A358 Taunton to Southfields Dualling Scheme

Preliminary Environmental Information Report - Chapter 13 Road Drainage and the Water Environment

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13 Road drainage and the water environment

13.1 Introduction

13.1.1 This chapter assesses the potential road drainage and water environment impacts from the construction and operation of the A358 Taunton and Southfields Dualling Scheme (the 'proposed scheme'), following the methodology set out in *Design Manual for Roads and Bridges* (DMRB) LA 113 *Road drainage and the water environment* [1].

13.1.2 In this chapter the road drainage and water environment is considered to comprise:

- surface water features within the study area
- groundwater contained within aquifer units that underlie the study area
- other water bodies or water dependent features that may potentially be affected
- the aspects of potable water supply that directly depend on water resources (for example private wells)
- existing road drainage assets

13.1.3 This chapter describes the baseline conditions of the existing road drainage water environment in the study area and the methodology used to assess potential impacts during the construction and operational phases of the proposed scheme, before presenting the preliminary results of these assessments and any further mitigation measures or monitoring deemed necessary.

13.1.4 The assessment considers the potential effects on the quality and quantity of surface and ground waters, hydrogeomorphology and flood risk that may result from construction activities, operational road drainage and accidental spillages.

13.1.5 The Water Framework Directive (WFD) compliance assessment and Flood Risk Assessment (FRA) will be reported within the Environmental Statement (ES) and presented as appendices, which will accompany the Development Consent Order (DCO) application. A WFD screening assessment and a preliminary FRA has been undertaken to accompany the Preliminary Environmental Information (PEI) Report and are provided as appendices.

13.1.6 The proposed scheme does not include any sizeable cuttings and there are no groundwater Source Protection Zones within the study area. As such, at this time no potentially significant hydrogeological risks have been identified and it is not proposed to undertake a formal Hydrogeological Impact Assessment (HIA) of the proposed scheme as a whole. However, where the need for hydrogeological calculation is identified at individual cutting and dewatering locations, these will be undertaken in order to inform the assessment process going forward and reported in the ES.

13.1.7 Associated effects on ecology (including aquatic ecology) are considered in Chapter 8 Biodiversity, although ecological proxy indicators of water quality may be considered in assessment of effects in the Road Drainage and the Water Environment ES Chapter. This will be dependent on the findings of the detailed assessment reported in the ES.

13.1.8 Effects on ground conditions and water quality arising from existing land contamination are considered in Chapter 9 Geology and Soils.

13.2 Legislative and policy framework

Legislation

13.2.1 As documented in Chapter 1 Introduction, the primary basis for deciding whether or not to grant a DCO is the *National Policy Statement for National Networks* (NPSNN) [2], which sets out policies to guide how DCO applications will be decided and how the effects of national networks infrastructure should be considered. Table 13-1 identifies the NPSNN policies relevant to the water environment and specifies where in this chapter information is provided to address the policy.

Table 13-1 Relevant NPSNN policies for road drainage and water environment assessment

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in this PEI Report chapter is information provided to address this policy
5.92	States that applications for projects (Such as this project) in Flood Zones 2 and 3 should be accompanied by a flood risk assessment (FRA) that *"…should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account"*.	A Preliminary FRA is provided in Appendix 13.1 PEIR Flood Risk Assessment to this PEI Report. This will be updated and finalised and provided with the ES.
5.96	States that applicants for projects that have the potential to be affected by, or increase, flood risk are advised to seek appropriate early stakeholder engagement with the Environment Agency and other relevant flood risk management bodies such as lead local flood authorities (LLFA), Internal Drainage Boards (IDB) and sewerage undertakers among others.	The Environment Agency comments on the Scoping Report have informed the PEI Report. Early engagement has been undertaken with the LLFA to inform the PEI Report and drainage design. Ongoing engagement will be undertaken to inform the ES.
5.97	States that local flood risk management strategies and surface water management plans provided by LLFAs should be used to inform the assessment of the project on flood risk and the FRA. This should include consideration of surface water flood risk in addition to fluvial flood risk	A list of relevant local flood risk documentation is provided in section 13.2 Legislative and policy framework. This documentation has directly informed the baseline provided in section 13.6 Baseline conditions. A Preliminary FRA is provided in Appendix 13.1 PEIR Flood Risk Assessment to this PEI Report. A summary of the Preliminary FRA is provided in section 13.9 Assessment of likely significant effects.
5.98 and 5.99, 5.105, 5.106 and 5.109	States the requirement of the project to apply *"…the Sequential Test…and, if required, the Exception Test"* to demonstrate that the project will not increase flood risk elsewhere and is only located in an area at risk of flooding if appropriate. The requirements relevant to the Sequential Test are	A Preliminary FRA is provided in Appendix 13.1 PEIR Flood Risk Assessment to this PEI Report which outlines the application of the Sequential

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in this PEI Report chapter is information provided to address this policy
	outlined in paragraph 5.105 and those relevant to the Exception Test are outlined in paragraphs 5.106-5.109.	Test and Exception Test to the proposed scheme.
5.100	States that *"For construction work which has drainage implications"*, the project will need to demonstrate that the proposed drainage system complies with the standards outlined in the Flood and Water Management Act 2010 and should include the provision for the adoption and maintenance of any Sustainable Drainage Systems (SuDs) and any necessary access requirements.	A description of the preliminary drainage design for the preliminary scheme design is provided in section 13.8 Design, mitigation and enhancement measures.
5.102	States that the project must take reasonable steps *"…to avoid, limit and reduce the risk of flooding to the proposed infrastructure and others"*.	A Preliminary FRA is provided in Appendix 13.1 PEIR Flood Risk Assessment to this PEI Report.
5.104	States that where linear infrastructure has been proposed in a flood risk area, reasonable mitigation measures should be made to *"…ensure that the infrastructure remains functional in the event of predicted flooding"*.	A Preliminary FRA is provided in Appendix 13.1 PEIR Flood Risk Assessment to this PEI Report.
5.112	States that the layout of the site should be designed to cope with events that exceed the design capacity of the system to appropriately manage excess water during flood events.	A Preliminary FRA is provided in Appendix 13.1 PEIR Flood Risk Assessment to this PEI Report. A description of the drainage design for the proposed scheme is provided in section 13.8 Design, mitigation and enhancement measures.
5.113 and 5.114	States that the *"…surface water drainage arrangements for any project should be such that the volumes and peak flow rates of surface water leaving the sites are no greater than the rates prior to the proposed project unless specific off-site arrangements are made and result in the same net effect"*. To fulfil this requirement, it may be necessary to provide infiltration and surface water storage to limit and reduce the peak rate of discharge from the site and total volume discharged from the site as outlined in paragraph 5.114 of the NPSNN.	A description of the preliminary drainage design for the preliminary scheme design is provided in section 13.8 Design, mitigation and enhancement measures.
5.221	States that *"Applicants should make early contact with the relevant regulators…"* for water quality and water supply to determine the existing status of, and complete an assessment of, the impacts of the *"…project on water quality, water resources and physical characteristics"* of the water environment as part of the ES.	Early engagement has been undertaken with the LLFA regarding water quality and water supply. Environment Agency comments on the Scoping Report have informed the PEI Report. Ongoing engagement will inform and be reported in the ES.

