise. The NPSNN advises on flood risk assessment and water resources in the context of NSIPs. Table 17.1 below

identifies those policies of direct relevance to this assessment and the location where they are considered in this ES.

Table 17.1: Summary of relevant NPSNN advice regarding flood risk and water resources

Summary of NPSNN Provision	Consideration within the ES
Paragraph 5.92. Advises on the circumstances in which applications for projects in flood zones should be accompanied by a FRA.	The DCO Scheme meets the criteria set out in paragraph 5.92 so a FRA has been prepared and is presented in the Environmental Statement, Appendix 17.1 (DCO Document Reference 5.6).
Paragraph 5.93. The FRA should assess the risks from all forms of flooding and demonstrate how these flood risks will be managed taking climate change into account.	The FRA considers flood risk from all sources. Modelling undertaken for the FRA includes climate change scenarios through the design life (for 60 years to 2075, and 2115 as sensitivity test) of the DCO Scheme.
Paragraph 5.94. Provides advice to the applicant to consider the risk of all forms of flooding and how these risks will be managed and where appropriate mitigated so that the development remains safe throughout its lifetime; the impacts of climate change clearly stating the development lifetime over which the assessment has been made; the vulnerability of those using the infrastructure including safe access and exit; the residual risk of flooding after risk reduction measures have been taken into account and demonstrate that this is acceptable; 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.	The advice given to applicants on the preparation of a FRA has been adhered to in the FRA presented at Appendix 17.1 (DCO Document Reference 5.6).
Paragraph 5.95. Applicants are advised that further guidance can be found in the Government's planning guidance supporting the NPPF.	All relevant Government guidance on undertaking a FRA has been adhered to.
Paragraph 5.96. Applicants are advised to liaise with relevant stakeholders in early pre-application discussions.	Early discussions have been held with the EA, NSDC, BCC and the NSILDB as part of the FRA (see Table 17.3).
Paragraph 5.97. Local flood risk management strategies and surface water management plans provide useful sources of information for FRAs.	Information from these documents has been used to inform the FRA.

Table 17.1: Summary of relevant NPSNN advice regarding flood risk and water resources

Summary of NPSNN Provision	Consideration within the ES
Paragraph 5.221. Applicants are advised to liaise with the relevant regulators, including the EA and water supply companies, and to undertake an assessment of the impact of the project on water quality, water resources and physical characteristics.	Consultation is presented in Section 17.4 and Table 17.3. The assessment of the impact of the DCO Scheme upon water quality, water resources and upon physical characteristics of watercourses is presented in Section 17.6.
Paragraph 5.222. For projects that are improvements to existing infrastructure, opportunities should be taken to improve the quality of existing discharges where these contribute towards Water Framework Directive commitments.	The WFD Assessment has been prepared and is presented in the ES Appendix 17.2 (DCO Document Reference 6.25).
Paragraph 5.223. Advises applicants on what information pertaining to the water environment should be included in the ES.	Section 17.4 describes the existing quality of waters, water resources and physical characteristics. Section 17.6 describes the impacts of the proposed DCO Scheme on water resources, physical modifications, upon water bodies or protected areas under the WFD and around potable groundwater abstractions. Cumulative effects are described in Section 17.7.

National Planning Policy Framework

17.2.18 The NPPF does not contain specific policies for NSIPs. However, NPPF paragraph 5 notes that applications for NSIPs are to be determined in accordance with the decision-framework set out in the Planning Act 2008 and relevant national policy statements "*as well as any other matters that are relevant (which may include the National Planning Policy Framework*". Section 14 of the NPPF on *Meeting the challenge of climate change, flooding and coastal change* advises that new developments should be planned to avoid increased vulnerability to a range of impacts related to climate change.

17.2.19 Inappropriate development in flood risk areas should be avoided, and where it is necessary, measures should be taken to make the DCO Scheme safe without directing the flood risk elsewhere (para. 155).

17.2.20 The NPPF is accompanied by planning practice guidance documents of which two are relevant to the water environment in relation to the DCO Scheme, *Flood risk and coastal change planning practice guidance* (Ministry of Housing, Communities and Local Government, 2014) and *Water supply, wastewater and water quality planning practice guidance* (Ministry of Housing, Communities and Local Government, 2019).

17.2.21 *Flood risk and coastal change planning practice guidance* provides advice to planning authorities in relation to flood risk and development. The guidance outlines the considerations for developments in relation to flood risk by ensuring that inappropriate development in areas at risk of flooding is avoided. This is achieved by undertaking a sequential test which directs development away from areas at highest risk and aims to locate new development in Flood Zone 1 (low probability). A site specific flood risk assessment is carried out which documents the sequential test and demonstrates how flood risk from all sources of flooding to the development itself and flood risk to others will be managed now, and taking future climate change into account.

17.2.22 *Water supply, wastewater and water quality planning practice guidance* recognises that adequate water and wastewater infrastructure is needed to support sustainable development. It also identifies that a healthy water environment has the capacity to deliver multiple benefits and encourages the wider adoption of an integrated catchment-based approach to improving the quality of the water environment. The guidance also acknowledges that local planning authorities must have regard to the river basin management plans that implement the WFD.

17.2.23 The planning practice guidance in relation to water supply identifies that this would normally be addressed through the relevant local plan, except when large developments that are likely to require a large amount of water have not been identified in local plans, or where enhanced water efficiency is required as part of a strategy to manage water demand locally and help deliver new development.

17.2.24 In relation to wastewater, the planning practice guidance identifies that development plans should align with the investment plans of water and sewerage companies and that applications will need to provide information to demonstrate how the proposed development will be drained and wastewater dealt with.

17.2.25 Water quality is only likely to be a particular planning concern when a proposal would involve physical modifications to a water body and/or would indirectly affect water bodies. Where there is the potential for significant impacts a proposal needs to demonstrate how the development would affect a relevant water body and how it is proposed to mitigate the impacts. Sufficient information should be provided in an application for the local planning authority to identify the likely impacts on water quality, which should be proportionate to the nature and scale of development proposed. Where significant impacts may occur, a more detailed assessment is required which should form part of the ES.

17.2.26 Advice on the EA's approach to managing and protecting groundwater is set out in a series of position statements published in February 2018 and *The Environment Agency's approach to groundwater protection*, which updates and replaces the previous publication *Groundwater protection: principles and practice* (commonly referred to as "GP3"). The position statements set out how the EA delivers government policies for groundwater and adopts a risk-based approach where legislation allows. The primary aim of all the position statements is the prevention of pollution of groundwater and protection of it as a resource.

Local Policy

17.2.27 A summary of relevant regional and local planning policies is presented in Chapter 6 Planning Framework (DCO Document Reference 6.9). The policies in Table 17.2 are relevant to the water environment for NSDC and BCC.

Table 17.2: Summary of local policy relevant to the water environment

Policy No.	Title	Description
North Somerset Core Strategy, adopted January 2017		
CS3	Environmental impacts and flood risk management	This overarching policy is concerned with ensuring that development which would result in environmental pollution or harm to amenity, health or safety is only permitted if the potential adverse effects are mitigated to an acceptable level and directing developments away from flood risk areas through the adoption of the Sequential Test as set out in the NPPF and where applicable by the Exception Test. The Sequential Test aims to direct new development first to sites at the lowest probability of flood risk. If the Sequential Test is passed, an Exception Test is required for some vulnerable types of development which should not normally be permitted in flood zones 2 and 3 unless there are exceptional circumstance. Development that poses an unacceptable risk of pollution of or damage to the water environment or which does not dispose of surface water run-off in an acceptable manner will only be permitted if these concerns are overcome. Sustainable Drainage Systems are the preferred approach for dealing with surface water run-off.
North Somerset Council Development Management Policies: Sites and Policies Part 1, adopted July 2016		
DM1	Flooding and Drainage	This policy aims to discourage inappropriate development in flood risk areas and to ensure that the impact of new development on flooding is fully taken into account. Sustainable Drainage Systems ("SuDS") are expected for all major developments; alternatives will only be permitted where SuDS are impractical or would compromise the scheme viability and the alternative does not conflict with national planning policy. Open areas including highways within developments must be designed to optimise drainage and reduce run-off, whilst protecting groundwater and surface water resources and quality.
BCC's Bristol Development Framework Core Strategy, adopted June 2011		

Table 17.2: Summary of local policy relevant to the water environment

Policy No.	Title	Description
BCS16	Flood Risk and Water Management	This policy sets out the Council's approach to minimising the risk and impact of flooding in the context of new development. All developments in flood risk areas will be expected to be flood-resilient through design and layout, and incorporate sensitively designed flood mitigation measures. All development will be expected to incorporate measures to reduce surface water runoff, including the use of SuDS, to ensure flood risk is not increased elsewhere.

17.3 Methodology

Guidance and Best Practice

17.3.1 The assessment of impacts of the DCO Scheme on the water environment is based on the guidance provided in the Department of Transport's *Design Manual for Roads and Bridges* ("DMRB") Volume 11 Section 3 Part 10, *Road Drainage and the Water Environment* ("HD45/09")[1] and the Government's *Web-based Transport Appraisal Guidance* ("WebTAG"). Although the DMRB is for highway schemes, it provides a useful basis for the environmental assessment of other linear transport schemes including railways[2].

17.3.2 The identification of the nature of the DCO Scheme, assessment of potential impacts, and appropriate mitigation measures are based upon the following guidance and best practice:

- EA position statements on its approach to groundwater protection;
- Construction Industry Research and Information Association ("CIRIA") guidance (e.g. *The potential for water pollution from railways* (C643), *Control of water pollution from construction sites- Guidance for consultants and contractors* (C532), *Control of water pollution from linear construction projects - Technical guidance* (C648) and *Control of water pollution from linear construction projects - Site guide* (C649) and the *SuDS Manual* 2015 (C753));

[1] The DMRB is currently being revised. The assessment was undertaken following the extant methodology at the time, and has not been updated to reflect current guidance.

[2] The Department for Transport's WebTAG Unit A3 *Environmental Impact Appraisal* paragraph 1.2.3 confirms that much of the guidance in DMRB is suitable for other transport modes and should be used unless more appropriate alternatives are available.

- Network Rail's *Railway Drainage Systems Manual Part 1: Purpose, scope and general management requirements* (NR/L3/CIV/005/1) (Network Rail 2010).

Consultations

17.3.3 A summary of consultations undertaken to date is presented in Table 13.4. Further information on the consultation process is presented in the ES Chapter 5 Approach to the Environmental Statement (DCO Document Reference 6.8). Responses to consultation exercises undertaken in 2015 and 2017 are available on the MetroWest project website at the following address http://travelwest.info/project/metrowest-phase-1, and in the Consultation Report and its Appendices (DCO Document Reference 5.1).

17.3.4 Subsequently, consultation has been undertaken with various parties, including the EA and NSLIDB.

17.3.5 A summary of consultations is presented in Table 17.3 below along with a description of where the comments have been considered within this ES.

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
Scoping Opinion Responses (August 2015)		
Planning Inspectorate	Paragraph 3.29. The Secretary of State considers that insufficient information was provided in the Scoping Report to scope out impacts of the project on the water quality changes to the River Avon, with particular concerns about potential for pollution due to new and altered track drainage, and the cumulative effects of other works for MetroWest Phase 1 on water resources.	Water quality changes to the River Avon are assessed in Section 17.6. Cumulative effects on water resources are assessed in section 17.7, and in ES Chapter 18 In-combination and Cumulative Effects (DCO Document Reference 6.21) and Appendix 18.2 (DCO Document Reference 6.25).
	Paragraph 3.58. The assessment should address the concerns of the EA regarding the potential for changes in silt to cause pollution of watercourses.	Water quality effects are assessed in Section 17.6.
	Paragraph 3.101. Pathways for discharges to surface and coastal waters via groundwater should be assessed.	Assessed in Section 17.6.
	Paragraph 3.102. The assessment should address the potential mobilisation/runoff of contaminants during construction and operation on ecological sites or the public water supply.	Assessed in Section 17.6.
	Paragraph 3.103. An FRA should form an appendix to the ES and should address the comments from the EA, which the Secretary of State agrees with.	An FRA has been prepared and is presented in this ES as Appendix 17.1 (DCO Document Reference 5.6).
	Paragraph 3.104. The ES should describe the water-related infrastructure which could be affected by the DCO Scheme. The Applicant should consult with the relevant statutory undertakers.	Information on water related infrastructure has been obtained from the relevant utilities and is identified and potential effects discussed in Chapter 15 Soils, Agriculture, Land Use and

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
		Assets (DCO Document Reference 6.18) at Sections 15.4 and 15.6.
	Paragraph 3.105. The scope of the assessment should be agreed with the EA and NSLIDB.	Pre-application consultation was undertaken with the EA and NSLIDB to agree the scope of the FRA. See Table 17.3 below.
	Paragraph 3.106. The Scoping Report does not explain how the requirements of the Water Framework Directive will be assessed. The EA identified five waterbodies which could be affected by the proposed development.	A WFD assessment has been undertaken and is presented in this ES as Appendix 17.2 (DCO Document Reference 6.25). It should be noted that of the five waterbodies identified by the EA at the scoping stage, only 2 have been taken forward to Cycle 2 of the RBMPs. These are the Severn Estuary and Portbury Ditch. In addition, although not identified by the EA in their list of five waterbodies, the River (Bristol) Avon has been considered in the WFD assessment.
	Paragraph 3.107. Provide a WFD assessment in the appendix to the ES and summarise the results in the ES.	A WFD assessment has been undertaken and is presented in this ES as Appendix 17.2 (DCO Document Reference 6.25). The results of the assessment are summarised in Section 17.6.
	Paragraph 3.108. Review the relevant RBMP to determine how the project can contribute to WFD objectives.	A WFD assessment has been undertaken and is presented in this ES as Appendix 17.2 (DCO Document Reference 6.25).
	Paragraph 3.109. The FRA should form an appendix to the ES and be cross-referenced in the relevant ES chapters.	An FRA has been prepared and is presented in this ES as Appendix 17.1 (DCO Document Reference 5.6).

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
	Paragraph 3.110. Given the inter-relationship between some of the environmental impact assessment (“EIA”) topics in respect of water resources (due to impacts on soils, ecology and hydrogeology), make appropriate cross-referencing in the water chapter of the ES.	Cross-referencing to other parts of the ES is made throughout this chapter where appropriate.
	Paragraph 3.111. Mitigation measures should be adequately described and secured through the Development Consent Order ("DCO"). The need for and characteristics of any on-going monitoring should be discussed and agreed with the relevant authorities.	Mitigation measures have been considered throughout the project design and are reported throughout this ES. Those relevant to this ES assessment are described in Sections 17.5 and 17.7.
	Paragraph 4.34. It is the applicants’ responsibility to identify the requirements for any environmental permit and/or water resource licences.	Consents and environmental permits expected to be required for the purposes of the DCO Scheme are identified in this Chapter with regards to the water environment and set out in DCO Document Reference 5.3, Consents and Licences required under Other Legislation.
Environment Agency	Flood Risk Management: The EA requires a robust FRA that quantifies the current and future flood risk, which incorporates appropriate allowance for the predicted impact of climate change, within the catchments over the lifetime of the development. All pertinent flood sources and flood zones should be clearly identified in the FRA. Any part of the development in the functional floodplain Flood Zone 3b should be identified as “Essential infrastructure” in accordance with the NPPF, as only water compatible development and essential infrastructure are compatible with flood zone 3b, subject	An FRA has been prepared and is presented in this ES as Appendix 17.1 (DCO Document Reference 5.6). The culverts are contained in the Network Rail minor civil plans and are listed in the FRA. The intention is to repair or replace existing culverts like for like on the disused line and more information will be provided at detailed design.