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in this PEI Report chapter is information provided to address this policy
5.222	States that, where appropriate, opportunities should be taken to improve upon the quality of existing discharges where these are identified to contribute towards WFD commitments.	A WFD Screening assessment is provided in Appendix 13.2 Water Framework Directive Screening to this PEI Report. This identifies the surface and groundwater bodies screened in for detailed assessment in the WFD Compliance Assessment to be appended to the ES.
5.223	Outlines that the environmental statement should describe existing water quality, water resources and physical characteristics of the water environment and any impacts of the project on water bodies of protected areas under the WFD and source protection zones (SPZ) as well as any cumulative effects.	A comprehensive description of existing surface water and groundwater features in the study area is provided in section 13.6 Baseline conditions. This includes a list of WFD waterbodies in the study area and consideration of SPZs. A cumulative assessment will be completed as part of the ES.
5.225	States the requirement for all activities that discharge to the water environment to be subject to pollution control and to include consideration of paragraphs 4.48-4.56 of the NPSNN.	A description of the measures to be implemented during construction to manage pollution and the preliminary operational drainage design for the preliminary scheme design is provided in section 13.8 Design, mitigation and enhancement measures.
5.226	States that the assessment of the impacts of the project on the water environment must consider ‘River Basin Management Plans’ and the requirements of the WFD and its daughter directives, including those on priority substances and groundwater’ and that ‘The overall aim of the project should be no deterioration of ecological of status in watercourses, ensuring that Article 4.7 of the WFD does not need to be applied’	A WFD Screening assessment is provided in Appendix 13.2 Water Framework Directive Screening to this PEI Report. This identifies the surface and groundwater bodies screened in for detailed assessment in the WFD Compliance Assessment to be appended to the ES.
5.228, 5.230 and 5.231	Outline how the project can minimise impacts on the water environment by planning and designing for the efficient use of water, introduction of SuDs and adherence to good pollution control practice.	A description of the measures to be implemented during construction to minimise impacts on the water environment and the preliminary operational drainage design for the preliminary scheme design is provided in section 13.8 Design, mitigation and enhancement measures.

13.2.2 A list of the relevant legislation and policy considered in this PEI Report is provided in the following sections.

13.2.3 Full details of relevant national and local legislation, policy and strategy is provided in Appendix 13.3 Water legislative and policy framework, of this PEI Report.

National legislation

- Environmental Protection Act 1990
- Land Drainage Act 1991 (as amended)
- Water Resources Act (England and Wales) 1991 (as amended in 2009);
- Environment Act 1995
- Water Act 2003
- The Water Resources (Abstraction and Impounding) Regulations 2006 and Water Resources (Abstractions and Impounding (Exemptions) Regulations 2017
- The Flood Risk Regulations 2009
- Flood and Water Management Act 2010
- The Environmental Damage (Prevention and Remediation) (England) Regulations 2015
- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- The Groundwater (Water Framework Directive) England Direction 2016
- The Environmental Permitting (England and Wales) Regulations 2016 (SI 2010/675) (as amended in 2018 and 2019)
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- The Water Supply (Water Quality) Regulations 2018
- Urban Waste Water Treatment (England and Wales) Regulations 1994
- The Conservation of Habitats and Species Regulations 2017

National planning policy

- NPSNN
- The National Planning Policy Framework (NPPF) is noted as being 'important and relevant' and is to be considered, however, if there is a conflict between the NPSNN and NPPF, the NPSNN takes precedence.

Regional planning policy

- South west river basin district River Basin Management Plan (RBMP) (Updated: 2015) [3]
- South west Flood Risk Management Plan (FRMP) 2015-2021

Local planning policy, strategy and evidence

- Taunton Deane Borough Council Adopted Core Strategy 2011-2028 (in the process of replacement by the Somerset West and Taunton Local Plan 2040 [4])
- Taunton Deane Strategic Flood Risk Assessment (SFRA) (2011) [5]
- South Somerset Local Plan 2006-2028 [6]
- Somerset West & Taunton and South Somerset Councils Joint level 1 SFRA [7]
- Somerset County Council Preliminary Flood Risk Assessment (PFRA)
- Somerset County Council Local Flood Strategy

- Somerset Local Flood Risk Management Strategy Summary

13.3 Assessment methodology

13.3.1 The assessment methodology followed in this chapter conforms to DMRB LA 104 *Environmental assessment and monitoring* and DMRB LA 113 *Road drainage and the water environment*. DMRB LA 104 *Environmental assessment and monitoring* and LA 113 provide a methodology and criteria for assessing the impact of a proposed road scheme on the water environment. This methodology comprises the following steps:

- Identification of potential water receptors within the study area (as defined in section 13.5 Study area), based on the features outlined in Table 13-2 Attributes and indicators of quality for water features (adapted from Table 3.69 in DMRB LA 113 *Road drainage and the water environment*).
- Assessment of the potential importance, value and sensitivity of each of these receptors, shown in Table 13-3, as per Table 3.70 of DMRB LA 113 *Road drainage and the water environment*.
- Assessment of the potential magnitude of any construction or operation impact on the receptor, shown in Table 13-4, as per Table 3.71 of LA 113 *Road drainage and the water environment*.
- Assessment of the overall significance of any effects on receptors due to impacts, shown in Table 13-5, as per Table 3.8.1 of DMRB LA 104 *Environmental assessment and monitoring* . The significance of effect is determined by a combination of the identified importance/sensitivity of the receptor with the estimated magnitude of the impact.

13.3.2 For the purpose of this assessment, values of moderate adverse and above have been defined as significant potential effects.

Table 13-2 Attributes and indicators of quality for water features (adapted from Table 3.69 in DMRB LA 113 *Road drainage and the water environment*)[1]

Feature	Attribute	Indicator of quality	Possible Measure
Surface Water body	Water supply/ quality	Amount used for water supply (potable). Amount used for water supply (industrial/agricultural). Chemical water quality.	Location and number of abstraction points. Volume abstracted daily. WFD chemical status.
	Dilution and removal of waste products	Presence of surface water discharges. Effluent discharges.	Daily volume of discharge (treated/ untreated).
	Recreation	Access to river. Use of river for recreation.	Length of river used for recreation (fishing, water sports). Number of clubs.

[1] Please note that estuaries, canals and coastal waters have been excluded from this table as there are none located in the road drainage and water environment study area.

Feature	Attribute	Indicator of quality	Possible Measure
	Value to economy	Value of use of river.	Length of river used for recreation commercially. Number of people employed Length of riverbank developed. Length of river fished commercially.
	Conveyance of flow	Presence of watercourses.	Number and size of watercourses, natural, artificial or heavily modified water body. Number of watercourses artificially managed to control flow/levels.
	Biodiversity	Biological water quality.	Fisheries quality.
		Fisheries quality.	Fish status, as defined under the WFD.
Floodplain	Conveyance of flow	Presence of floodplain Flood flows.	Developed area within extent of floodplain affected, as determined from hydraulic modelling. Flood risk. Mean annual flood.
Groundwater	Water supply/ quality	Amount used for water supply. Amount used for water supply (industrial/ agricultural).	WFD groundwater quantitative and chemical status. Catchment abstraction management Strategy (CAMS) status. Location and number of abstraction points. Volume abstracted daily and use (potable most important). Location and grade of SPZ.
	Soakaway	Presence of soakaways or other discharges to the ground.	Location, type and number of discharge points. Daily volume discharged.
	Vulnerability	Groundwater vulnerability.	Classification of aquifer vulnerability.
	Economic value	Extent of use for abstractions.	Number of people employed, cost of alternatives.
	Conveyance of flow	Presence of groundwater supported water bodies. Potential for groundwater flooding. Groundwater interception by road structures or drainage.	Changes to groundwater recharge, levels or flows. Number and size of watercourses fed by baseflow.
	Biodiversity	Presence of Groundwater-dependent terrestrial ecosystems (GWDTE).	Changes to groundwater recharge, levels or flows. Status or classification of wetland including GWDTE under WFD.
Lakes, ponds and reservoirs	Recreation Access	Use for recreation.	Area used for recreation.
	Water supply/ quality	Amount used for water supply (potable). Amount used for water supply	Volume abstracted daily. WFD chemical status.

Feature	Attribute	Indicator of quality	Possible Measure
		(industrial/agricultural). Chemical water quality.	
	Dilution and removal of waste products	Presence of surface water discharges. Effluent discharges.	Daily volume of discharge (treated/ untreated).
	Value to economy	Extent of employment.	Number of people employed.
	Biodiversity	Biological water quality.	WFD ecological status.
		Fisheries quality. Populations of birds.	Fish status, as defined in WFD 2000/60/EC. Assemblages or number of species of UK biodiversity. Action plan or birds of conservation concern.

Table 13-3 Estimating the importance of water environment attributes (taken from Table 3.70 in DMRB LA 113 *Road drainage and the water environment*)

Importance	Aspect	Description	Examples within the study area
Very High (Nationally significant attribute of high importance)	Surface water	Watercourse having a WFD classification shown in a RBMP and Q_{95}[2] ≥1.0 m^3/s. Site protected/designated under EC or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/Species protected by EC legislation.	None identified within the study area.
	Groundwater	Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation. Groundwater locally supports GWDTE SPZ1.	None identified within the study area.
	Flood risk	Essential infrastructure or highly vulnerable development.	Existing A358.
High (Locally significant attribute of high importance)	Surface water	Watercourse having a WFD classification shown in a RBMP and Q_{95} <1.0m^3/s. Species protected under EC or UK legislation.	Broughton Brook, River Tone, Meare Stream, Fivehead River Main Channel 1, Fivehead River Main Channel 2, River Ding, River Isle.
	Groundwater	Principal aquifer providing locally important resource or supporting a river ecosystem Groundwater supports GWDTE SPZ2.	None identified within the study area.

[2] Q_{95} is the flow equalled or exceeded in a watercourse 95% of the time.

Importance	Aspect	Description	Examples within the study area
	Flood risk	More vulnerable development.	Residential properties along Stoke Road.
Medium (Moderate quality and rarity)	Surface water	Watercourses not having a WFD classification shown in a RBMP and Q_{95} >0.001m^3/s.	Black Brook and its tributaries, Thornwater Stream, Meare Stream Tributary 1, Venner's Water, Cad Brook drainage network, Cad Brook, River Ding Tributaries 1 and 2, Back Stream.
	Groundwater	Aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ3.	Quaternary deposits of Secondary aquifers, Triassic/Jurassic sequence of Secondary aquifers No groundwater SPZs identified within study area.
	Flood risk	Less vulnerable development.	Agricultural land.
Low (Lower quality)	Surface water	Watercourses not having a WFD classification shown in a RBMP and Q_{95} ≤0.001m^3/s.	River Tone Tributaries 2 to 6, Fivehead River Tributaries 1 to 5, River Isle drainage network and tributary 1.
	Groundwater	Unproductive strata.	None identified within the study area.
	Flood risk	Water compatible development.	None identified within the study area.

Table 13-4 Estimating the magnitude of an impact on an attribute (taken from Table 3.71 of DMRB LA 113 *Road drainage and the water environment*)

Magnitude	Criteria	Attribute	
Major adverse	Results in loss of attribute and/or quality and integrity of the attribute	Surface water	Failure of both acute-soluble and chronic-sediment related pollutants in Highways England's Water Risk Assessment Tool (HEWRAT) and compliance failure with Environmental Quality Standards (EQS) values.
			Calculated risk of pollution from a spillage ≥2% annually (spillage assessment).
			Loss or extensive change to a fishery.
			Loss of regionally important public water supply.
			Loss or extensive change to a designated nature conservation site.
			Reduction in water body WFD classification.
		Groundwater	Loss of, or extensive change to, an aquifer.
			Loss of regionally important water supply.
			Potential high risk of pollution to groundwater from routine runoff – risk score >250 (Groundwater quality and runoff assessment).
			Calculated risk of pollution from spillages ≥2% annually (spillage assessment).
			Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies.
			Reduction in water body WFD classification.
			Loss or significant damage to major structures through subsidence or similar effects.
		Flood risk	Increase in peak flood level (>100mm).
Moderate adverse	Results in effect on integrity of attribute, or loss of part of attribute	Surface water	Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values.
			Calculated risk of pollution from spillages ≥1% annually and <2 % annually.
			Partial loss in productivity of a fishery.
			Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies.
			Contribution to reduction in water body WFD classification.
		Groundwater	Partial loss or change to an aquifer.
			Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies.
			Potential medium risk of pollution to groundwater from routine runoff – risk score 150-250.
			Calculated risk of pollution from spillages ≥1% annually and <2 % annually.
			Partial loss of the integrity of GWDTE.
			Contribution to reduction in water body. WFD classification.

Magnitude	Criteria	Attribute	
			Damage to major structures through subsidence or similar effects or loss of minor structures.
		Flood risk	Increase in peak flood level (>50mm).
Minor adverse	Results in some measurable change in attributes, quality or vulnerability	Surface water	Failure of either acute soluble or chronic sediment related pollutants in HEWRAT.
			Calculated risk of pollution from spillages ≥0.5% annually and < 1% annually.
			Minor effects on water supplies.
		Groundwater	Potential low risk of pollution to groundwater from routine runoff – risk score <150.
			Calculated risk of pollution from spillages ≥0.5% annually and <1% annually.
			Minor effects on an aquifer, GWDTEs, abstractions and structures.
		Flood risk	Increase in peak flood level (>10mm).
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	Surface water	No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants).
			Risk of pollution from spillages <0.5%.
		Groundwater	No measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages <0.5%.
		Flood risk	Negligible change to peak flood level (≤ +/- 10mm).
Minor beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Surface water	HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was of 'fail' condition.
			Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually).
		Groundwater	Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <1% annually).
			Reduction of groundwater hazards to existing structures.
			Reductions in waterlogging and groundwater flooding.
		Flood risk	Creation of flood storage and decrease in peak flood level (>10mm).
Moderate beneficial	Results in moderate improvement of attribute quality	Surface water	HEWRAT assessment of both acute-soluble and chronic-sediment related pollutants becomes pass from an existing site where the baseline was of 'fail' condition.
			Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually).
			Contribution to improvement in water body WFD classification.
		Groundwater	Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is >1% annually).