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
	to the Exception Test being successfully applied. Various options and appropriate flood resilience measures must be considered to avoid flood related disruption to operations. Emergency planning and flood warning options must also be considered to complement any built measures. A key element of the FRA will be the status of the Portishead Tidal flood defences due to their current condition. Appropriate means to assist in resolving the matters relevant to the coastal defences or additional mitigation measures to provide the necessary level of protection should be considered. The proposed development is seen as an opportunity to improve the condition of the existing culverts on the Drove Rhyne south of the M5.	
	Groundwater/Contaminated Land: There is potential for contamination of controlled waters due to the mobilisation of historical contamination. Dealing with contamination on an ad hoc basis during construction may result in the unexpected disturbance of contaminants and the subsequent contamination of controlled waters. Prior site investigation and the preparation of an appropriate strategy for the management of contaminated land would reduce any potential impacts on controlled waters.	The identification and assessment of likely significant effects arising from the mobilisation of historic contamination is presented in sections 10.4 and 10.6 of Chapter 10 Geology, Hydrogeology, Ground Conditions and Contaminated Land (DCO Document Reference 6.13). Appendix 10.2 Contaminated Land Summary Report (DCO Document Reference 6.25) brings together existing information on land quality.
	Water Quality/Pollution Prevention: New and altered track drainage from the railway may result in unacceptable levels of silt in receiving waters. For	The proposed drainage is described in Chapter 4 Description of the Proposed Works (DCO Document Reference 6.7). Network Rail has

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
	example, there is an ongoing problem of siltation in the Ham Green fishing lakes due to high levels of silt in drainage water from Pill Tunnel. Other locations such as Charlton Tunnel Drainage improvements are also causing pollution problems. The discharges are not a significant risk to all watercourses, but it is critical to consider the sensitivity of the receiving water.	improved silt removal for drainage from Pill Tunnel to Ham Green Lakes and no further mitigation is proposed for the DCO Scheme. Charlton Tunnel is not on the DCO Scheme. The sensitivity of receiving waters has been considered in Appendix 17.3 (DCO Document Reference 6.25) of the ES Volume 4 Technical Appendices.
Highways England	No new connections are permitted to the Highways England drainage network. The existing “permitted” connection can only be retained if there is no change in land use.	It is not proposed to connect to the Highways England drainage network. The proposed drainage is described in Surface Water Drainage Strategy (DCO Document Reference 6.26).
	Development must not lead to any surface water flooding on the Strategic Road Network carriageway.	Surface water flooding is discussed in the FRA which is presented in this ES as Appendix 17.1 (DCO Document Reference 5.6).
North Somerset Levels Internal Drainage Board	The principle interest of the NSLIDB is to ensure that the watercourse network can be operated and maintained for appropriate drainage, water level management and environmental standards and that the proposed works will not adversely affect any Board activity. During previous consultation key principles have been established, including: - Any new or modified infrastructure, compound areas or other construction is sited at least 9 m away from the banks of any watercourses. Land Drainage Consent will be required for works within 9 m of the top of bank.	A number of Land Drainage Consents will be sought. These are identified in Section 17.6 and listed in DCO Document Reference 5.3.

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
	- Any works will not adversely impact on the ability of the watercourse to function properly, be maintained efficiently, or be improved in the future. Land Drainage Consent will be required from the Board for works in, under, or over any watercourse. - Any new construction will not increase surface water runoff rate or volume of water entering the drainage network or detrimentally affect surface water distribution in the catchment. Land Drainage Consent will be required for any new connections or modifications to existing watercourse connections.	
Public Health England ("PHE")	Receptors: The ES should consider the impact of the scheme on environmental receptors, including watercourses, surface and groundwater, and drinking water supplies.	This chapter of the ES considers the impact on surface waters, groundwater and drinking water supply in Section 17.6.
	PHE sets out issues to be considered in developing the baseline, the assessment and future monitoring for emissions to water. Emissions to water should consider potential impacts on human health. The assessment should consider all routes by which emissions to water may lead to population exposure. The off-site effects of emissions to groundwater and surface waters should be considered in terms of potential for population exposure. Recreational users should be considered alongside assessment of exposure via drinking water.	Section 17.6 identifies the potential impacts upon humans through public water supplies. Chapter 10 Geology, Hydrogeology, Ground Conditions and Contaminated Land (DCO Document Reference 6.13) identifies and assesses likely significant effects in respect of ground conditions and contamination affecting human health.
Informal micro-consultation on DCO scheme boundary (22 June to 3 August 2015)		

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
North Somerset Levels Internal Drainage Board	New construction should not increase surface water run-off rates or volumes. Any new structures should be a minimum of 9 m from banks of any watercourses.	Noted. Chapter 4 - Description of the Proposed Works (DCO Document Reference 6.7) summarises the assumptions adopted in the highway and railway drainage design.
Informal Stakeholder Consultation		
Environment Agency	Non-statutory pre-application consultation has been undertaken with the EA. Meetings were held on 2 May 2014, 10 December 2014, 18 May 2016, and 16 October 2016. The meetings in 2014 were mostly focussed on the historic flood risk and agreeing the approach to the flood risk assessment. The EA also advised (response dated 28 July 2014) no issues regarding water resources availability and identified the requirement for a separate WFD compliance assessment. The meetings in 2016 were to discuss the findings of the FRA and agree on further work required to complete the FRA to the EA's satisfaction.	The meetings with the EA have informed the methodology and development of the FRA and WFD Assessment which are presented in this ES as Appendices 17.1 and 17.2 respectively (DCO Document References 5.6 and 6.25).
North Somerset Levels Internal Drainage Board	A meeting was held with NSLIDB on 8 May 2014. They advised land drainage consent would be required for works around NSLIDB managed watercourses and that enlargement of culverts beneath the railway would be considered an improvement.	The response from NSILDB has been addressed in the FRA.
Bristol Water	Various meetings and discussions have been held by NSDC and their consultants with Bristol Water regarding	The DCO Scheme interfaces with infrastructure owned by Bristol Water at multiple locations. Discussions have been held with Bristol Water for

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
	the location of their assets and potential issues associated with the DCO Scheme.	each interface and agreements made. These vary on the location but consist of Bristol Water's standard protective provisions, protection through use of road plates or concrete slabs. In the case of the Avon Road Bridge works, a method statement will be provided due to the possible impact of vibration caused by potential piling. Sources of water for construction are discussed in paragraph 17.6.14.
Wessex Water	Various meetings and discussions have been held by NSDC and their consultants with Wessex Water regarding the location of their assets and potential issues associated with the DCO Scheme.	The predicted effects of the DCO Scheme on infrastructure owned by Wessex Water are considered in Chapter 15 Soils, Agriculture, Land Use and Assets (DCO Document Reference 6.18). Paragraph 17.6.19 covers the need for consents to discharge to Wessex Water surface water sewers. The station design has been produced to accommodate foul sewer pipes. In other locations replacements, diversions, and shared accesses have been accommodated and agreed with Wessex Water.
Formal Stage 2 Consultation (23 October to 4 December 2017)		
North Somerset Council (Planning and Highways)	The design of the stations, buildings, car parks, highway works, permanent maintenance compounds, temporary construction compounds, and haul roads will each need to be supported by a sustainable drainage strategy. The Council provided standards to be followed in terms of the drainage design.	The drainage design for the temporary construction compounds and haul roads, and the permanent drainage designs for the stations, car parks and highways works are presented in the FRA Appendix O, including:

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
		- *MetroWest Phase 1 Surface Water Drainage Strategy for Portishead and Pill Stations, haul roads and compounds* report (DCO Document Reference 6.26). - Extracts from the Approval in Principle (Form 001) Portishead Station Civils Design - Extracts from the Pill Station Form 001 - Culvert Survey Report (for the disused line); and - Track Drainage Design Report. The FRA (ES Appendix 17.1, DCO Document Reference 5.6) provides the drainage design criteria used to address flood risk.
Bristol City Council (Flood Risk Manager)	The works within the BCC area would have minimal impact on surface water drainage matters. Mitigation will be required with the proposed maintenance compound adjacent to Clanage Road. Works to the highway within the BCC area must ensure drainage standards meet local requirements.	The *MetroWest Phase 1 Surface Water Drainage Strategy for Portishead and Pill Stations, haul roads and compounds* report (DCO Document Reference 6.26) considers drainage associated with the Clanage Road temporary and permanent compound. Mitigation for construction compounds is presented in the Code of Construction Practice ("CoCP"- ES Volume 4 Appendix 4.1, DCO Document Reference 8.15) and Master Construction Environmental Management Plan ("CEMP" ES Volume 4 Appendix 4.2, DCO Document Reference 8.14). Specific mitigation

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
		and drainage strategy for the site compounds will be produced by the construction contractor and presented in their CEMP.
Environment Agency	The EA provided the following comments on the Preliminary Environmental Information Report. Flood Risk: Table 17.3 – It is not possible to rely on "*significant changes in strategic flood risk management interventions*" before 2135. This is a long timeframe and it is therefore not known if future policy or funding will allow for any interventions. The proposal should assume none. Section 17.4.45 – as above, despite the intentions of the draft SMP, there is no certainty that improvements can or will be made. 17.6.11 – The Agency will require further evidence regarding the impact of the Clanage Road compound within the FRA. 17.6.21 – The flood plan should not assume that a strategic solution, to address the future flood risk, will be adopted.	These issues are discussed in the FRA which is presented at ES Appendix 17.1 (DCO Document Reference 5.6). The FRA does not assume that strategic flood risk management interventions will be available.
	The Ham Green Fishing Lakes adjacent to the railway line at Pill Tunnel, which receives treated surface run off from the railway via settlement tanks, will need to be closely monitored during construction. Care must be taken to ensure the collection of sediment is maintained effectively, due to the likely increase in loading.	Noted. Network Rail has now installed three "silt busters" to reduce the suspended sediment load of drainage from Pill Tunnel to the Ham Green Lakes. No further mitigation is required for the DCO Scheme. The contractor's CEMP will identify sediment management measures during construction.

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
	With regard to the proposed Maintenance Compound near Pill Tunnel, the Agency would request specific details regarding the management of any polluting substances stored on site, that may potentially impact on the lakes in the event of a discharge from the site.	The Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) presents measures to control pollution and the contractors would be required to comply with relevant legislation including the Control of Pollution Oil Storage (England) Regulations 2001.
	Two meetings were held following the statutory consultation. The meeting on 27 February 2018 was to agree the design life of the scheme for purposes of the FRA. The purpose of the meeting on 30 July 2018 was to discuss the revised FRA.	These issues are addressed in the ES Volume 4 Appendix 17.1 FRA (DCO Document Reference 5.6).
North Somerset Levels Internal Drainage Board / NSC / BCC	A meeting was held with NSLIDB and drainage engineers at NSC and BCC on 24 October 2017 to establish their comments on the scheme, their requirements and gather further information to inform the FRA. Written representation was received covering a number of issues: • Seek approval of NSLIDB on any permanent or temporary works within 9 m of any watercourse for which they have responsibility. • Preserve free drainage paths to ditches and obtain consent prior to any changes such as culverting. • Provide access by NSLIDB to ditches for which they have maintenance responsibilities. • Fencing taller than 1.2 m could constrain NSLIDB's access to adjacent watercourses.	An track drainage design report has been produced and is annexed to the FRA in ES Volume 4 Technical Appendix 17.1 (DCO Document Reference 5.6). The *MetroWest Phase 1 Surface Water Drainage Strategy for Portishead and Pill Stations, haul roads and compounds* report considers temporary drainage for compounds and haul roads and permanent highway and car park drainage (DCO Document Reference 6.26). The Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) includes a chapter on the management of drainage, water and flood risk during construction. Flood risk issues are discussed in the FRA (ES Appendix 17.1, DCO Document Reference 5.6).

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
	• Any replacement culvert headwalls should be situated on or just outside the respective boundary fencing rather than leave short lengths of open ditch inside the boundaries at each end. • The NSLIDB wished to see specific drainage proposals for the track. • Unattenuated run-off is only allowable from Portishead Station roof areas. Areas of car parking will require appropriate attenuation and water quality mitigation. • Specific comments on individual culverts. • Watercourse east of Marsh Lane (Easton-in-Gordano stream) has been subject to blockages and flooding in the past.	The culvert headwalls and proposed permanent fencing along the DCO Scheme are presented in DCO Document Reference 2.7, Disused railway engineering plans / Governance for Railway Investment Projects ("GRIP") 4 Minor Civils. The railway drainage design is included in the ES Volume 4 Appendix 17.1 FRA Appendix O (DCO Document Reference 5.6). The Easton-in-Gordano Stream culvert (chainage approx. 126 mi 64 ch or 14,250 m) has been studied in the FRA in the ES Volume Appendix 17.1 (DCO Document Reference 5.6).
Sustrans	Avon tow path - exploit any opportunity to improve the drainage and surface of the towpath, for instance by retaining any imported stone brought in for access by Network Rail vehicles.	The tow path passes through a very environmentally sensitive area and has a number of formal protective designations. The rare fauna includes grasses, habitats and trees which in places abuts the path. Any works to improve the drainage and the surface could conflict with ensuring the survival of these habitats and is essentially out of the scope of the scheme.
Informal Stakeholder Consultation		
Environment Agency	27 February 2018. Meeting to discuss the appropriate design life for the DCO Scheme. 30 July 2018. Meeting to discuss the findings of the revised draft FRA issued to them in May 2018.	Potential impacts on surface and groundwaters during construction and operation are discussed in Section 17.6.

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
	September 2018. Letter from the EA with their comments on the draft FRA and hydraulic modelling. 24 April 2019. Letter from the EA with their comments on the revised draft FRA, hydraulic modelling and other documents issued to them in February and March 2019. 17 May 2019. Meeting with the EA to discuss their comments in their letter of 24 April 2019. 19 June 2019. Letter from the EA commenting on the minutes of the meeting on 17 May including potential impacts on third party land and need for flood compensation. 26 July 2019. Telephone conference call with the EA to discuss modelling work undertaken in May-July 2019 to assess floodplain compensation options at Bower Ashton, revised design options, and construction methodology. 17 September 2019. EA comments considers that Clanage Road construction compound is in Flood Zone 3b based on the modelling results and commented on the flood risk at other compounds. They provided commentary on contaminated ballast and licensing.	A summary of the issues relating to flood risk is presented in the ES Volume 4 Appendix 17.1 FRA (DCO Document Reference 5.6). A Water Framework Directive Assessment is presented in the ES Volume 4 Appendix 17.2 (DCO Document Reference 6.25). Comments regarding land quality are considered in the ES Volume 2 Chapter 10 Geology, Hydrogeology, Ground Conditions and Contaminated Land (DCO Document Reference 6.13) and Appendix 10.2 Land Contamination Summary Report (DCO Document Reference 6.25).
North Somerset District Council and North Somerset Levels Internal Drainage Board	8 February 2018. Joint meeting to discuss aspects of the DCO Scheme design relevant to the activities and planned works of the NSDC drainage team and NSLIDB.	A summary of the issues relating to flood risk is presented in the ES Volume 4 Appendix 17.1 FRA (DCO Document Reference 5.6).

Table 17.3: Summary of scoping consultation responses

Organisation	Summary of Response	Consideration within the ES
North Somerset Levels Internal Drainage Board	1 June 2018. Meeting to discuss the interface between the DCO Scheme and NSLIDB maintenance requirements. 21 February 2019. Telephone call to review with the IDB the draft DCO's approach to dis-applying certain IDB byelaws, and how (despite byelaw dis-application) parallel steps can be taken to allow the IDB to maintain its drains within the red line boundary on DCO Scheme land. 24 September 2019. Meeting to address any outstanding areas of concern that NSLIDB may have prior to drafting a Statement of Common Ground between the NSDC and NSLIDB in relation to the DCO Scheme.	A summary of the issues relating to flood risk is presented in the ES Volume 4 Appendix 17.1 FRA (DCO Document Reference 5.6).

Definition of the Study Area

17.3.6 For the purposes of the water environment assessment the study area for the DCO Scheme comprises surface water features within 250 m of the centreline of the railway between Portishead and Ashton Junction and within 50 m of haul roads and construction compounds where these extend beyond 250 m of the centreline of the railway. For groundwater the study area extends to 500 m either side of the centreline of the railway. The FRA considers a wider study area defined by the EA's flood zones to incorporate areas representative of flood risk potentially impacted by the DCO Scheme.

Key Receptors

17.3.7 The key receptors for the water assessment are:

- surface water, including ponds, ditches, streams and estuaries;
- groundwater, comprising aquifers that provide regional and local drinking water supply, and base flow to rivers;
- drainage, including surface and foul drainage; and
- flood risk.

Defining the Baseline

17.3.8 The baseline information for the study area has been established primarily from a desk-based review of the following sources:

- Environment Agency, December 2009. *River Basin Management Plan, Severn River Basin District*.
- Environment Agency, February 2016. *Severn River Basin District Management Plan*.
- www.environment-agency.gov.uk "what's in your backyard" https://www.gov.uk/check-local-environmental-data (accessed April 2014, checked February 2015, October 2015 and November 2015).
- http://environment.data.gov.uk/catchment-planning/ (accessed October and November 2015).
- http://www.magic.gov.uk/.
- https://maps.google.co.uk/maps?hl=en&tab=wl.
- http://gridreferencefinder.com/#.
- Ordnance Survey mapping.
- Landmark Envirocheck report (for the Portishead area).
- British Geological Survey online mapping tool.
- Data provided by NSDC.
- Site walkover of the disused railway between Portishead and Pill undertaken to identify the watercourses and to inform the FRA.
- NSLIDB: http://www.nslidb.org.uk/.
- Emerging/ developing track design.

17.3.9 The websites have not been accessed since late 2015 as the baseline data have been used to value the receptors. Any changes in the data would not affect the value of the receptor or the outcome of the assessment.

17.3.10 Data collected for the purposes of the determining flood risk are reported in the FRA (see the ES, Appendix 17.1, DCO Document Reference 5.6). Topographical surveys of the Drove Rhyne and Easton-in-Gordano streams were undertaken in 2015.

17.3.11 The EIA hydrologist undertook a site walkover along the disused section of the railway line between Portishead and Pill in March 2014. Separate site visits have been made by the railway and highways drainage design engineers.

Assessment of Construction Impacts

17.3.12 The assessment criteria adopted are largely derived from the environmental assessment approach presented in Highways England's DMRB. Although the guidance applies to appraisal of road transport schemes, the concepts adopted are applicable for other large linear transport developments. DMRB covers environmental assessment for *Road Drainage and the Water Environment* in Volume 11 Section 3, Part 10: HD45/09 (referred to herein as HD45/09).

Assessment of Operational Impacts

17.3.13 The assessment of operational impacts was undertaken adopting the criteria derived from HD45/09 and WebTAG which specifically covers water environment appraisal under Unit A3.10. The criteria provided in the guidance to undertake a qualitative assessment was applied to the DCO Scheme, as the quantitative assessment criteria provided in this guidance is only relevant to road schemes.

17.3.14 The assessment takes into account the nature and management of the railway operations and Network Rail’s best practice and requirements.

Assessment of Decommissioning Impacts

17.3.15 Chapter 4 - Description of the Proposed Works (DCO Document Reference 6.7) explains that consideration has been given to likely significant effects arising during the decommissioning phase. However, owing to the nature and life span of the proposed development, the regulated process of any closure in the future, which would be overseen by the Office of Rail and Road, and there being no reasonably foreseeable decommissioning proposals such that likely impacts could be identified and assessed, these effects are not considered further in this chapter.

Assessment of Cumulative Effects

17.3.16 The potential impacts related to the construction and operation of the DCO Scheme may have a cumulative effect when considered in combination with other developments in the vicinity of the DCO Scheme and the other works associated with the MetroWest Phase 1 project. The cumulative assessment, presented in Section 17.7, assesses the scale and significance of these impacts.

Water Framework Directive Assessment

17.3.17 As advised in paragraph 17.2.2, the classifications, objectives and programme of measures set out in the RBMP have been taken into account in considering the DCO Scheme, with the specific intent of ensuring that the construction and operation of the DCO Scheme will not lead to a deterioration in the current status of any water body or hinder the achievements of any statutory objectives in the Severn RBMP.

17.3.18 Based on the *Water supply, wastewater and water quality planning practice guidance* (CLG, 2014b), water quality is only likely to be a significant planning concern where a development involves physical modifications to a water body and, or would indirectly affect water bodies.

17.3.19 The WFD Assessment Report is presented in ES Appendix 17.2 (DCO Document Reference 6.25) and is based upon data from Cycle 2 of the RBMPs. WFD data from Cycle 1 of the *River Basin Management Plans* (Environment Agency, 2009) have also been presented in Section 17.4 where it assists in determining the value of receptors for assessment purposes.

Use of Significance Criteria

17.3.20 The determination of significance follows the approach presented in HD45/09. This is a three step process which involves identifying the value or sensitivity (to change) of the receptor, evaluating the magnitude of the impact of the DCO Scheme on the receptor, and combining these to determine the significance of the effect of the DCO Scheme on the receptor.

Value of the Receptor

17.3.21 The water environment receptors are identified through the baseline study and are assigned a value based on the criteria in Table A4.3 in HD45/09 which is reproduced below in Table 17.4.

Table 17.4: Estimating the importance of water environment attributes

Importance	Criteria	Typical Examples
Very High	Attribute has a high quality and rarity on regional or national scale	Surface Water: • European Council ("EC") Designated Salmonid/Cyprinid fishery* • WFD Class 'High' • Site protected/designated under EC or UK habitat legislation (Special Area of Conservation ("SAC"), Special Protection Area ("SPA"), Site of Special Scientific Interest ("SSSI"), Water Protection Zone ("WPZ"), Ramsar site, or salmonid water) • Species protected by EC legislation Groundwater: • Principal aquifer providing a regionally important resource or supporting site protected under EC and UK habitat legislation • Source Protection Zone ("SPZ") 1 Flood Risk+: • Floodplain or defence protecting more than 100 residential properties from flooding
High	Amenity has a high quality and rarity on a local scale	Surface Water: • WFD Class 'Good' • Major Cyprinid Fishery* • Species protected under EC or UK habitat legislation Groundwater: • Principal aquifer providing locally important resource or supporting river ecosystem • SPZ2 Flood Risk+: • Floodplain or defence protecting between 1 and 100 residential properties or industrial premises from flooding
Medium	Attribute has a medium quality and rarity on local scale	Surface Water: • WFD Class 'Moderate' Groundwater: • Aquifer providing water for agricultural or industrial use with limited connection to surface water • SPZ3 Flood Risk+: • Floodplain or defence protecting 10 or fewer industrial properties from flooding

Table 17.4: Estimating the importance of water environment attributes

Importance	Criteria	Typical Examples
Low	Attribute has a low quality and rarity on local scale	Surface Water: • WFD Class 'Poor' Groundwater: • Unproductive strata Flood Risk+: • Floodplain with limited constraints and a low probability of flooding of residential and industrial properties

* Fishery designated under the Surface Waters (Fishlife) (Classification) Regulations 1997 (amended 2003), which transposes the EC Freshwater Fish Directive 78/659/EEC. This has now been superseded by the WFD.

+ As noted above flood risk is covered by a separate FRA, but is retained herein as a reflection of the importance criteria highlighted in HD45/09.

Source: Department for Transport's Design Manual for Roads and Bridges, HD45/09 Road Drainage and the Water Environment, reproduced from Table A4.3.

17.3.22 The key water environment receptors within the study area that could potentially be affected by the DCO Scheme either during construction or operation have been identified. The tables in Appendix 17.3 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25) provide a summary of the identified water receptors to be assessed and the value ascribed to them based on the criteria presented in Table 17.4. The table also identifies those receptors that have been scoped out of the ES and the justification for doing so. Impacts pertaining to flood risk (floodplain extent and flood conveyance) are dealt with separately in the FRA and are cross referenced herein as appropriate.

Magnitude of Impact

17.3.23 The magnitude of potential impacts (the degree of change) may be beneficial or adverse. The criteria for estimating the magnitude of impacts is presented in Table 17.5 below. This is taken from the criteria provided in DMRB HD45/09 Table A4.4.

Table 17.5: Estimating the magnitude of an impact on an attribute

Magnitude of effect	Criteria
Major Adverse	Results in loss of the attribute and/or quality and integrity of the attribute
Moderate Adverse	Results in an effect on the integrity of the attribute, or loss of part of the attribute
Minor Adverse	Results in some measurable changes in the quality or vulnerability of the attribute
Negligible	Results in an effect on the attribute, but of insufficient magnitude to affect the use or integrity of that attribute
Minor Beneficial	Results in some beneficial effect on the attribute or a reduced risk of a negative effect occurring
Moderate Beneficial	Results in a moderate improvement of attribute quality
Major Beneficial	Results in a major improvement of attribute quality

Source: Department for Transport's Design Manual for Roads and Bridges, HD45/09 Road Drainage and the Water Environment, adapted from Table A4.4.

17.3.24 The magnitudes of flooding and runoff effects have been investigated and are reported separately within the FRA presented in the ES Appendix 17.1 (DCO Document Reference 5.6).

Significance of Effect

17.3.25 The significance of effects is based on the combination of the value (or importance) of the receptor (and its attributes) and the magnitude of impact using the matrix in Table 17.6 below reproduced from Table A4.5 in HD45/09. Potential effects can be neutral, beneficial or adverse.

Table 17.6: Significance of effects

Importance of attribute					
	Very High	Neutral	Moderate/Large	Large/Very Large	Very Large
	High	Neutral	Slight/Moderate	Moderate/Large	Large/Very Large
	Medium	Neutral	Slight	Moderate	Large
	Low	Neutral	Neutral	Slight	Slight/Moderate
		Negligible	***Minor***	***Moderate***	***Major***
		Magnitude of impact			

Source: Department for Transport's Design Manual for Roads and Bridges, HD45/09 Road Drainage and the Water Environment, Table A4.5.

17.3.26 Those residual effects described as having a Moderate, Large or Very Large effect upon a receptor are usually considered to be significant in terms of the EIA Regulations 2017.

17.4 Baseline, Future Conditions and Value of Resource

Regional Overview

17.4.1 The programme of works required for MetroWest Phase 1 lies within the catchment of the River Avon, a tributary of the River Severn. The River Avon has a large catchment area of approximately 2,220 km^2 encompassing the major cities of Bristol and Bath. The primary river flows from its source upstream of Malmesbury south then west for approximately 134 km through gentle rural landscapes and towns such as Bradford-on-Avon, Bath, and Bristol, before flowing through the Avon Gorge to Avonmouth, and into the Severn Estuary.

17.4.2 The DCO Scheme primarily runs along the coastal plain of the North Somerset coast and the left[3] (south) bank of the River Avon. The River Avon is tidal throughout the study area.

Surface Water Features and Drainage

17.4.3 The main features of the surface water environment for the DCO Scheme comprise the River Avon, which is tidal throughout the study area and several watercourses and drains which form tributaries of the river. The Main Rivers as defined by the Environment Agency are the River Avon, and then from Portishead towards Bristol, Portbury Ditch, Drove Rhyne, Markham Brook, Longmore Brook and Colliter's Brook. Other watercourses are classified as ordinary rivers.

17.4.4 There is an extensive network of small drains and ditches, with a number of culverts under the existing railway track, particularly through the section between Portishead and Pill. From onsite observations, the culverts, mostly brick lined, are in moderate to poor condition, with flow restricted by siltation. Many of the ditches in this area are also heavily overgrown and with the flat topography, the direction of the drainage may be unclear.

17.4.5 There are no coastal waters within the study area. The Severn Estuary (identified as the Severn Lower transitional water body under WFD) is located over 1 km from the proposed centreline of the railway and this potential receptor is not considered to be one that could sustain a likely significant environmental effect in respect of surface water quality. However, flood risk pertaining to the estuarine and coastal waters has been evaluated as part of the FRA and the Severn Lower was scoped into the WFD assessment as a downstream waterbody.

[3] The left and right hand banks of a river assume the respondent is facing in the downstream direction.

17.4.6 A lot of the watercourses and ponds are un-named and for the purposes of assessment have been assigned a unique number or name. The surface water features within the study area are presented, from west to east, in Appendix 17.3 (DCO Document Reference 6.25) and are shown on Figure 17.1 (Sheets 1 to 5) in Volume 3 (DCO Document Reference 6.24). The table in Appendix 17.3 should be read in conjunction with these figures.

Geomorphology

17.4.7 The surface watercourses in the study area are either artificial or heavily modified water bodies. Few watercourses have natural morphological features, such as the channel form and profile, bed substrate, and bank materials.

17.4.8 The flow regime and patterns in these watercourses are also dictated by bank vegetation and siltation from field drains and other sources. With flat gradients dominant, flow rates do not appear to be sufficient to move in-channel sediment and the environment is dominantly depositional.

17.4.9 Where ditches and drains pass beneath existing culverts (e.g. through the Portbury to Pill section) they are in places partly blocked and often heavily silted.