Magnitude	Criteria	Attribute	
			Contribution to improvement in water body WFD classification.
			Improvement in water body Catchment Abstraction Management Strategy (CAMS) (or equivalent) classification. Support to significant improvements in damaged GWDTE.
		Flood risk	Creation of flood storage and decrease in peak flood level1 (>50mm).
Major beneficial	Results in major improvement of attribute quality	Surface water	Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse. Improvement in water body WFD classification.
		Groundwater	Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification.
		Flood risk	Creation of flood storage and decrease in peak flood level (>100mm).
No change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.	

Table 13-5 Significance matrix (taken from Table 3.8.1 of DMRB LA 104 *Environmental assessment and monitoring*)

		Magnitude of impact (degree of change)				
		No change	Negligible	Minor	Moderate	Major
Environmental value (sensitivity)	Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Construction

13.3.3 DMRB LA 113 *Road drainage and the water environment* recommends that an assessment of construction impacts should use the advice given in Construction Industry Research and Information Association (CIRIA) Report C648 *Control of Water Pollution from Linear Construction Projects* [8] on potential impacts arising during the construction phase and the assessment and mitigation of these risks.

13.3.4 The potential impacts of construction on surface water or sediment runoff, water quality, flood risk and groundwater quality or level have been assessed based on the proposed construction methods and sequencing. Where details on construction methods have not been available, the use of standard construction practices have been assumed.

13.3.5 The impact and effect of physical works to watercourses is not assessed in the construction stage assessment but is instead examined as part of the operational assessment. This is because the hydromorphological and hydrological changes will be permanent.

13.3.6 The construction stage will only be assessed using hydraulic modelling (fluvial and/or surface water) if a specific activity at a specific location is identified to be at high risk of changing local flood risk characteristics increasing flood risk of local communities or endangering construction works. Hydraulic modelling may also be employed to assess the flood risk considerations of construction activities with a long duration. This will be determined through consultation with the Highways England and the LLFA.

13.3.7 Cumulative impacts on the water environment as a result of construction phasing have also been assessed in this PEI Report.

13.3.8 Outline measures to reduce construction impacts will be included in an Environmental Management Plan (EMP). These measures will be secured by the DCO application through the imposition of a requirement and these measures are therefore relied on for the purposes of this assessment. For the purposes of the impact assessment it is assumed that they will be implemented correctly. These measures will also be reported in the Register of Environmental Actions and Commitments in the EMP, to be submitted with the ES as part of the DCO application.

13.3.9 The potential impacts of construction on hydrogeology and surface hydrology will be evaluated by consideration of the proposed construction activities in the context of the baseline hydrogeological and surface water regime.

Operation

13.3.10 The assessment of potential impacts during operation includes the following key aspects of the water environment for the purpose of the PEI Report:

- WFD compliance
- flood risk
- routine highway runoff, surface water flow paths and surface water quality
- hydromorphological assessment
- spillage and water quality
- groundwater level and flow
- groundwater quality and routine runoff
- groundwater-dependent terrestrial ecosystems (GWDTEs)

<u>WFD compliance assessment</u>

13.3.11 A WFD compliance assessment for the proposed scheme will be undertaken and provided as part of the ES, with reference to the Planning Inspectorate (PINS) *Advice Note 18 The Water Framework Directive* [9].

13.3.12 The WFD quality and quantity elements identified through scoping and the WFD Screening assessment (Appendix 13.2 Water Framework Directive Screening) as being at potential risk of impact from the proposed scheme will be assessed in the WFD compliance assessment.

13.3.13 The WFD compliance assessment will identify how the proposed scheme has the potential to affect each of the water bodies' quality/quantity elements and whether this results in non-compliance with the WFD. The results of the other

assessments in ES Chapter 13 Road drainage and the water environment will be used to inform the WFD compliance assessment, where considered applicable.

13.3.14 For water bodies that have the potential to be impacted by the proposed scheme, the effect of the proposed scheme on any mitigation measures identified within the relevant RBMP will be assessed.

Flood risk

13.3.15 A preliminary FRA has been prepared to support the PEI Report and a standalone FRA will be prepared and provided as an appendix to ES.

13.3.16 The preliminary FRA outlines the baseline conditions in terms of flood risk from fluvial, groundwater, surface water and infrastructure failure (including existing drainage systems) both to and as a result of the proposed scheme and identifies the key flood risk receptors. It provides a commentary on how the proposed scheme has taken the sequential and exception tests into account during the route selection process and document the approach to assessment.

13.3.17 A standalone FRA will be produced to accompany the ES. This document will present an updated baseline, based on any additional data received, site observations and analytical work undertaken (including hydraulic modelling). It will also provide an assessment of flood risk from all the sources of flooding outlined.

13.3.18 A key component of the FRA supporting the ES will be an assessment of the watercourses crossed by the proposed scheme or in close proximity to the proposed scheme. This element of the assessment will be informed by fluvial hydraulic modelling at bridge and culvert crossings, watercourse realignments or diversions as necessary.

13.3.19 The assessment of the proposed scheme in the FRA will be based on application of the latest published climate change allowances where required.

Routine highway runoff, surface water flow paths and surface water quality

13.3.20 At this preliminary stage of assessment, the proposed scheme has been assessed based on a drainage strategy that implements sustainable methods of surface water management. This will consist of natural vegetated features which are recognised to capture and treat potentially polluting matter, such as hydrocarbons and heavy metals. Therefore, it assumed the implementation of the drainage strategy will mitigate the potential impact of routine runoff from highways.

13.3.21 A detailed assessment of the potential impacts of routine runoff on surface water quality will be undertaken using the Highways England Water Risk Assessment Tool (HEWRAT), to determine whether the risk is acceptable, and be included as an appendix to ES.

13.3.22 For the purpose of the HEWRAT assessment to be undertaken as part of the ES, baseline surface water quality will be determined based on the Environment Agency's online Water Quality Archive and water quality surveys undertaken along the extent of the proposed scheme.

13.3.23 The assessment will be conducted at proposed outfall locations. This assessment tool takes account of the release of materials with known toxicity to aquatic organisms (the heavy metals Copper (Cu) and Zinc (Zn)) and also accounts for locations where there could be accumulations of sediments.