17.4.10 Overall, the surface watercourses have little geomorphological interest.

Surface Water Quality

17.4.11 Under the WFD, water quality comprises ecological and chemical components. Ecological status is measured on the scale: high, good, moderate, poor and bad. Chemical status is recorded as good, fail or, where priority pollutants are not discharged, as "*does not require assessment*". Whilst good ecological status is defined as a slight variation from undisturbed natural conditions in natural water bodies, artificial water bodies (“AWB”) and heavily modified water bodies (“HMWB”) are unable to achieve natural conditions. Instead, they have a target to achieve good ecological potential, which recognises their important uses whilst making sure ecology is protected as far as possible. For a surface water body to be in overall good status or potential, both its ecological and chemical status must be at least good. Hydromorphology and hydrology are also used to assess the high status water bodies. Further details on the classification of waterbodies is provided in the WFD assessment in the ES Appendix 17.2 (DCO Document Reference 6.25).

17.4.12 Surface waterbodies classified under the WFD have been identified using the EA's online mapping tool ("*what's in your backyard*"). This weblink has now been removed by the EA and is no longer available. WFD data from Annex B of the Severn RBMP, 2009 are presented in Table 17.7 for all Cycle 1 WFD surface waterbodies within the study area.

17.4.13 Cycle 2 data (2015-2021) were released in February 2016 and have been used in developing the WFD assessment. Where available on the Environment Agency’s Catchment Data Explorer website, Cycle 2 data have been included in Table 17.7 below. Further information is available from https://www.gov.uk/check-local-environmental-data and http://environment.data.gov.uk/catchment-planning/.

Table 17.7: WFD classification data on Cycle 1 surface waterbodies within the study area

Waterbody Name	**Bristol Avon**	**Portbury Ditch - source to confluence with Severn Estuary**	**Easton in Gordano stream (see Note 1)**	**Markham Brook – source to confluence with River Avon (Bristol) (see Note 1)**	**Chapel Pill (see Note 1)**	**Colliter's Brook source to confluence with River Avon (Bristol New Cut) (see Note 1)**
Waterbody ID	GB530905415405	GB109052027330	GB109053027470	GB109053027420	GB109053027430	GB109053027360
Waterbody category	Transitional	River	River	River	River	River
Typology Description	Mixed, macro, extensive intertidal [Transitional water] (see Note 2)	Low, Small, Calcareous [River]	Low, Extra Small, Calcareous	Low, Extra Small, Calcareous	Low, Extra Small, Calcareous	Low, Small, Calcareous
Hydro-morphological Status	Heavily Modified (flood protection, navigation and quay line)	Artificial (land drainage) [Heavily modified]	Artificial (flood protection and land drainage)	Not Designated A/HMWB	Not Designated A/HMWB	Heavily Modified (flood protection, land drainage, urbanisation, water regulation (impoundment release))

Table 17.7: WFD classification data on Cycle 1 surface waterbodies within the study area

Waterbody Name	**Bristol Avon**	**Portbury Ditch - source to confluence with Severn Estuary**	**Easton in Gordano stream (see Note 1)**	**Markham Brook – source to confluence with River Avon (Bristol) (see Note 1)**	**Chapel Pill (see Note 1)**	**Colliter's Brook source to confluence with River Avon (Bristol New Cut) (see Note 1)**
Protected Area Designation	Freshwater Fish Directive, Natura 2000 (Habitats Directive and/or Birds Directive)	Freshwater Fish Directive, Natura 2000 (Habitats Directive and/or Birds Directive)	Natura 2000 (Habitats Directive and/or Birds Directive)	Not Designated		Not Designated
Current Ecological Quality (2009)	Good Potential	Moderate Potential (Dissolved oxygen - poor)	Good Potential	Moderate Status	Moderate Status	Moderate Potential
Current Ecological Quality (2015)	[Moderate Potential]	[Moderate Potential]	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Current Chemical Quality (2009)	Does Not Require Assessment (see Note 3)	Does Not Require Assessment	Does Not Require Assessment	Does not Require Assessment	Does not Require Assessment	Does not Require Assessment

Table 17.7: WFD classification data on Cycle 1 surface waterbodies within the study area

Waterbody Name	**Bristol Avon**	**Portbury Ditch - source to confluence with Severn Estuary**	**Easton in Gordano stream (see Note 1)**	**Markham Brook – source to confluence with River Avon (Bristol) (see Note 1)**	**Chapel Pill (see Note 1)**	**Colliter's Brook source to confluence with River Avon (Bristol New Cut) (see Note 1)**
Current Chemical Quality (2015)	[Good]	[Good]	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2015 Predicted Ecological Quality (2009)	Good Potential	Moderate Potential	Good Potential	Moderate Status	Moderate Status	Moderate Potential
2015 Predicted Chemical Quality (2009)	Does Not Require Assessment	Does Not Require Assessment	Does Not Require Assessment	Does Not Require Assessment	Does Not Require Assessment	Does Not Require Assessment
Status Objectives	Good Ecological Potential by 2015 [2021]	Good Ecological Potential by 2027	Good Ecological potential by 2015	Good Ecological Status by 2027	Good Ecological Status by 2027	Good Ecological potential by 2027
Ecological (2014 Cycle 2)*	Good	Moderate	Waterbody not listed	Waterbody not listed	Waterbody not listed	Waterbody not listed

Table 17.7: WFD classification data on Cycle 1 surface waterbodies within the study area

Waterbody Name	**Bristol Avon**	**Portbury Ditch - source to confluence with Severn Estuary**	**Easton in Gordano stream (see Note 1)**	**Markham Brook – source to confluence with River Avon (Bristol) (see Note 1)**	**Chapel Pill (see Note 1)**	**Colliter's Brook source to confluence with River Avon (Bristol New Cut) (see Note 1)**
Chemical (2014 Cycle 2)*	Good	Good	Waterbody not listed	Waterbody not listed	Waterbody not listed	Waterbody not listed

* Data taken from http://environment.data.gov.uk/catchment-planning/ for those waterbodies where data are available.

Notes: 1. These water bodies are defined as WFD water bodies in the 2009 RBMP but are absent from the revised 2015 RBMP

2. Data in square brackets taken from revised 2015 RBMP

3. Refer to paragraph 17.4.10 for the explanation for "Does Not Require Assessment"

17.4.14 The River Severn (GB530905415401) Transitional waterbody has not been included as a receptor within the assessment as it is located more than 250 m from the railway centreline (i.e. is located outside of the study area). The waterbody has been considered in the WFD assessment which requires that downstream waterbodies are considered in terms of the WFD objectives.

Pollution Incidents

17.4.15 The Environment Agency's online "What's in your backyard" mapping tool records one significant pollution incident within the study area, located adjacent to the River Avon near Ashton Gate (National Grid Reference ST567721). The pollution incident occurred in June 2009 (Incident Number 685142) and had a significant impact upon water and a minor impact upon land. The data provided on the EA's website do not specify the source of the pollution incident. However, the location recorded is 170 m east of the railway line and is unlikely to be associated with railway operations.

17.4.16 Pollution of the ditch (water receptor D12 in Appendix 17.3 in the ES Volume 4 Technical Appendices, DCO Document Reference 6.25), located beneath the Royal Portbury Dock Road which flows under the disused Portishead Branch railway and discharges into the Drove Rhyne, has been reported to the Environment Agency on two occasions (May 2015 and August 2015) during site visits associated with the DCO Scheme. The incidents, considered to be Category 3 (minimal effect on water quality) by the Environment Agency, are assumed to be associated with the Gordano Motorway Service Area at Junction 19 of the M5 or from upstream farm activity.

17.4.17 Consultation with the EA (meeting held 10 December 2014) highlighted historical water quality and drainage issues associated with Pill Tunnel. Network Rail has confirmed that although there is a functioning track drainage system in Pill Tunnel, this includes discharge to an outfall into Ham Green Lakes via a series of silt interceptor settlement units and clarification tanks. A third silt interceptor was added during 2016 which has improved the capacity of the system.

Environmental / Water Designations

17.4.18 The study area does not lie within a surface water or ground water NVZ.

17.4.19 The Severn RBMP Annex D (Protected Area Objectives) (Environment Agency, 2009) provides a list of designated freshwater fish protected areas within the river basin. Portbury Ditch is classed as a cyprinid fishery with a compliance status of passing the imperative quality standards but failing the more stringent guideline standards.

17.4.20 Drinking water safeguard zones are designated areas in which the use of certain substances must be carefully managed to prevent the pollution of raw water sources that are used to provide drinking water. These are referred to as Drinking Water Protected Areas ("DrWPA") within the Water Framework Directive. In order to protect raw water sources and prevent the need for additional treatment Safeguard Zones have been identified by the EA for any raw water sources that are 'at risk' of deterioration where the land use is causing pollution of the raw water. Safeguard Zones are a joint initiative between the EA and water companies. Safeguard Zones are one of

the main tools for delivering the drinking water protection objectives of the Water Framework Directive. The DCO Scheme does not lie within a drinking water safeguard zone.

Water Dependent Ecological Designations

17.4.21 Tables 9.8 and 9.9 in Chapter 9 - Ecology and Biodiversity (DCO Document Reference 6.12) identify the internationally and nationally designated sites for nature conservation within the study area of the DCO Scheme between Portishead and Pill. The locations are shown on Figures 9.1 and 9.2 in the ES Volume 3 Book of Figures (DCO Document Reference 6.24). Downstream of Pill, the River Avon forms part of the Severn Estuary SAC, SPA, Ramsar site and SSSI. No other internationally and nationally designated sites are located within the water environment study area. Further discussion on the nature conservation characteristics of these designations is provided in section 9.4 of Chapter 9 Ecology and Biodiversity (DCO Document Reference 6.12). These international and national designations for the River Avon represent additional sensitivity to water quality conditions.

17.4.22 Table 9.10 in Chapter 9 Ecology and Biodiversity (DCO Document Reference 6.12) identifies a number of Wildlife Sites ("WS") (non-statutory designated sites within North Somerset) and Sites of Nature Conservation Importance ("SNCI") (non-statutory designated sites within the City of Bristol) within the DCO Scheme study area. These are shown on Figure 9.3 in the ES Volume 3 Book of Figures (DCO Document Reference 6.24). Those sites within the water environment study area that contain water-dependent features include the following:

- Portbury Wharf Nature Reserve North Somerset Wildlife Site (“NSWS”), now managed by NSDC (includes marshy grassland and open water);
- Drove Rhyne and adjacent fields NSWS (includes swamp and standing water);
- Fields between railway line and A369, Portbury NSWS (includes marshy grassland);
- Priory Farm (Avon Wildlife Trust Nature Reserve) (wetland with reed beds);
- Field east of M5 Motorway, Lodway NSWS (includes marshy grassland);
- Land adjacent to Severn Estuary SSSI (Portbury) NSWS (includes marshy grassland);
- Fields between A369 and M5 Motorway, Portbury NSWS (includes marshy grassland); and
- Fields on Caswell Moor NSWS (includes swamp and standing water).

17.4.23 There are no nationally designated sites for nature conservation within the study area of the DCO Scheme along the operational freight line (i.e. the Portbury Freight Line) that are within the water environment study area and that have water dependent features, other than the Severn Estuary SSSI mentioned above.

17.4.24 Table 9.16 in Chapter 9 Ecology and Biodiversity (DCO Document Reference 6.12) lists the wildlife sites and nature reserves within the Portbury Freight Line study area. Those within the water environment study area with water-dependent features comprise the following:

- River Avon (part of) NSWS (saltmarsh and saltmarsh influenced grassland);
- River Avon (part of) SNCI (saltmarsh);
- Lamplighter's Marsh SNCI (brackish marshland and saltmarsh);
- Cumberland Basin Lock BWNS (canal); and
- Cumberland Basin BWNS (canal).

Water Environmental Permitting

17.4.25 Abstraction licence data published on the EA website show that there are no surface water abstraction licences within the study area. There is one groundwater abstraction licence within the study area, licensed to Welcome Break Group Ltd located at the Gordano Motorway Service Area at Junction 19 of the M5, approximately 450 m south of the disused section of the railway line.

17.4.26 EA data were obtained (January 2015) for discharges to waters (previously called discharge consents) located within the study area. Table 17.8 presents information on those environmental permits located within the study area and the locations are shown on the maps presented in Appendix 17.4 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25). These data have been used to assist in determining the value of receptors. Any new environmental permits or variations in existing environmental permits would not affect the value of the receptors determined and as reported in Appendix 17.3 (DCO Document Reference 6.25).

Table 17.8: Environmental permits within the study area between Portishead and Ashton Junction

Licensed holder	Grid reference (approximate)	Discharge type	Receiving watercourse	Distance and direction from railway line/ development
Wessex Water	ST 47194 76473	Sewage discharge from Portishead Town Pumping Station (storm sewer overflow)	Portbury Ditch	Located within the study area, west of the proposed station. Portbury Ditch to receive discharge from the proposed station car park
		Harbour Road combined / storm sewer overflow	Portbury Ditch	See above

Table 17.8: Environmental permits within the study area between Portishead and Ashton Junction

Licensed holder	Grid reference (approximate)	Discharge type	Receiving watercourse	Distance and direction from railway line/ development
Mustad Manufacturing	ST 47110 76352	Sewage - final and treated	Portbury Ditch (left bank)	C 150 m upstream of where Portbury Ditch to receive car park drainage
Wessex Water	ST 47616 76398	Sewage discharge from Portishead Town Pumping Station (storm sewer overflow)	Tributary of Portbury Ditch (The Cut – NSLIDB controlled drain)	~65 m downstream of where the tributary passes beneath the railway line; the Pumping station is located on the left bank
Unknown	ST 500 759	Trade	Drove Rhyne	Located 170 m north of the railway line.
Unknown	ST 502 759	Trade	Drove Rhyne	Located 90 m north of railway line
Unknown	ST 503 759	Trade	Drove Rhyne	Located 98 m north of railway line.
Unknown	ST 504 761	Trade	Culverted tributary of Drove Rhyne	Located 205 m north of railway line
Wessex Water	ST 522 764	Sewage Outlet	River Avon	Located 220 m north east of railway line near Pill.

Groundwater

17.4.27 The geology and soils underlying the DCO Scheme are described in Chapter 10 Geology, Hydrogeology, Ground Conditions and Contaminated Land, Section 10.2 (DCO Document Reference 6.13). As groundwater within the underlying strata may represent an important water resource and impact upon surface waters, it is also covered in this chapter in relation to groundwater quality and quantity and the WFD assessment.

17.4.28 The Mercia Mudstone is classified as a Secondary B aquifer characterised by predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

17.4.29 The Carboniferous sediments are classified as a Principal aquifer; these are layers of rock having high intergranular and/or fracture permeability and can provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

17.4.30 The Devonian sandstones (Portishead Formation and Black Nore Sandstone Formation) are classified as Secondary A aquifers; permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

17.4.31 Where they occur, the superficial deposits are classified as Secondary A and Secondary undifferentiated. Secondary A aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

17.4.32 There are no groundwater SPZs within the study area to protect groundwater abstraction points.

17.4.33 The Severn RBMP (EA, 2009) classifies groundwater bodies within the Severn RBD. Each groundwater body has quantitative and chemical components representing its overall status. The study area lies within three groundwater bodies, the WFD status of which are presented in Table 17.9. These data have been supplemented, where available, by updated RBMP Cycle 2 data published on the EA Catchment Data Explorer website[4].

Table 17.9: WFD classification data for groundwater bodies within the study area

Water Body Name	Portishead Mercia Mudstone (See note 1)	Carboniferous Limestone (Bristol)	Bristol Triassic
Water Body ID	GB40902G805300	GB40901G806800	GB40902G804800
Current Quantitative Quality	Good	Good	Good
Current Chemical Quality	Good	Good	Poor
Upward Chemical Trend	No	No	Yes
2015 Predicted Quantitative Quality	Good	Good	Good

[4] http://environment.data.gov.uk/catchment-planning/

Table 17.9: WFD classification data for groundwater bodies within the study area

Water Body Name	Portishead Mercia Mudstone (See note 1)	Carboniferous Limestone (Bristol)	Bristol Triassic
2015 Predicted Chemical Quality	Good	Good	Poor
Overall Risk	Probably At Risk	Probably At Risk	At Risk
Protected Area	Yes - Drinking Water Protected Area	Yes - Drinking Water Protected Area	Yes - Drinking Water Protected Area
Quantitative Status (2015 Cycle 2)	Good	Good	Good
Chemical Status (2015 Cycle 2)	Good	Good	Poor

Note 1: These descriptions are taken directly from the 2016 Severn RBMP

Water Resources Availability

17.4.34 The *Bristol Avon and North Somerset Streams WFD Management Area Abstraction Licensing Strategy* (EA, 2012) supersedes the Catchment Abstraction Management Strategies ("CAMS") for these areas and provides information on where water is available and the reliability of the resource. The Environment Agency has confirmed (letter reference WX/2014/125769/01-L01, dated 28 July 2014, appended to the Scoping Report (CH2M, 2015) and available from the Planning Inspectorate's website) that following an assessment of local water resources, there are no issues regarding water resources availability along the proposed route.

Water Supply and Foul Drainage Assets

17.4.35 Wessex Water is the sewerage undertaker and Bristol Water plc provides public water supplies within the study area. There are pumping stations at Quays Avenue (Portishead) and adjacent to the railway at The Drove (Portbury) operated by Wessex Water Authority.

Flood Risk

17.4.36 Flood risk management in the area is undertaken by the EA, NSLIDB, NSDC and BCC. A full description and analysis of flood risk relating to the DCO Scheme is presented in the FRA (ES, Appendix 17.1, DCO Document Reference 5.6). The location of flood risk zones and defences are shown on Figure 17.1 Sheets 1 to 5 in the ES Volume 3 Book of Figures (DCO Document Reference 6.24).

17.4.37 The EA Flood Map covering the DCO Scheme is provided in Appendix B of the FRA (Appendix 17.1, DCO Document Reference 5.6). This shows the DCO Scheme to be in Flood Zone 1 except for the following locations:

- Defended Flood Zone 3 at the crossing of Portbury Ditch;

- Flood Zone 3 at the crossing of Markham Brook in Pill and Chapel Pill watercourse;
- Partly in Flood Zone 2 and defended Flood Zone 3 between Portbury Ditch and Royal Portbury Dock Road;
- Partly in Flood Zones 2 and 3 between Royal Portbury Dock Road and the M5 Motorway crossing;
- Flood Zone 3 near Paradise Bottom;
- Flood Zones 2 and 3 near Bower Ashton; and
- Adjacent to Flood Zone 2 at Colliter's Brook culvert entrance adjacent to the Portbury Freight Line, and Flood Zone 2 at the Portbury Freight Line crossing of Longmoor Brook culvert, and adjacent areas.

17.4.38 The EA flood maps are derived from models. Hydraulic modelling undertaken for the DCO Scheme has provided a more detailed assessment of flood risk than the modelling undertaken for the EA Flood Zones and this is presented in the FRA (Appendix 17.1, DCO Document Reference 5.6).

17.4.39 The FRA describes the main sources of flood risk that may impact the vicinity of the DCO Scheme as follows.

- The EA Flood Map (presented in the FRA in Appendix 17.1, DCO Document Reference 5.6) indicates that parts of the Portishead to Pill (disused section) are at risk of fluvial/tidal flooding (Flood Zones 2 and 3). However, the EA Flood Zones do not account for the presence of flood defences.
- Flood risk from the River Avon is tidally dominated adjacent to the DCO Scheme, where flooding of the existing railway alignment near Bower Ashton from the River Avon is estimated to occur every 5 to 10 years on average. The area around Bower Ashton lies in Environment Agency Flood Zone 3.
- Flood risk to the Portishead to Pill (disused section) between Portishead and the M5 motorway Junction 19 is due to coastal flood risk (including the defended Flood Zone 3 shown adjacent to Drove Rhyne).
- The EA Flood Map shows the Portishead to Pill (disused section) crosses Flood Zones 2 and 3 at Easton-in-Gordano Stream. Here the EA Flood Map estimates tidal flood risk by projecting simulated River Avon tidal flood levels up the Easton-in-Gordano Stream. The farm access track under the Portishead to Pill (disused section), between Easton-in-Gordano stream and the M5 Motorway, acts as a flood relief flow path.
- The EA surface water flood map (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map) indicates that there may be relatively small and localised areas in the vicinity of the DCO Scheme that could be vulnerable to surface water flooding during rainstorms.
- Although some areas are located in areas of medium susceptibility to groundwater flooding the EA has indicated there are no specific groundwater flooding problems in the DCO Scheme area.
- The risk of flooding from breached canals or reservoirs is understood to be very low.

- In the vicinity of Colliter's Brook the Portbury Freight Line is in Flood Zone 2, but elsewhere (e.g. Chapel Pill and through the Avon Gorge) the railway is higher (by several metres) than the watercourse it crosses and hence potential fluvial flood risk is discounted at these locations.

17.4.40 The FRA (DCO Document Reference 5.6) provides details of the DCO Scheme specific modelling that has been undertaken to establish baseline and post development flood risk with a greater degree of accuracy for the present day (2015) and future (2075 as well as testing sensitivity for future year 2115). This includes updates to the EA coastal flood model (covering flooding from the Severn Estuary), the BCC Central Area Flood Risk Assessment ("CAFRA") model (covering tidal and flooding from the Bristol Avon and its tributaries) and development of new hydraulic models to assess fluvial/tidal flood risk from Drove Rhyne and Easton-in-Gordano Stream.

Drainage

17.4.41 Along the disused railway line from Portishead to Portbury Junction near Pill there are no piped track drains throughout the route (see Table 17.10 below). There are formation drainage (ditches) at the following locations:

- Down side, adjacent to Harbour Crescent;
- Down and Up sides, partially between Moor Lane and Sheepway Road;
- Down side past Shipway Gate Farm; and
- Down side from Royal Portbury Dock Road to Portbury Station

17.4.42 Many of these ditches are overgrown with vegetation and in some places it is not possible to see the alignment of the ditches. Three culverts under the existing railway line were observed between the old Portbury Station and the bridge carrying the Royal Portbury Dock Road. The locations of culverts are shown on the Disused railway engineering plans / GRIP 4 Minor Civils (DCO Document Reference 2.7).

17.4.43 The operating Freight Line between Portbury Dock Junction and Parson Street Junction was reopened by Railtrack in 2001 to meet a basic requirement of 20 freight trains in each direction per day. No drainage or formation works were undertaken as this was deemed unnecessary.

17.4.44 Historically Pill Tunnel has suffered from inadequate drainage and track formation. As a result Network Rail undertook full track renewal during 2012/2013 with the associated provision of enhanced track drainage. The drainage through Clifton Bridge No. 2 Tunnel was also considered inadequate. Also during 2012/13 ballast placement and drainage works were carried out through Ashton Gate and the Pill Station site. Further track works, including drainage works, are scheduled for the Parson Street Junction area by Network Rail.

17.4.45 Information on the existing track drainage is presented in Table 17.10 below. The track has been divided into six drainage catchments ("CAT"), some of which have been further divided into sub-catchments. A catchment has been defined as a drainage network that discharges from the Network Rail corridor to a single unique outfall. Catchments are suffixed UKN (unknown catchment) where no records of existing drainage/outfalls exist and no proposed drainage is recommended.

Table 17.10: Catchment overview of existing track drainage

Catchment ID	Chainage	Hydrology Assessment	Existing Drainage
CAT1.1 Parson St Station	120mi 589y (3735m) to 120mi 200y (3382m)	This is an at grade catchment.	This catchment drains to an outfall east of Parson Street Bridge. The drainage is in poor to moderate condition.
CAT 1.2 Parson St. Junction	120mi 593y (3738m) to 120mi 1667y (4078m)	This catchment falls predominantly at grade, with some areas falling within a cutting.	Existing drain outfalls via an under track crossing to a make-shift infiltration device. The drainage condition is poor. The existing drainage will be replaced and the infiltration outfall is to be abandoned.
CAT 1 UNK	120mi 1667y (4078m) to 121mi 374y (5140m)	This catchment falls predominantly at grade with some areas falling within a very shallow cutting.	N/A
CAT 2 Ashton Gate	121mi 374y (5140m) to 121mi 539y (5290m)	This catchment falls predominantly at grade with some areas falling within a very shallow cutting.	Existing drainage located within the cess of the Down Portbury line. The condition of the drainage is unknown.
CAT 2 UNK	121mi 539y (5290m) to 122mi 1133y (7430m)	This catchment falls within a highly variable terrain predominantly lying upon an embankment with sections of cutting intermittently occurring on one side of the track	N/A
CAT 3 Clifton Bridge No. 2 Tunnel	122mi 1133y (7430m) to 122mi 1425y (7695m)	This catchment falls within a tunnel; flows are contributed from seepage within the tunnel itself as well as some contributing runoff from directly outside of the tunnel.	An existing 3-catchpit drainage network run lies within the Down Portbury cess of the tunnel with no outfall. This drainage run is believed to be in poor condition as no outfall has been provided.

Table 17.10: Catchment overview of existing track drainage

Catchment ID	Chainage	Hydrology Assessment	Existing Drainage
CAT 3.1 UNK	122mi 1425y (7695m) to 124mi 1309y (10790m)	This catchment passes through very variable terrain with areas of steep rock cliff to one side of track, high embankments and through a tunnel.	N/A
CAT 3.2 UNK	124mi 1309y (10790m) to 125mi 534y (11685m)	This catchment falls predominantly within a steep cutting (Cage Cutting) contributing overland flows to the track drainage; at higher mileage, the track runs across an embankment and viaduct.	N/A
CAT 4 Pill Tunnel	125mi 534y (11685m) to 125mi 1474y (12540m)	This catchment falls mostly within Pill Tunnel with some contributing flows likely from the cutting outside both ends.	There is existing high installation drainage running in both cess along the length of the Tunnel. Towards the low mileage end, the drains meet via under track crossing in a chamber before continuing in the Up Portbury cess and discharging off track at approx. 11,822 m.
CAT 4 UNK	125mi 1474y (12540m) to 126mi 193y (12975m)	This catchment falls within a cutting at low mileage before passing over an embankment (and viaduct) towards the end of the catchment.	N/A
CAT 5 Pill Station	126mi 193y (12975m) to 126mi 594y (13340m)	This catchment is located within a cutting contributing overland flows to the track drainage.	Existing drainage runs in the right cess before crossing to the left cess at the start of the platform. The condition of the drainage is good. The existing drainage will be replaced by proposed drainage.

Table 17.10: Catchment overview of existing track drainage

Catchment ID	Chainage	Hydrology Assessment	Existing Drainage
CAT 5 UNK	126mi 512y (13320m) to 129mi 440y (18000m)	This catchment is located predominantly at grade or on top of an embankment.	N/A
CAT 6 Portishead Station	129mi 362y (18010m) to 129mi 715y (18250m)	This catchment is predominantly at grade.	N/A

Source: GRIP 3 Track Drainage Design Report annexed to the FRA Appendix 17.1 (DCO Document Reference 5.6).

17.4.46 In general the existing highway runoff is collected in the highway drainage and discharged to surface waters.

Future Conditions

17.4.47 Flood risk is projected to increase in the future as a result of climate change and sea level rise. The dominant increase in flood risk for the DCO Scheme is considered to be tidal flood risk resulting from increased sea levels.

17.4.48 Fluvial and surface water flood risk are expected to increase as a result of increased extreme rainfall depths, with increased fluvial and surface water flooding extents. Increased sea levels will increase the risk of tide locking of inland watercourses and drainage systems.

17.4.49 The FRA has considered impacts from climate change and has concluded the following points.

- The lifetime of the DCO Scheme is assumed to be 60 years (a 100 year climate change horizon has also been assessed as a sensitivity test). Projected climate change and sea level rise during the life of the DCO Scheme are notable, with projected sea level rise of approximately 0.59 m between 1990 and 2075 (and approximately 1.14 m between 1990 and 2115).
- The most significant flood risk is River Avon tidal flooding near Bower Ashton. For the future (2075) scenario, due to projected future sea level rise, the area will flood approximately once every year on average near Bower Ashton.
- Modelling indicates that for the future (2075) scenario the DCO Scheme between Portishead and Pill would experience coastal flooding less frequently than once every 1000 years on average (and once every 200 to 1000 years on average in 2115)
- Fluvial flood risk to the DCO Scheme from Portbury Ditch, Drove Rhyne and Easton-in-Gordano stream is not considered to be significant for the future (2075 and 2115) scenarios.

- For the future (2075 and 2115) scenarios the operational railway lies outside the Colliter's Brook and Longmoor/Ashton Brook 50-year return period flood extent, and within the 75-year return period flood extent.
- For the future (2075) scenario, the area which would become the Portishead station and car parks, and the pedestrian crossing of Portbury Ditch (providing a pedestrian route from the station to Portishead) is forecast to be outside of the 1000-year coastal flood level, and for the future (2115) scenario, above the 200-year coastal flood level.

17.4.50 The Severn Estuary SMP (approved 2017) considers tide defences in the Bristol area which are expected to be improved in the future to keep pace with increased tidal flood risk. The EA advises that, in undertaking this FRA for the DCO Scheme, the FRA should be assumed that no improvements are made.

17.4.51 Apart from the effects of climate change upon flood risk, it has been assumed that the conditions identified now will still be representative of the water environment at the time of construction and throughout the operation of the DCO Scheme unless otherwise stated within the relevant section. This is based upon the assumption that existing environmental legislation currently in place to protect and prevent deterioration in environmental standards will remain in place. Based upon this it is anticipated that the general quality of the water environment will improve over the longer term, although different attributes of the water environment will improve at different rates. It also assumes that any future development impacting upon the water environment will be subject to the same environmental permits, controls and legislation as currently exists and that this will be enforced appropriately.