13.3.24 The assessment of surface water quantity will be based on results from hydrodynamic modelling of the proposed conveyance and attenuation features. This will likely be undertaken in MicroDrainage. This will be informed by hydrological inputs based on the Flood Estimation Handbook (FEH) suite of data sources and the associated flood flow calculation methods that are routinely employed to determine appropriate rates of discharge from developed areas.

13.3.25 This information will be complimented by an assessment of existing surface water flow paths using analysis of topographical survey data and the impact that the proposed scheme may have on these. This will take account of overland flow, watercourses and land drainage features. Localised surface water models may be created where required. This will be undertaken using Tuflow or the FloodFlow module in MicroDrainage.

13.3.26 The assessment will also be used to inform the design of suitable drainage systems and ensure that an appropriate train of treatment is provided in the preliminary scheme design. In addition, the assessment process will ensure mitigation measures such as proprietary treatment devices are implemented where required.

Groundwater quality and routine runoff

13.3.27 An assessment of groundwater quality and routine runoff will be undertaken as an appendix to the ES. This will use DMRB LA 113 *Road drainage and the water environment* Appendix C Groundwater quality and run off, which provides a methodology to determine the risk of impact on groundwater quality from routine runoff. The method is based on the 'source-pathway-receptor' pollutant linkage principle.

13.3.28 For there to be a risk of impact to groundwater quality, a source, pathway and receptor all must be present to create a pollutant linkage or create a linkage based on natural processes. In the context of road drainage, the source is the road runoff with any pollutants it contains. The pathways are the processes which may modify the pollutants during transmission through the discharge system and unsaturated zone. The receptor is the groundwater resources.

Hydromorphological assessment

13.3.29 At this preliminary stage of assessment, the impact of the proposed scheme on hydromorphology has been limited to examining the length of culverting and the length and form of watercourse diversions. This information has then been compared to the overall length of the existing river channel and the existing hydromorphological condition of the watercourse, based on preliminary observations collected during a water features walk-over survey undertaken in June 2021, to enable a preliminary assessment to be undertaken.

13.3.30 A detailed hydromorphological assessment will be undertaken to determine whether the degree of hydromorphological change is acceptable and will be presented as an appendix to the ES.

13.3.31 The appropriate, methods of assessment to measure hydromorphological change will be determined by a competent expert on a site-specific basis. Appendix E Hydromorphological assessment of DMRB LA 113 *Road drainage and the water environment* will be followed.

13.3.32 The assessment will be made using professional judgement and experience of working within similar watercourses and will be focussed on locations where the

route of the proposed scheme physically interacts with water bodies for example proposed bridges, culverts, realignments and where development is taking place directly adjacent to a watercourse. The assessment will also take account of locations where sediment accumulation may occur as a result of the proposed drainage system or changes to the hydrodynamic characteristics of the channel.

Accidental spillage

13.3.33 An accidental spillage assessment will be undertaken using Appendix D Spillage assessment from DMRB LA 113 *Road drainage and the water environment* and presented as an appendix to the ES. Using the spillage assessment method, for the risk of a serious pollution incident to be acceptable the calculated annual probability of such an incident shall not be greater than 1%. Where spillage has the potential to affect a Site of Special Scientific Interest (SSSI), SPZ, protected area, drinking water supply or commercial activity abstracting from the watercourse, for the risk of a serious pollution incident to be acceptable the calculated annual probability shall not be greater than 0.5%.

13.3.34 The risk is assessed initially without any mitigation measures. Where mitigation measures are needed to reduce the probability, a reduction factor is applied, depending on the type of mitigation used.

Groundwater

13.3.35 An assessment will be undertaken following the procedures set out in Appendix A Groundwater levels and flow of DMRB LA 113 *Road drainage and the water environment*, which follows a stepped approach as follows:

- Step 1 – Establish regional groundwater body status.
- Step 2 – Develop a conceptual model for the surrounding area.
- Step 3 – Based on the conceptual model, identify all potential features which are susceptible to groundwater level and flow impacts.

13.3.36 The assessment of potential effects resulting from the operation of the proposed scheme will consider the interaction of the elements of the proposed scheme that are identified as interacting with the groundwater environment and the baseline conditions presented in the hydrogeological conceptual model created in Step 2. Ground investigation works, including a programme of groundwater level monitoring, will inform the assessment, which will be reported within an appendix to the ES.

13.3.37 For there to be a risk of impact to groundwater quality, a source, pathway and receptor all have to be present to create a pollutant linkage or create a linkage based on natural processes. In the context of the road drainage and water environment chapter, pollutant sources comprise the drainage water that would be discharged at the outfalls of the proposed drainage system, and the receptors are defined as controlled water bodies, including the groundwater that underlie the proposed scheme. In the case of natural processes, sources include recharge, pathways include flow paths through the aquifer and residence times, and receptors are defined as the aquifer or surface expressions of groundwater such as springs.

13.3.38 The source-pathway-receptor model can also be applied to water resources and water features that are sensitive to groundwater levels and flow. In this context sources include abstraction and recharge points, which may be for dewatering or drainage purposes that are artificially altering groundwater level and flows. The

pathway is the hydraulic connection between the water resource that is being changed and features up or down gradient, so this could include the aquifer that connects the two. The receptors are groundwater bodies and groundwater-dependent features.

13.3.39 Assessment of the impacts of the proposed scheme on groundwater abstractions will be carried out in accordance with DMRB LA 113 *Road drainage and the water environment* and Environment Agency guidance for dewatering abstractions (SC040020/SR1 [10]) and groundwater abstractions (SC040020/SR2 [11]), as needed within the ES.

13.3.40 At the preliminary scheme design stage, a qualitative assessment has been undertaken and this has informed the PEI Report, as reflected in Table 13-16. Detailed assessment will be undertaken, as necessary to inform the ES.

Groundwater-dependent terrestrial ecosystems

13.3.41 An assessment will be undertaken in the ES following the procedures set out in Appendix B Groundwater-dependent terrestrial ecosystems of DMRB LA 113 *Road drainage and the water environment*, which follows a stepped, risk-based approach which depends upon establishing linkages between potential impacts from the proposed scheme on the hydrological and hydrogeological regime and the GWDTEs.

13.3.42 The understanding of the baseline regime and the location of the GWDTE in comparison to the proposed scheme will enable an assessment of the potential impact of the proposed scheme on GWDTE to be undertaken as part of the ES. This will be undertaken at a Simple level, as per the requirements of DMRB LA 113 *Road drainage and the water environment*, and where a likely significant effect is identified, be further investigated by a Detailed assessment.

13.4 Assessment assumptions and limitations

13.4.1 Assessment of the road drainage and the water environment aspects of the proposed scheme has been carried out in accordance with DMRB LA 113 *Road drainage and the water environment*, and supplementary methods for potential impacts not covered in DMRB LA 113 *Road drainage and the water environment*.

13.4.2 For the assessment of construction impacts, where details on construction methods and sequencing are not available, current standard construction practices are assumed.