17.5 Measures Adopted as Part of the DCO Scheme

17.5.1 A number of measures have been included as part of the project design in order to minimise certain operational environmental effects. These include:

- The engineering and drainage design for the railway and highway works which are described in:
  - ES Chapter 4 - Description of the Proposed Works (DCO Document Reference 6.7);
  - The *MetroWest Phase 1 Surface Water Drainage Strategy for Portishead and Pill Stations, haul roads and compounds* (DCO Document Reference 6.26), and
  - The *GRIP 3 Track Drainage Design Report* (see the ES Appendix 17.1 FRA, DCO Document Reference 5.6); and
  - Civil designs for Portishead and Pill stations including drainage (see the ES Appendix 17.1 FRA, DCO Document Reference 5.6).
- Careful designing of the project to ensure key receptors are avoided where possible;

- Construction adopting best practice techniques that are known to be effective and deliverable, which are described in:
  - The MetroWest 1 Construction Strategy (Network Rail, 2018) (see DCO Document Reference 5.4);
  - The CoCP (see the ES Appendix 4.2, DCO Document Reference 8.15); and
  - The Master CEMP (see the ES Appendix 4.1, DCO Document Reference 8.14);
- compliance with regulatory and legislative regimes as required by law.

17.5.2 The ES Chapter 4 Description of the Proposed Works (DCO Document Reference 6.7) sets out the measures that have been incorporated as part of the DCO Scheme and which are assessed within each of the topic chapters. This includes the treatment of existing culverts across the railway, temporary drainage during construction and permanent highway and railway drainage. The proposed drainage works are also shown on some of the figures, in particular the Disused railway engineering plans/ GRIP 4 Minor Civils (DCO Document Reference 2.7) drawings.

17.5.3 All culverts along the disused section of the DCO Scheme between Portishead and Pill will be refurbished or replaced, as required, with culverts of the same dimensions (i.e. same flow capacity). There will therefore be no increase in flood risk due to culvert works. Where railway drainage ditches are currently overgrown or in poor condition, clearing and refurbishment works will improve surface water management. Culverts under the railway will continue to be managed by Network Rail, EA, NSLIDB, NSDC and BCC as appropriate.

17.5.4 The Flood Risk Assessment (DCO Document Reference 5.6) has contributed to the development of the DCO Scheme through:

- Retaining existing railway levels in the Bower Ashton / Ashton Vale area to avoid off site impacts on flooding; and
- Provision of floodplain compensation at two locations to offset development in the floodplain:
  - Within the Clanage Road permanent maintenance to offset a new access ramp from the compound to the railway by lowering ground levels by about 10 cms over about 3000 m^2 (DCO Document Reference 2.55 Clanage Road Compound, Landscaping and Access Plan) and access compound; and
  - In the field between Marsh Lane and the Easton-in-Gordano Stream with the disused railway to the west and the M5 to the east to offset a wider railway embankment by ground lowering of about 10 cms over some 4000 m^2 (Easton-in-Gordano Flood Mitigation Plan, DCO Document Reference 2.41).

17.5.5 Further details on the proposals for temporary and permanent drainage design for the highways, car parks, hauls roads and construction sites are presented in *The MetroWest Phase 1 Surface Water Drainage Strategy for Portishead and Pill Stations, haul roads and compounds* (referred to below as the Surface Water Drainage Strategy) (DCO Document Reference 6.26).

17.5.6 The design for temporary drainage at the construction compounds is based on filter drains, attenuation ponds and outfalls to surface ditches. These designs will be revised by the contractor to ensure that the site drainage takes account of the proposed layout of the site, including temporary stockpiles for old ballast and new ballast brought to site.

17.5.7 Two options have been identified for temporary drainage along haul roads.

- Wide ditches with check dams to capture sediment and control runoff discharged to downstream watercourses. If required, the accumulated silt will be removed and disposed of periodically.
- Where space is constrained shallower and narrower ditches are proposed, with the water piped to detention basins before the discharge to the receiving watercourses.

17.5.8 The haul roads will cross existing drainage ditches that, at the request of NSLIDB will be culverted during the duration of the works and subsequently reinstated on completion. Options for temporary drainage at the construction compounds are discussed in the report. Any discharges will be subject to the EP Regulations where not exempt.

17.5.9 Proposals for permanent highway drainage include attenuation and pollution control prior to discharge to surface waters in accordance with the requirements of the EA and the NSLIDB.

17.5.10 The outline drainage design and surface water drainage strategy for the railway works between Parsons Street Junction and Portishead is presented in the ES Appendix 17.1 Annex O, *GRIP 3 Track Drainage Design Report* (DCO Document Reference 5.6). This has been developed in consultation with the EA, NSDC, BCC and NSLIDB. Key features of the track design are:

- The track drainage is designed to accommodate a 50-year return period storm with a 20% uplift to allow for projected future climate change;
- The drainage pipe gradients will be set to achieve self-cleaning velocities; and
- The existing track drainage will be improved if required to achieve the design standard.

17.5.11 The DCO Scheme Construction Strategy (DCO Document Reference 5.4) will be issued to contractors, together with the CoCP (DCO Document Reference 8.15), the Master CEMP (DCO Document Reference 8.14) and the Drainage Strategy (DCO Document Reference 6.26). The appointed contractor(s) will develop and implement the construction strategy within the framework provided by these documents. The construction strategy will be developed in detail once the contractor(s) has been appointed.

17.5.12 The Master CEMP (DCO Document Reference 8.14) requires the contractor to produce the following plans as part of their more detailed CEMP.

- Surface Water Management Plan. This would detail the measures to be taken to manage surface water runoff so as not to increase flood risk within the site or elsewhere. This plan would also include measures to protect water quality in any receiving waters and specifically detail measures to prevent sediment pollution from any site runoff. The plan

will be agreed with the LLFA and the EA, and approved by the local planning authorities as a DCO requirement.

- Emergency Preparedness and Response Plan. This plan will identify the potential risks and hazards associated with the works and the site locations, and will set out mitigation measures to avoid and reduce risks and hazards, and reporting to the relevant authorities.
- A Flood Plan will be developed that will specify measures to be taken should a flood event occur during construction. This may include, for example, appropriate triggers to cease operation during flooding and safe evacuation routes for site personnel as well as measures to prevent the working areas from flooding (if appropriate). The plan will specify clear roles and responsibilities and responses to flood warnings. The plan will be agreed with the relevant emergency services.
- Pollution Incident Prevention and Control Plan. This plan will identify potential pollution risks on site, set out measures to prevent pollution, and in the event of a pollution incident, set out procedures to minimise, clean up and report the incident to the relevant authorities.

17.5.13 Network Rail implements their Standard Maintenance Procedure NR/L3/TRK/1010, Issue 02 August 2008 *Management of responses to extreme weather conditions at structures, earthworks and other key locations* (formally NR/L3/MTC/TK0167) to safeguard passengers and railway assets. This procedure does not currently include the Portishead Branch Line. Consequently, Network Rail has prepared an Outline Draft Flood Plan (see ES, Volume 4, Appendix 17.1 Flood Risk Assessment Appendix T, DCO Document Reference 5.6), which briefly summarises the potential flood risks which may be faced during the operation of the DCO Scheme, together with an overview of how flood waters may affect critical scheme infrastructure and the approach that Network Rail will adopt in response to flood warnings and floods themselves.

17.6 Assessment of Effects

Water Framework Directive Assessment

17.6.1 A WFD compliance screening assessment has been carried out for the DCO Scheme and is presented in this ES (Appendix 17.2, DCO Document Reference 6.25). The assessment has been undertaken with respect to three surface water bodies: Portbury Ditch, the Bristol Avon and the downstream Severn Lower transitional water body.

17.6.2 There are three groundwater bodies (Carboniferous Limestone, Bristol Triassic, and Portishead Mercia Mudstone) within the study area. As explained in paragraph 17.6.10 below, the significance of the effect of the DCO Scheme on groundwater has been evaluated as **neutral** during the construction and operational phases. Groundwater has therefore been scoped out of further assessment in the WFD assessment.

17.6.3 The design of the DCO Scheme and measures to be adopted during construction and operation are such that impacts on any (defining) water quality, hydromorphological and ecological elements are likely to be either negligible or short lived.

17.6.4 The four key objectives against which the impacts of the proposed DCO Scheme on a water body need to be assessed to determine compliance with the overarching objectives of the WFD have been used to determine impacts, and it can be concluded that:

- Objective 1: The DCO Scheme does not cause deterioration in the status of the biological elements of water bodies;
- Objective 2: The DCO Scheme does not compromise the ability of the water body to meet its WFD status objectives;
- Objective 3: The DCO Scheme does not cause a permanent exclusion or compromise achieving the WFD objectives in other water bodies within the same RBD; and
- Objective 4: The DCO Scheme does not compromise the delivery of the WFD objectives and/or affect high status sites.

17.6.5 The assessment concludes that no deterioration to the identified water bodies will occur as a result of the proposed works. Therefore, the DCO Scheme complies with the WFD and no further assessment is required.

Construction Phase

Water Quality

17.6.6 The water quality of surface water features could be affected through runoff of contaminants, including silt into surface waters and accidental spillages of contaminating substances such as fuel and cement. As part of the DCO Scheme the construction works pose a risk of runoff (with associated contaminants) occurring particularly from the proposed earthworks, reprofiling the existing railway drainage ditches, culvert works and generally for any works near a watercourse. The use of contaminating materials may occur throughout the DCO Scheme area but the high risk activities include areas where works will take place within 10 m of a watercourse and for those earthworks which include the use of shotcrete to install soil nails. Impacts are likely to be temporary and localised. The potential for impacts to water quality will be reduced through adhering to the measures identified in the Master CEMP and as implemented through the contractor's CEMP.

17.6.7 The following low value water features (see Figure 17.1, Sheets 1 to 5, Book of Figures, DCO Document Reference 6.24) have been scoped into the assessment; PDT1, PDRDN1, PDRDS1, The Cut, RDN2, RDS2, SG1, D3, D4, D5, D7, D8, Pond 5, Drove Rhyne, D9, D10, D11, D12, D13, D15 and WC 1. For these receptors, given the proposed management of works near watercourses set out in the Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) and with the contractor's CEMP in place, the magnitude of the impact upon water quality during construction is anticipated to be negligible resulting in a **neutral** significance of effect.

17.6.8 Portbury Ditch, Markham Brook, Chapel Pill, Ashton/Longmoor Brook and Colliter's Brook (Figure 17.1, Sheets 1 to 5, Book of Figures, DCO Document Reference 6.24) are medium value receptors. Markham Brook, Ashton/Longmoor Brook and Colliter's Brook are all culverted under the railway and will not be affected by drainage from construction sites. For the Portbury Ditch and Chapel Pill, given the proposed management of works near watercourses set out in the Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) and with the contractor's CEMP in place, the

magnitude of the impact upon water quality during construction is anticipated to be negligible resulting in a **neutral** significance of effect.

17.6.9 Easton-in-Gordano Stream and the River Avon (Figure 17.1) are high value receptors. For these receptors, given the proposed management of works near watercourses set out in the Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) and with the contractor's CEMP in place, the magnitude of the impact upon water quality during construction is anticipated to be negligible resulting in a **neutral** significance of effect.

17.6.10 The migration of pollutants through surface runoff, mobilisation of contaminants in the old ballast during excavation and temporary stock piling, use of polluting substances and risk of accidental spillages during construction poses a temporary risk to groundwater quality during construction. Contamination of the aquifer through the migration of contaminants will be reduced and/or avoided through the implementation of the measures in the Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14). Furthermore, where contaminated ballast occurs along the railway (mostly between Portishead and Pill Junction and in the vicinity of Ashton Gate), superficial deposits appear to be dominated by silts and clays which being relatively impermeable, will limit infiltration to underlying groundwater. With these ground conditions and the implementation of measures to protect water resource during construction as set out in the Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) and implemented through the contractor's CEMP the magnitude of the impact is considered to be negligible upon groundwater quality. The Portishead Mercia Mudstone and Bristol Triassic groundwater bodies are considered to be of Medium value and therefore the significance of the effect upon these receptors is **neutral**. The Carboniferous Limestone (Bristol) groundwater body is of high value and the resulting significance of effect upon this receptor is also **neutral**.

17.6.11 As part of the construction works, and as necessary, existing contaminated ballast material and all wooden sleepers will be removed for temporary storage, appropriate treatment and disposal. This will be undertaken in accordance with one of the options described in Section 4.3. Whichever option is adopted, measures will be put in place to ensure that there is minimal risk of contaminants within the ballast migrating to surface waters or groundwater. Temporary storage (stockpiles) will be laid on impermeable surfacing and drainage from these areas will, where necessary, include the facility for treatment (including the removal of suspended sediments) prior to discharge to watercourses or groundwater. The contractor would ensure the ballast is managed appropriately in accordance with the Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) and their CEMP which will detail necessary measures to prevent pollution of groundwater or surface waters.

17.6.12 The removal of this potential source of contaminants through off-site disposal throughout the DCO Scheme will result in a long term beneficial impact of minor magnitude. The residual significance of effect is **negligible** for those receptors (watercourses and groundwater bodies) of low value and

slight beneficial for those receptors (watercourses and groundwater bodies) of medium and high value.

17.6.13 To summarise, the magnitude of the impacts upon water quality during the construction phase are anticipated to be negligible resulting in a **neutral** significance of effect and thus are not significant in regards to the EIA Regulations 2017.

Water Quantity and Flood Risk

17.6.14 During construction, the adoption of an appropriate Surface Water Management Plan as identified in the Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) and compliant with the Drainage Strategy (DCO Document Reference 6.26) will reduce and/or avoid impacts related to discharges of surface water runoff from working areas, haul roads and site compounds on downstream flood risk. The measures include the use of drains and temporary detention ponds to attenuate flows, trap sediments, and control discharges to surface waters.

17.6.15 The Surface Water Management Plan will be prepared by the contractor, within the envelope of the CoCP (ES Appendix 4.1, DCO Document Reference 8.15), the Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) and the Drainage Strategy (DCO Document Reference 6.26) submitted with the application for the DCO Scheme. The Surface Water Management Plan will set out how the construction activities will be managed to minimise the risk of flooding and will be agreed with the EA.

17.6.16 Construction activities will be undertaken having regard to the requirements to avoid any significant increase of flood risk. Appropriate measures, such as keeping watercourses clear of obstructions and debris to reduce blockage risk, will be implemented by the contractor to prevent, so far as is reasonably practicable, damage to equipment or the works during potential flooding events.

17.6.17 The magnitude of the impact of stormwater drainage from construction sites, haul routes and construction compounds on the low, medium and high value watercourses is assessed to be negligible. The significance of effect is **neutral** and not significant with regards to the EIA Regulations 2017.

17.6.18 All construction compounds lie outside the coastal and fluvial (undefended) floodplain except for the micro-compound under Pill Viaduct and the Clanage Road compound.

17.6.19 The proposed micro-compound under Pill Viaduct lies in Flood Zone 3a. The site is currently an area of hardstanding off Underbanks and next to Pill Library, which is used for car parking. It is proposed to locate a small welfare unit here and use this site for parking construction vehicles and small scale deliveries. The site would be required for the duration of the construction programme.

17.6.20 The proposed Clanage Road construction compound lies in Flood Zone 3b. An outline Flood Plan has been prepared for this site and is provided in the ES Appendix 17.1 FRA (DCO Document Reference 5.6). The proposed activities and use of the Clanage Road construction compound will be developed in consultation with the EA.