13.4.3 The preliminary drainage design will be finalised later in the design process. However, it is assumed that the drainage strategy will implement sustainable methods of surface water management and that this will consist of natural vegetated features that are known to capture and treat potentially polluting matter, such as hydrocarbons and heavy metals.

13.4.4 The impact and effect of physical works to watercourses is not assessed in the construction stage assessment but is instead examined as part of the operational assessment. This is because the hydromorphological and hydrological changes will be permanent.

13.4.5 At this stage no ground investigations or environmental monitoring have been completed to inform this assessment. Conceptual models and assessments discussed within this PEI Report will therefore be developed within the ES,

utilising ground investigation and monitoring information procured following completion of the PEI Report.

13.4.6 A water features walk-over survey was undertaken in June 2021 to help gain an understanding of the existing conditions of surface water features that may be affected by the proposed scheme. It was not possible to gain access to all areas potentially relevant and ongoing data collection in the form of further surveys of surface water features will be required to enhance the understanding of current conditions to inform the ES. The ongoing data collection will aim to include the areas that could not be accessed during the surveys undertaken in June 2021 where access restrictions allow.

13.4.7 The surveys were affected by access limitations and therefore it is recognised that ongoing data collection will be required to enhance the understanding of current conditions to inform the ES.

13.4.8 Surface water quality surveys are in the process of being undertaken along the proposed scheme and will be undertaken across a total of six months. The results of the surface water quality surveys will be reported in the ES and used to inform the assessment undertaken in the ES.

13.4.9 It is acknowledged that uncertainty is inherent to this type of assessment, in particular with respect to the assessment of interaction between surface water and groundwater. Every effort has been made to ensure that the information used is as accurate as possible.

13.4.10 The final environmental design may be amended during detailed design prior to construction. However, the assessment of potential effects has taken account of the ‘reasonable worst case’ scenarios and mitigation measures are included within the preliminary scheme design accordingly.

13.4.11 This chapter includes the information reasonably required to assess the likely significant environmental effects. A precautionary valuation of the baseline that represents a ‘reasonable worst-case’ is provided, i.e. one that is precautionary, but it is reasonable to assume could occur, rather than an extreme scenario that is unlikely. Precautionary valuations have been assigned to surface water and groundwater receptors based on the best available information including consideration of any available field or desk study data and published research literature relevant to the study area. The degree of precaution built into the assessment is linked to the level of confidence in the existing data upon which the assessment is based.

13.4.12 The findings presented in this chapter represent those available at the time writing and data collected to end of June 2021.

13.4.13 Further topic-specific limitations and assumptions associated with the proposed scheme are discussed in the following sections.

Surface water

13.4.14 The baseline conditions have primarily been derived from desk-based sources. Baseline water quality data collection and monitoring will be completed prior to commencement of the ES, the findings of which will be incorporated into the assessment at that time.

Groundwater

13.4.15 The understanding of the hydrogeological regime of the proposed scheme and its study area is currently limited to published reports and available mapping.

13.4.16 If the DMRB LA 113 *Road drainage and the water environment* Appendix C Groundwater quality and run off assessment identifies an effect of a significance that is relevant to the specific locale of the point of discharge, which is not relevant to the wider groundwater body due to dilution effects, a supplementary risk assessment will be undertaken as part of the ES.

13.5 Study area

13.5.1 The study area for the road drainage and the water environment assessment has been defined as encompassing all surface water, groundwater, flood risk and human health receptors (taken to be drinking water abstractions in the context of the road drainage and water environment chapter) located within 1 kilometre (km) of the proposed scheme.

13.5.2 The 1km radius is based on the Highways England Water Resources Assessment Tool methodology and Help Guide which considers any protected areas for conservation located within 1km to be at higher risk than sites at a greater distance and applies stricter thresholds of compliance to protect against pollution incidents.

13.5.3 The 1km study area has been extended for features that have been determined as being in hydraulic connectivity with the proposed scheme and, therefore, have the potential to be affected by pollutants transported downstream of the works. These features include the underlying aquifer and associated WFD groundwater bodies and habitats identified as groundwater dependent.

13.5.4 Receptors within the study area (including those outside the 1km boundary, where relevant) are described in the baseline section of this chapter.

13.6 Baseline conditions

Data sources

13.6.1 The baseline conditions have been derived from a number of sources, including the following:

- Environment Agency long term flood risk map and flood map for planning [12]
- Environment Agency Catchment Data Explorer [13]
- Environment Agency Groundwater Vulnerability Map [14]
- British Geological Society (BGS) mapping [15]
- Environment Agency groundwater SPZs [14]
- Somerset West & Taunton and South Somerset Councils Joint Level 1 Strategic Flood Risk Assessment (SFRA) [7]
- Somerset County Council Preliminary Flood Risk Assessment (PFRA) [16]
- Somerset County Council Local Flood Strategy [17]
- Somerset Local Flood Risk Management Strategy Summary [18]
- River Basin Management Plan (RBMP) South West River Basin District [19]
- Natural England, MAGIC [14]
- Ordnance Survey (OS) mapping (including topography)

13.6.2 A water features walk-over survey was undertaken in June 2021 which has informed the baseline for the PEI Report. The water features walk-over survey

was conducted on upstream and downstream extents (dependent on access availability) of the following watercourses:

- Black Brook and tributaries
- Broughton Brook
- Thornwater Stream
- Meare Stream
- Fivehead Main River Channels 1 and 2
- Fivehead River Tributaries 3 and 5
- Venner's Water
- Cad Brook and Cad Brook drainage network
- River Ding
- Back Stream

13.6.3 The water features walk-over survey involved collecting high-level observational data and photographs along the extents of the watercourses available to access. Ongoing data collection (including surface water quality surveys as identified in 13.3.22) will be undertaken prior to the preparation of the ES to refine and enhance understanding of existing conditions of the water environment.

13.6.4 Details regarding historical ground investigations are referenced in Chapter 9 Geology and soils. Very limited information is available but will be supplemented by additional ground investigation as noted above.

Surface water features

13.6.5 The surface watercourses located in the study area are described in Table 13-6 and shown on Figure 13.1 Surface watercourses and flood risk. Unique names have been allocated to each of the watercourses for the purposes of the assessment set out in this chapter, utilising existing names where applicable, or allocating project-specific ones where not. The study area sits within a catchment that slopes gently to the north-east, with watercourses flowing generally in a north easterly direction, joining the River Parrett before discharging into the Bristol Channel at Burnham-on-Sea. The watercourses at the northern end of the study area flow into the River Parrett via the River Tone, a major tributary of the Parrett, while the watercourses to the south of the study area flow into the River Parrett via the River Isle, another major tributary of the Parrett. A detailed description of the individual watercourses is provided in the Preliminary FRA.

13.6.6 The whole River Parrett catchment has been subject to extensive flow and water level management, which is evidenced by networks of drains, ditches, rhynes (drainage ditches, or canals used to turn areas of wetland at around sea level into useful pasture) and canals.