17.6.21 The railway alignment through Bower Ashton crosses Flood Zone 3. Here the new railway will be built to the same elevation as the existing railway (within construction tolerances of +/- 25mm) in order to avoid increasing the flood risk to third parties. To achieve this, the existing ballast would need to be excavated and removed from site by train or HGV and replaced with fresh ballast.

17.6.22 The use of the construction compounds at Pill Viaduct and Clanage Road and the works along the railway within Flood Zone 3 will be agreed with the EA and consented through the EP Regulations. These sites will be managed in such a way that their use will not increase the flood risk, resulting in a **neutral** significance of effect and thus not significant with regards to the EIA Regulations 2017.

Use of Water Resources

17.6.23 Water may be required for construction processes such as for concrete batching, wheel washing, drinking water supplies and welfare facilities. It is proposed to source water from a statutory water undertaker, which is expected to be Bristol Water plc. It is not proposed to abstract ground water or surface water. Accordingly, the use of water during construction is not anticipated to have a material effect upon any water features within the study area and the residual effect is **neutral**.

17.6.24 To summarise, no impacts upon water resources during the construction phase are anticipated resulting in a **neutral** significance of effect which is not significant in regard to the EIA Regulations 2017.

Physical Impacts

17.6.25 Construction activities may require works within the channels of watercourses such as for culverting and new drainage outfalls. Such activities can result in changes to the physical characteristics of water features. As described in Chapter 4 Description of the Proposed Works (DCO Document Reference 6.7) and in section 17.5, culverts beneath the Portishead to Pill disused section will, where necessary, be refurbished or replaced with culverts of the same dimension. The construction activities for culverts are likely to include de-silting, repairs to the headwall and culverts, or replacement of the culvert. These works may locally change sediment dynamics within the watercourse and the flow of water through these culverts. The works will be subject to the consenting process associated with works within the watercourse. The receptors of the water environment potentially affected by this impact vary from low to high value. The impact is likely to be temporary and localised until the watercourse reaches an equilibrium state. The magnitude of this impact is negligible resulting in a **neutral** effect upon all receptors. In the longer term, these activities are likely to be beneficial to the physical processes in the watercourses by increasing conveyance, improving flows and removing accumulated sediment.

17.6.26 The various watercourses along the DCO Scheme are given values of low (such as many unnamed ditches), medium (several brooks) and high (River Avon and the Easton-in-Gordano Stream), as described in paragraphs 17.6.7 to 17.6.9. The physical impacts of construction on these watercourses mostly concern culvert works along short sections of low to

high value ditches and streams which cross the railway. The impact of the works during construction is negligible.

17.6.27 There will be no outfall to Markham Brook resulting in no change. Minor civils works to repair the Miles Underbridge (also known as Miles Viaduct) over Chapel Pill by Ham Green lakes and Miles Dock Underbridge will have negligible impact on the watercourses.

17.6.28 There will be no direct physical impacts on the River Avon where the works will be confined to the railway corridor several metres above the River Avon, or the Markham Brook, Colliter's Brook and Longmoor Brook, all three of which are culverted where they cross the railway.

17.6.29 Where works will be required within 8 m of the top of the bank of a watercourse managed by the EA and 9 m for watercourses managed by the NSILDB, these will be subject to the consenting process and best practice measures outlined in the Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) for works near watercourses. For works in, on or within 8 m of a main river (16 m of a tidal river) or on a floodplain an environmental permit will be required from the EA. For ordinary watercourses, LDC will be required from the relevant LLFA. These consents will be granted subject to conditions to ensure that the activities will not result in unacceptable impacts to the water environment. It is an offence to fail to comply with the conditions imposed on environmental permits and LDCs. As set out above, this assessment has evaluated the nature and extent of potential impacts, has embedded within the description of the DCO Scheme measures that are known to be effective in minimising both risk and impacts, and identified the need for environmental permits and LDCs where appropriate. It is anticipated that there may be overlap between (a) measures set out in the CoCP (ES Appendix 4.1, DCO Document Reference 8.15), Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) and Schedule of Mitigation (ES Appendix 4.3, DCO Document Reference 6.31), and (b) measures that will be required by conditions imposed through standard or bespoke environmental permits and LDCs. All likely significant effects have been identified and assessed. No gaps have been identified between appropriate controls under environmental permits / LDCs and the measures that will be secured through the DCO, nor any effects identified off site that require controls to be exercised over third party land.

17.6.30 As such, it is predicted that magnitude of physical impacts of construction works on these low to high value watercourses will be negligible. Accordingly, it is predicted that the significance of effect would be **neutral** and not significant under the EIA Regulations 2017.

Operation Phase

Water Quantity - Drainage

17.6.31 Runoff rates from the railway line would be no higher than from the existing footprint of the DCO Scheme, as there would be no increase in impermeable area. Therefore, no impacts are anticipated for any receptors resulting in a **neutral** significance of effect.

17.6.32 Runoff rates from the realignment of Quays Avenue, the site of Portishead station and car parks, Pill station forecourt and car park will increase as a result of the increase in impermeable areas. Measures to manage drainage

discharges and pollution control from the car park at Portishead station and Pill Station have been incorporated into the design and are described in Chapter 4 Description of the Proposed Works (DCO Document Reference 6.7) and the Drainage Strategy (DCO Document Reference 6.26). With these measures in place there will be a negligible impact on receiving waters of low to high value resulting in a **neutral** significance of effect.

17.6.33 The existing track over Pill Viaduct and associated ballast will be removed and new track and ballast will be installed. New drainage will be provided for Pill Station platform which will be conveyed to temporary storage near Pill Station car park and connect into the highway drainage. There will be a separate drainage system for the car park itself. The magnitude of the impact of the station platform drainage to the highway drainage system will result in a slight increase in flow which is a **neutral** significance of effect.

17.6.34 In summary, during operations, the effect of highway and railway drainage on the quantity of surface water resources is generally assessed to be neutral and the removal of contaminated ballast may even lead to a slight beneficial effect. These effects are not significant in relation to the EIA Regulations 2017.

Water Quantity – Flood Risk

17.6.35 During operation, a number of residual risks have been identified in respect of the culverts beneath the railway. Without maintenance, it is likely that these culverts would, over time, become blocked and thus give rise to a risk of flooding. It will be necessary to adopt appropriate maintenance practices to ensure the culverts remain free from blockage. Any SuDS drainage measures that are adopted by the DCO Scheme must also be maintained in a sound operational condition.

17.6.36 The DCO Scheme (a section of the railway itself and Clanage Road maintenance and access compound) crosses Flood Zone 3b in the vicinity of Bower Ashton. Simulation of tidal River Avon flooding indicated that the DCO Scheme would be flooded during tidal River Avon floods approximately once every 5 to 10 years for the current year (taken to be 2015), about every year for the future (2075) scenario taking climate change, including sea level rise, into consideration and more frequently than once a year by 2115.

17.6.37 Network Rail operates procedures to safeguard passengers and the railway in the event of accidents and hazards, including *Guidance and Procedures on the Dangers to the Railway due to Extreme Weather Conditions* (Procedure No. NR/L2/OPS/250) for the Western Route. This procedure does not reference the DCO Scheme, which has not been built. However, the Outline Flood Plan for the Operations Phase (see ES Appendix 17.1 FRA, Appendix T, DCO Document Reference 5.6) provides an overview of Network Rail's approach to dealing with the flood risk during operations. When flooding occurs during operating hours, the railway service will be suspended. Alternative travel provision may be provided between Bristol Temple Meads, Pill and Portishead by bus provided flooding has not affected the highway network. Safe operating procedures will ensure that flooding of the DCO Scheme in the vicinity of the Bower Ashton would have

a negligible impact on passenger safety resulting in a **neutral** significance of effect.

17.6.38 Where the DCO Scheme crosses the tidal River Avon Flood Zone 3b near Bower Ashton, proposed railway levels and footprint are unchanged compared to existing levels (within design and construction tolerances). The proposed railway will not therefore result in displaced floodplain storage at this location. The Clanage Road maintenance and access compound includes access ramps from the compound to the main road and to the railway. These ramps displace floodplain storage and so the design provides compensation for this displaced floodplain storage within the Clanage Road compound, by lowering compound ground levels. This is discussed further in Appendix 17.1 FRA, DCO Document Reference 5.6. The Clanage Road maintenance compound would be used to gain access to the railway periodically. For most of the time, the use of this site would be light, allowing vans to park here during routine maintenance and inspections. This access point would not be used during flood events.

17.6.39 To accommodate an existing cycle path on the Portishead to Pill (disused section), the proposed works include an increase in the railway embankment footprint within the Easton-in-Gordano Stream floodplain, between the M5 Motorway and Marsh Lane, by approximately 3 m on average along the southern edge of the DCO Scheme (see Disused railway engineering plans / GRIP 4 Minor Civils, DCO Document Reference 2.7). This additional footprint results in additional displacement of potential floodplain storage by the DCO Scheme, south of the railway. The proposed design therefore provides compensation for this loss of floodplain storage south of the railway. This is discussed further in Appendix 17.1 FRA (DCO Document Reference 5.6).

17.6.40 With the embedded measures proposed in the FRA Table 10.1 (DCO Document Reference 5.6) that form part of the DCO Scheme, no further impacts related to flood risk during the operation of the railway have been identified for assessment.

17.6.41 To summarise, impacts upon flood risk during the operational phase are predicted to be negligible, resulting in a neutral significance of effect and thus are **not significant** in regards to the EIA Regulations 2017.

Water Quality

17.6.42 Given the proposals for ballast renewal, track and station drainage, and the appropriate management of solid waste at stations and control of wastewater from trains in sealed units, there will be little generation of solid or wastewater for the DCO Scheme to the environment. The impact of waste generation has been scoped out of the assessment in both Chapter 10 Geology, Hydrogeology, Ground Conditions and Contaminated Land (DCO Document Reference 6.13) and Chapter 12 Materials and Waste (DCO Document Reference 6.15).

17.6.43 The renewal of existing track drainage and incorporation of an improved track drainage system in some locations will provide long term benefits for water quality. The magnitude of impact is assessed to be negligible to minor beneficial, with a **neutral** significance of effect for low and medium value

receptors of the water environment and a **slight beneficial** significance of effect on high value receptors.

17.6.44 There are no source protection zones or abstraction licences within the area for public water supplies, therefore no impact from the operation of the railway affecting the public drinking water supply has been identified and the significance of effect is **neutral**.

17.6.45 Impacts upon groundwater quality during operation of the railway line are considered to be negligible due to the small quantities of pollutants produced, the localised nature of any contaminants and the presence of the ballast which will aid in the removal contaminants. As near surface (superficial) deposits are primarily silts and clays these are relatively impermeable and provide a very limited (if any) connection with surface waters. Hence the potential for groundwater to act as a pollutant pathway to surface water receptors is also considered to be negligible. Where a drainage system to a surface watercourse exists this will also reduce the potential for inputs of contaminants to groundwater. The groundwater receptors are of medium and high value therefore the negligible impact upon groundwater quality from track drainage is anticipated to be of **neutral** significance of effect.

17.6.46 To summarise, impacts upon water quality during the operational phase are predicted to be negligible, resulting in a **neutral** significance of effect and thus are **not significant** in regards to the EIA Regulations 2017.

Physical Impacts

17.6.47 Several new outfalls will be required, including one into Portbury Ditch, a Main River, one to The Cut and several from the drainage catchments where new track drainage systems are to be installed or repaired as described in Chapter 4 - Description of the Proposed Works (DCO Document Reference 6.7). The outfalls will be subject to more detailed design but any outfall structure would require consent under other regulatory regimes. The new outfall structures are anticipated to have a negligible long term impact upon the watercourses, which vary from low to high value resulting in a **neutral** significance of effect.

17.6.48 At present it is understood that no new culverting will be required for the medium (Portbury Ditch, Markham Brook, Chapel Pill, Ashton Brook and Colliter's Brook) and high value (River Avon) receptors.

17.6.49 The structural performance of the Longmoor Brook and Colliter's Brook culverts will be assessed in the context of the proposed development, and the culverts will be improved if required to allow for any additional structural loading. Any required works (i.e. structural improvements) would be designed in consultation with the EA.

17.6.50 Any culverting works on the remaining low value receptors will be negligible resulting in a **neutral** significance of effect. Any culverting will be subject to other regulatory regimes.

17.6.51 To summarise, the impacts of the physical presence of new structures in or along watercourses during the operational phase are predicted to be negligible, resulting in a **neutral** significance of effect and are thus not significant in relation to the EIA Regulations 2017.

Maintenance Activities

17.6.52 Maintenance activities will be undertaken in accordance with Network Rail standards (such as NR/L3/CIV/005/1), which are applied across the whole railway network. Any maintenance activities are anticipated to have a negligible impact on all aspects of the water environment, resulting in a **neutral** significance of effect for all potential receptors.

17.6.53 Network Rail has already increased the pollution control on drainage from Pill Tunnel to Ham Green Lakes and have now installed three sediment removal systems. Network Rail will continue to maintain the silt removal plant at Pill Tunnel to reduce the risk of pollution by siltation to the Ham Green lakes.

17.7 Mitigation and Residual Effects

17.7.1 No likely significant effects have been identified upon the water environment for which mitigation is required. No residual significant environmental effects in relation to the EIA Regulations 2017 have been identified for the water environment.

17.8 Cumulative Effects

17.8.1 The methodology for assessing cumulative effects with other projects is set out in Chapter 18 In-combination and Cumulative Effects (DCO Document Reference 6.21). For the purposes of this chapter, the value, magnitude and sensitivities are as described in Section 17.3.

Other Projects along the Portishead Branch Line

17.8.2 Developments to be considered in the cumulative assessment have been identified and are discussed in Chapter 18 In-combination and Cumulative Effects Assessment (DCO Document Reference 6.21) together with an explanation of the approach to the assessment of cumulative effects. Appendix 18.1 (DCO Document Reference 6.25) presents a long list of projects considered for the cumulative effects assessment and Appendix 18.2 (DCO Document Reference 6.25) summarises the potential cumulative effects for a short list of other projects.

17.8.3 Where planning applications have identified potential impacts in relation to the water environment, the majority relate to flood risk.

17.8.4 Assuming these developments are subject to the same planning and environmental protection policies and principles as detailed in national and local policy, which require for example the incorporation of SuDS into drainage designs, the DCO Scheme in combination with these developments is not anticipated to lead to significant cumulative effects upon the water environment.

17.8.5 In addition, all developments and associated activities (whether subject to planning permission of some kind or not) are required to comply with the requirements of environmental legislation. Legislation provides protection of the water environment through requiring discharges to watercourses and groundwaters and abstractions of water to be permitted. Legislation also affords protection to hydromorphological aspects and flood risk of watercourses through the requirement to obtain consents for works to

watercourses. Any permits and consents granted in respect of other activities would be subject to conditions as deemed appropriate by the permitting authority in order that impacts upon the environment are acceptable. The assessments of likely significant cumulative effects in respect of the water environment that are undertaken and presented in Appendices 18.1 and 18.2 (DCO Document Reference 6.25) take into account the requirement for environmental permits and LDCs for regulated discharges. The assessments assume that other developers and operators will comply with the conditions of the required permits and consents. On this basis, it is concluded that the grant of consent for the DCO Scheme will not give rise to likely significant cumulative effects on the water environment.