13.6.7 The main rivers and ordinary watercourses that are located within the study area have been considered as part of the baseline for this assessment and are listed in Table 13-6. Individual drain features will only be assessed in the PEI Report and the ES where changes to their characteristics as a result of the proposed scheme affects the local land drainage regime.

Table 13-6 Surface water features in the study area

Surface water feature	Main river or Ordinary watercourse	WFD waterbody	Crossed by proposed scheme (Y/N)
Broughton Brook	Ordinary watercourse	Broughton Brook (South and West Somerset)	Y
Black Brook	Main river		Y
Black Brook Tributary 1	Ordinary watercourse		Y
Black Brook Tributary 2	Ordinary watercourse		Y
Black Brook Tributary 3	Ordinary watercourse		Y
Black Brook Tributary 4	Ordinary watercourse		N
Black Brook Tributary 5	Ordinary watercourse		N
Black Brook Tributary 6	Ordinary watercourse		N
River Tone	Main river	Tone Ds Taunton	N
Thornwater Stream	Ordinary watercourse		Y
River Tone Tributary 2	Ordinary watercourse		N
River Tone Tributary 3	Ordinary watercourse		N
River Tone Tributary 4	Ordinary watercourse		N
River Tone Tributary 5	Ordinary watercourse		N
River Tone Tributary 6	Ordinary watercourse		N
Meare Stream	Ordinary watercourse	West Sedgemoor Main Drain	Y
Meare Stream Tributary 1	Ordinary watercourse		Y
Fivehead River Main Channel 1	Ordinary watercourse	Fivehead River	Y
Fivehead River Tributary 1	Ordinary watercourse		N
Fivehead River Tributary 2	Ordinary watercourse		N
Fivehead River Tributary 3	Ordinary watercourse		N
Fivehead River Main Channel 2	Ordinary watercourse		Y
Fivehead River Tributary 4	Ordinary watercourse		N
Fivehead River Tributary 5	Ordinary watercourse		Y
Venner's Water	Ordinary watercourse		Y
Cad Brook drainage network	Ordinary watercourse	Ding	Y
Cad Brook	Ordinary watercourse		Y
River Isle drainage network	Ordinary watercourse	Isle – Cad Brook to Fivehead River	N
River Isle Tributary 1	Ordinary watercourse		N
River Ding	Ordinary watercourse	Ding	Y
River Ding Tributary 1	Ordinary watercourse		N
River Ding Tributary 2	Ordinary watercourse		N
Back Stream	Ordinary watercourse	Isle – upper to confluence with Cad Brook	Y
River Isle	Main river		N

Surface water quality

13.6.8 The Environment Agency's online Water Quality Archive indicates that there are freshwater monitoring points within the study area associated with:

- Broughton Brook, approximately 2km upstream of the proposed scheme.

- Fivehead River Main Channel 1, approximately 300m downstream of the proposed scheme.
- Fivehead River Main Channel 2, approximately 2.5km downstream of the proposed scheme.
- River Isle, approximately 100m downstream of the proposed scheme.

13.6.9 The most recent data from Broughton Brook, Fivehead River Main Channel 2 and the River Isle is dated to 2017 and records neutral to slightly alkaline pH waters, well oxygenated and with low levels of biochemical oxygen demand (BOD), indicating good quality water.

13.6.10 The River Isle is recorded as consistently containing higher levels of nitrates and phosphates than the Broughton Brook or Fivehead River Main Channel 2.

13.6.11 The most recent data from Fivehead River Main Channel 1 dates to 2021 and records water that is slightly alkaline, with low BOD, good oxygen saturation and good quality with respect to ammonia.

Groundwater features

13.6.12 The groundwater features located in the study area are described in Table 13-7.

13.6.13 The study area crosses a region that is gently rolling countryside, underlain by Lower Jurassic and Upper Triassic bedrock, mostly formed of mudstones but also containing beds of limestone and other more permeable strata. Strata generally dip to the east and southeast, with variations on a localised scale as a consequence of faulting. BGS hydrogeological mapping notes that Triassic strata underlying the northern end of the study area are of low productivity, yielding limited amounts of water (that can be highly mineralised) and that the strata act as a confining layer over the Sherwood Sandstone that lies at greater depth. The Jurassic strata that underlie the southern portion of the study area are classified by the BGS as being rocks with essentially no groundwater. The bedrock underlying the study area is thus likely to have a limited role in any groundwater movement and thus any hydrogeological interaction with the proposed scheme.

13.6.14 Overlaying the bedrock for approximately 50% of the route are superficial deposits of head, colluvium and alluvium, reflecting Quaternary remnant landscape, with higher topography (and no superficial deposits) to the southwest, with alluvium cropping out in sinuous patterns aligning with drainage from the higher land, down to the northeast and towards the River Parrett. Although such strata can contain permeable strata and have been classified as Secondary aquifers by the EA, review of BGS borehole logs within the study area records that very little if any groundwater has been encountered during investigation works. It is recognised, however, that a number of groundwater issues are located within the study area (see section 13.6.34).

13.6.15 Issues are points where water emerges at the surface. This can be water discharging from a culvert, a land drainage pipe or from a formal drainage system but in some instances is groundwater emergence. The issues identified predominantly occur in outcrops of head, colluvium and alluvium, indicating that there is water present within these strata, although likely to be geographically limited in extent. Issues are discussed further in section 13.6 Baseline conditions.

Table 13-7 Groundwater features in the study area

Age	Formation	Aquifer classification*	Description (generic)	WFD waterbody
Quaternary	Alluvium	Secondary (undifferentiated)	Clay, silt, sand and gravel	Tone and North Somerset Streams (Between M5 junction and West Hatch)
	Colluvium	Secondary (undifferentiated)	Diamicton	
	Head	Secondary A	Gravel, sand and clay	
Jurassic	Charmouth Mudstone Formation	Secondary (undifferentiated)	Mudstone	Tone and North Somerset Streams (Between M5 junction and West Hatch)
	Belemnite Marl Member	Unproductive strata	Calcareous mudstones with abundant belemnites	
Triassic/Jurassic	Blue Lias Formation	Secondary A	Mudstone and Limestone, interbedded	
Triassic	Westbury Formation and Cotham Member (undifferentiated)	Secondary (undifferentiated)	Mudstone and limestone, interbedded	
	Blue Anchor Formation	Secondary (undifferentiated)	Mudstone	
	Branscombe Mudstone Formation	Secondary B	Mudstone	
	Mercia Mudstone	Secondary B	Mudstone and Halite-Stone	
	Mercia Mudstone Group	Secondary A	Sandstone	

** Secondary A – containing permeable layers capable of supporting water supplies but at a local scale rather than a strategic scale, these deposits can form an important source of baseflow to local watercourses.*

Secondary B – 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.

Secondary undifferentiated – strata of mixed characteristics that are a mix of unproductive strata and strata that may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

Unproductive strata - low permeability and negligible significance for water supply or watercourse base flow.