Other Works for MetroWest Phase 1

17.8.6 Other elements of MetroWest Phase 1, namely Liberty Lane Depot Sidings and Parson Street Junction modifications, Parson Street Station improvements, the Bedminster Down Relief Line and Bathampton Turnback comprise small scale works, confined within the existing railway land. These works are to be undertaken by Network Rail under their permitted development rights and do not form part of the DCO Scheme.

17.8.7 The management and control process used by Network Rail for delivering projects that enhance or renew the operational railway is called GRIP. The GRIP process provides assurance that a project can successfully progress to the next stage and requires the preparation of reports for each GRIP stage. Environmental studies are undertaken as part of the GRIP process to identify potential issues and capture the need for mitigation during design and construction. The environmental reports are carried forward from options and feasibility design (GRIP 3 and 4), into the detailed design phase (GRIP 5) and construction (GRIP 6). In this way, environmental issues and mitigation measures are identified at an early stage and addressed through the design and construction phases. Consequently, while permitted development works do not require statutory environmental impact assessment, the GRIP process provides an internal, non-statutory environmental impact assessment process.

17.8.8 These other works for MetroWest Phase 1 will be subject to environmental legislation requiring consents and permits for works that pose a risk to the water environment. Given the small scale nature of these works and the distances between these projects and the Portishead Branch Line, it is considered that there are no significant cumulative effects during the construction and operation of these projects on the water environment.

17.9 Limitations Encountered in Compiling the ES

17.9.1 All data presented in this ES have been obtained from third party sources. It is assumed that the data provided by third parties are accurate.

17.9.2 The RBMPs are subject to a 6-yearly cycle. The first cycle of river basin planning ran from the publication of RBMPs in 2009 until 2015. The second cycle of river basin planning runs from 2015 until 2021. WFD data from the 2009 Severn RBMP have been presented in the baseline section of this ES in order to assist in establishing the value of receptors. This has been

supplemented by 2014 (draft) Cycle 2 WFD data from the EA's Catchment Data Explorer website. The Cycle 2 RBMPs were published on 18 February 2016 and have been used to inform the WFD Assessment. However as the number of WFD classified waterbodies within the study area has decreased in Cycle 2, compared to those in Cycle 1, the Cycle 1 data have been retained in this report and were used to assist in establishing the value of these receptors (in the absence of Cycle 2 data). The changes between the Cycle 1 and Cycle 2 RBMPs are not considered to be significant for the purposes of this assessment.

17.9.3 The feasibility drainage design for the station buildings, car parks and the railway track has been completed, but some aspects require detailed design. Where required, the EA, the local planning authorities' Flood Risk Teams, NSLIDB and utility companies have been consulted on the proposals and consents will be sought. Consequently, through this permitting process, it is envisaged that there will be no significant effect of scheme drainage on the environment.

17.10 Summary

17.10.1 A summary of the potential impacts of the DCO Scheme on the water environment, committed mitigation and the residual effects is presented in Table 17.11.

Table 17.11: Summary of the assessment of the DCO Scheme on the water environment

Aspect and control measures embedded in the DCO Scheme	Receptors	Impact	Environmental Mitigation	Residual Effects
Construction activities				
Pollution from site works runoff / sediment / spillage. Contractors to implement temporary site drainage (see Surface Water Drainage Strategy) and measures for pollution control, prevention of spillage, etc, as required by the CoCP (ES Appendix 4.1, DCO Document Reference 8.15), Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14), and the contractors' CEMP.	Watercourses and other surface water features. Groundwater. **Value/Sensitivity: Low, Medium and High**	Pollution of water resources. **Magnitude: Negligible**	N/A	**Magnitude: Negligible** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant**

Table 17.11: Summary of the assessment of the DCO Scheme on the water environment

Aspect and control measures embedded in the DCO Scheme	Receptors	Impact	Environmental Mitigation	Residual Effects
Water resources use during construction (e.g. for concrete batching). Early consultation with water supply companies (Bristol Water) and EA as required to agree water supply during construction. Water use minimisation to be adopted during construction as required by the CoCP (ES Appendix 4.1, DCO Document Reference 8.15), Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14), and the contractors' CEMP.	Watercourses Groundwater **Value/Sensitivity: Low, Medium and High**	None anticipated as water will be supplied by Bristol Water plc. **Magnitude: No impact anticipated**	N/A	**Magnitude: No impact anticipated** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant**
Works on, in or nearby watercourses. The CoCP (ES Appendix 4.1, DCO Document Reference 8.15), Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14), contractors' CEMP to set out appropriate measures for work in, over, nearby watercourses. Surface Water Management Plan in the contractor's CEMP to	Watercourses **Value/Sensitivity: Low, Medium and High**	Risk of reduction of flow capacity and increase in flood risk. **Magnitude: Negligible**	N/A	**Magnitude: Negligible** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant**

Table 17.11: Summary of the assessment of the DCO Scheme on the water environment

Aspect and control measures embedded in the DCO Scheme	Receptors	Impact	Environmental Mitigation	Residual Effects
outline measures to manage runoff from construction areas to reduce flood risk and risk of pollution. Obtain appropriate Environmental Permit, Land Drainage and Flood Defence consents.				
Works within a water channel i.e. rhynes and ditches along the disused section and potentially Miles U/b and Miles Dock U/b along the operational railway. Obtain appropriate Environmental Permit, Land Drainage and Flood Defence consents. Plan accesses and haul routes to avoid the need for culverting watercourses and minimise length of culverting where required.	Watercourses **Value/Sensitivity: Low, Medium and High**	Changes to the physical characteristics of water features (sediment dynamics and flow), such as through culverting, new outfalls, temporary diversions etc. **Magnitude: Negligible**	N/A	**Magnitude: Negligible** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant**
Risk of pollution from the temporary storage of ballast alongside the track or in designated storage areas. Methods of removal, handling and storage to follow measures	Watercourse and Groundwater **Value/Sensitivity: Low, Medium and High**	Potential pathway for pollutants to enter surface and groundwaters and change water quality. **Magnitude: Negligible**	N/A	**Magnitude: Negligible** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant**

Table 17.11: Summary of the assessment of the DCO Scheme on the water environment

Aspect and control measures embedded in the DCO Scheme	Receptors	Impact	Environmental Mitigation	Residual Effects
outlined in the Construction Strategy (DCO Document Reference 5.4), Drainage Strategy (DCO Document Reference 6.26), the Master CEMP (ES Appendix 4.2, DCO Document Reference 8.14) and to be detailed in contractor's CEMP.				
Operation activities				
Drainage from rail network, stations or associated development activities (e.g. car parks). Incorporation of appropriate drainage, including SuDS and pollution control as described in the Surface Water Drainage Strategy. To be agreed with the relevant competent authority (EA, the NSLIDB or highways / local flood risk authorities). Removal of existing sources of pollutants such as contaminated ballast and wooden sleepers.	Watercourses and other surface water features. Groundwater. **Value/Sensitivity: Low, Medium and High**	Pollution of surface and groundwaters. **Magnitude: Negligible**	N/A	**Magnitude: Negligible** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant**

Table 17.11: Summary of the assessment of the DCO Scheme on the water environment

Aspect and control measures embedded in the DCO Scheme	Receptors	Impact	Environmental Mitigation	Residual Effects
Widening of the railway embankment into the Easton-in-Gordano floodplain. Localised ground lowering over c4000 m^2 to about 10 cms to provide local floodplain compensation.	Easton-in-Gordano stream and adjoining fields Value/Sensitivity: Medium	Increased flood risk on agricultural land. Magnitude: Negligible	N/A	**Magnitude: Negligible** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant**
Presence of Bower Ashton maintenance compound within the floodplain. Design includes new access ramps from the maintenance compound to the railway and main road. Design provides compensation for loss in floodplain storage due to the ramps by lowering the ground levels by about 10 cms over about 3000 m^2. No permanent structures on site. Obtain appropriate LDCs.	River Avon Floodplain in the vicinity of Bower Ashton and land occupiers (recreational, farmland, highways). **Value/Sensitivity: Low, Medium and High**	Risk of changes to conveyance of flows, including flood waters, leading to increased flood risk in the event of a flood during construction. **Magnitude: Negligible**	N/A	**Magnitude: Negligible** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant**
New outfall structure to discharge runoff from Portishead station car park drainage catchment. Agree discharge rate with NSLIDB to greenfield runoff rates	Portbury Ditch **Value/Sensitivity: Medium**	Presence of new hard engineered structure within natural river (tidal) bank. Increase in total stormwater	N/A	**Magnitude: Negligible** **Significance of Effect: Neutral**

Table 17.11: Summary of the assessment of the DCO Scheme on the water environment

Aspect and control measures embedded in the DCO Scheme	Receptors	Impact	Environmental Mitigation	Residual Effects
or 2 5l/s as the minimum practicable. Agree drainage design in the Drainage Strategy (DCO Document Reference 6.26) with the EA as part of Flood Defence Consent, including attenuation storage and pollution control. Minimise footprint of structure.		discharged, but no change in peak flow due to attenuation storage. **Magnitude: Negligible**		**Significance for EIA legislation: Not significant**
New outfall structure to discharge runoff from road diversion and Portishead station car park areas drainage catchment to The Cut. Agree necessary mitigation proposed in the Surface Water Drainage Strategy with the NSLIDB as part of LDC and the EA as The Cut drains to Portbury Ditch.	The Cut **Value/Sensitivity: Low**	Presence of new hard engineered structure within watercourse. **Magnitude: Negligible**	N/A	**Magnitude: Negligible** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant**
Presence of physical structures: culverts (including extensions), outfalls, and realignments (if required) within the channel of a watercourse.	Watercourses and other surface water features. **Value/Sensitivity: Low - High**	Physical changes to surface water features through introduction of hard engineered structures, affecting bed and banks of channel. **Magnitude: Negligible**	N/A	**Magnitude: Negligible** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant**

Table 17.11: Summary of the assessment of the DCO Scheme on the water environment

Aspect and control measures embedded in the DCO Scheme	Receptors	Impact	Environmental Mitigation	Residual Effects
Agree necessary changes with the EA and NSLIDB. Obtain appropriate LDCs. Minimise the footprint of any structures. Refurbish, repair or replace culverts as required maintaining existing flow capacity.				
Potential impacts from rail / station / other asset maintenance activities. Appropriate maintenance procedures by the highways authorities (road and car park drainage), Network Rail (railway) and Train Operating Company (the stations).	Watercourses and other surface water features. Groundwater. **Value/Sensitivity: Low, Medium and High**	Risk of pollution of water resources. **Magnitude: Negligible**		**Magnitude: Negligible** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant.**

Table 17.11: Summary of the assessment of the DCO Scheme on the water environment

Aspect and control measures embedded in the DCO Scheme	Receptors	Impact	Environmental Mitigation	Residual Effects
Coastal flood risk to the proposed railway between Portishead and Pill. Implement Network Rail's procedures Extreme Weather Plan to manage risk and safeguard passengers and railway assets.	The DCO Scheme within the coastal floodplain between Portishead and Pill. **Value/Sensitivity: Low**	Flooding of the railway line during coastal flooding events. The risk of coastal flooding is insignificant for the present day (2015) and future (2075) scenarios and increases in the future (2115) scenario due to sea level rise. **Magnitude: Negligible**	N/A	**Magnitude: Negligible** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant**
Coastal flood risk to proposed Portishead station and car park. Implement Network Rail's procedures Extreme Weather Plan to manage risk and safeguard passengers and railway assets.	Proposed Portishead station car park and access route. **Value/Sensitivity: Low**	Insignificant for present day (2015) and future (2075) scenarios. For the future (2115) scenario, potential flooding on the proposed Portishead station car park and at the pedestrian crossing of Portbury Ditch for events with return periods above 200 years due to climate change. **Magnitude: Negligible**	N/A	**Magnitude**: Negligible **Significance of Effect**: Neutral **Significance for EIA legislation**: Not significant

Table 17.11: Summary of the assessment of the DCO Scheme on the water environment

Aspect and control measures embedded in the DCO Scheme	Receptors	Impact	Environmental Mitigation	Residual Effects
Tidal River Avon flood risk to the DCO Scheme near Bower Ashton. Implement Network Rail's procedure Extreme Weather Plan to manage risk and safeguard passengers and railway assets.	The DCO Scheme within the River Avon floodplain near Bower Ashton. **Value/Sensitivity: Low**	At present tidal River Avon flooding of the DCO Scheme occurs approximately once every 5 to 10 years for the present day and more frequently in the future due to future sea level rise. Passenger services will be temporarily halted during flooding. **Magnitude**: **Negligible**	N/A	**Magnitude**: Negligible **Significance of Effect**: Neutral **Significance for EIA legislation**: Not significant
Maintain access to EA, NSDC, BCC and NSLIDB maintained watercourses and structures. The DCO Scheme has been designed in consultation with the EA, NSDC, BCC and NSLIDB to ensure required maintenance access is retained.	Watercourses crossed by the DCO Scheme. **Value/Sensitivity: Low, Medium and High**	No change and slight improvement in some areas in access for third parties to maintain watercourses. **Magnitude: Negligible**	N/A	**Magnitude: Negligible beneficial** **Significance of Effect: Neutral** **Significance for EIA legislation: Not significant.**

17.11 References

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17.12 Abbreviations

AWB	Artificial Water Body
BCC	Bristol City Council
CAFRA	Central Area Flood Risk Assessment (Bristol City Council's flood model)
CAMS	Catchment Abstraction Management Strategies
CAT	Drainage Catchment
CEMP	Construction Environmental Management Plan
CoCP	Code of Construction Practice
DCO	Development Consent Order
Defra	Department for the Environment and Rural Affairs
DMRB	Design Manual for Roads and Bridges
DrWPA	Drinking Water Protected Area
EA	Environment Agency
EC	European Council
EIA	Environmental Impact Assessment
ES	Environmental Statement
FRA	Flood Risk Assessment
GEP	Good Ecological Potential
GES	Good Ecological Status
GRIP	Governance of Railway Improvement Projects
HMWB	Heavily Modified Water Body
LDC	Land Drainage Consent
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
NPSNN	National Policy Statement on National Networks
NSDC	North Somerset District Council
NSIP	Nationally Significant Infrastructure Project
NSLIDB	North Somerset Levels Internal Drainage Board
NSWS	North Somerset Wildlife Site
NVZ	Nitrate Vulnerable Zone
OFP	Outline Flood Plan
PHE	Public Health England
RBD	River Basin District
RBMP	River Basin Management Plan
SAC	Special Area of Conservation

SFRA	Strategic Flood Risk Assessments
SMP	Shoreline Management Plan
SNCI	Sites of Nature Conservation Importance
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
WebTAG	Web-based Transport Appraisal Guidance
WFD	Water Framework Directive
WPZ	Water Protection Zone
WS	Wildlife Sites