13.6.16 Groundwater vulnerability across the route of the proposed scheme predominantly varies between high and medium-high. Areas designated as high and medium-high can easily transmit pollution to groundwater and are characterised by high leaching soils and the absence of low permeability superficial deposits. The consequence of this is that operations and activities in these areas may (high areas) / are likely (medium-high areas) to require measures in addition to good practice pollution prevention in order to ensure that groundwater is not impacted.

13.6.17 In the vicinity of Ashill there is a small area of medium to low vulnerability aquifers, together with outcrops of unproductive strata. Areas designated as medium offer intermediate groundwater protection and areas identified as unproductive strata are associated with low permeability bedrock or superficial deposits that naturally offer protection to any underlying aquifers. Strata in this area have some to a high degree of natural protection from surface activities and therefore no additional measures would be required to ensure that groundwater is impacted.

13.6.18 SPZs are designated around groundwater abstraction points to protect the water quality of the abstraction from surface activities. There are no SPZs located within the study area.

13.6.19 The assessment of potential contamination risk to groundwater quality in the study area is provided in Chapter 9 Geology and Soils to this PEI Report.

Groundwater quality

13.6.20 The Environment Agency's online Water Quality Archive indicates that there are no groundwater monitoring points within the study area.

13.6.21 The Tone and North Somerset Streams WFD designated groundwater body underlies the north western end of the study area (from the M5 to West Hatch). It is currently classified as having poor water quality, this classification being associated with diffuse pollution from agricultural land use. The Dyrham Formation (North of Yeovil – Fragmented GWB) is not located within the 1km study area but lies directly to the south-east and is considered to potentially be in hydraulic connectivity with the proposed scheme. It currently is classified as having good water quality.

13.6.22 A significant proportion of the study area (from West Hatch to Illminster) is not designated as a WFD groundwater body and there is thus no groundwater quality data available.

Groundwater levels

13.6.23 There are no known groundwater level monitoring locations within the study area. Groundwater level monitoring will be undertaken as part of planned ground investigations in order to inform the assessments to be completed for the ES. The BGS have produced a groundwater flooding risk categorisation based on underlying geology and hydrogeological characteristics. The BGS classify the route of the proposed scheme as follows:

- The northernmost third – located in an area with the potential for groundwater flooding at the surface.
- Central third – located in an area with limited potential for groundwater flooding to occur or not considered to be prone to groundwater flooding.

- Southern third – located in an area with a mixture of classifications from not prone to groundwater flooding, to potential for groundwater flooding at the surface.

WFD waterbodies

13.6.24 The statutory objective of the WFD is to prevent deterioration of all water bodies at good or high status and to prevent waterbodies at less than good status from deteriorating further.

13.6.25 The WFD waterbodies in the study area are located within the South West River Basin District and are described in Table 13-8 and shown on Figure 13.5 Surface water WFD waterbodies and Figure 13.6 Groundwater WFD waterbodies.

Table 13-8 WFD waterbodies in the study area

WFD waterbody	Operational catchment	Overall status (Cycle 2 - 2019)	Future objective
Surface water			
Broughton Brook (South and West Somerset) (GB108052015420)	Tone	Poor	Good by 2027
Tone Ds Taunton (GB108052015482)	Tone	Moderate	Good by 2021
West Sedgemoor Main Drain (GB108052015450)	Parrett	Moderate	Moderate by 2015 (Achieved)
Fivehead River (GB108052015241)	Parrett	Moderate	Moderate by 2027
Ding (GB108052015180)	Parrett	Poor	Poor by 2015 (Achieved)
Isle – Cad Bk to Fivehead River (GB108052015220)	Parrett	Moderate	Good by 2027
Isle – Upper to conf Cad Bk (GB108052015190)	Parrett	Moderate	Moderate by 2015 (Achieved)
Groundwater			
Tone and North Somerset Streams (GB40802G806400)	South West GW	Poor	Good by 2027
Dyrham Formation – North of Yeovil – Fragmented GWB (GB40802G803700)	South West GW	Good	Good by 2015 (Achieved)

Designated sites with potential hydraulic connectivity to the proposed scheme

13.6.26 Table 13-9 lists the national and international designated sites that have a potential hydraulic connection to the watercourses and underlying groundwater receptors (identified as GWDTEs in line with DMRB LA 113 *Road drainage and the water environment*) located within the study area of the proposed scheme. These sites will also be addressed as part of the Habitats Regulations Assessment, as outlined in Chapter 8 Biodiversity of this PEI Report.

13.6.27 In addition to the statutory designated sites listed in Table 13-9, there are a number of non-statutory wildlife sites such as Local Wildlife Sites (LWS) within and adjacent to the proposed scheme. Some of these are associated directly with watercourses. Details of these are provided in Chapter 8 Biodiversity of this PEI Report.

13.6.28 Ashill Wood and Every's Copse are two ancient woodlands that lie to the east north-east of Ashill. Whilst not directly associated with any of the watercourses listed in Table 13-6, they are bordered by ditches which have the potential to be affected by the proposed scheme.

13.6.29 The assessment of designated sites, in terms of the impact of changes to hydrological conditions and water quality will be undertaken in accordance with DMRB LA 113 *Road drainage and the water environment* and will include the assessment of GWDTE. It will involve collaboration with the biodiversity and ecology team and informed by consultation with the Environment Agency and Natural England. Impacts and effects will be reported in the ES and will also take account of WFD compliance.

Table 13-9 Designated sites with potential hydraulic connectivity close to the proposed scheme

Designated site name	Designation [1]	Location (relative to the proposed scheme)	Surface water dependent (Y/N)	Associated water body	If Yes, relevant species/ habitats/ vegetation	Ground-water dependent (Y/N)	If Yes, relevant species/habitats/ vegetation
Curry and Hay Moors	SSSI	Approx. 3.5km north-east	Y	River Tone Broughton Brook Black Brook	Annually flooded grazing marshes and meadows which also support wintering birds. Important communities associated with ditches.	Y	Marsh and ditches
Somerset Levels and Moors	SPA & Ramsar	Approx. 3.5km north-east	Y	River Tone Broughton Brook Black Brook	Grassland, marshland, standing water and fen environments which supports diverse aquatic, flora and over-wintering bird populations	Y	Marshland and fen systems
Children's Wood/ Riverside Park	LNR	Approx. 500m west	Y	River Tone	Park with lake, open grassland and woodland habitats. Supports large numbers of bird and butterfly species as well as bats and otters	N	n/a
South Taunton Streams	LNR	Approx. 700m west	Y	Tributary of River Tone	Wetland habitats supporting wide range of flora and fauns including water voles, otters, bats and birds.	Y	n/a
North Moor	SSSI	Approx. 6.7km north-east	Y	River Tone	Nationally important grazing marsh and ditch system. Communities associated with peat, wet pastures and wet grasslands. Diverse aquatic communities and birdlife.	Y	Marshes, peat and wet grasslands
Somerset Levels	NNR	Approx. 10km northeast	Y	River Tone	Open water, lowland grassland habitats	N	n/a
Southlake Moor	SSSI	Approx. 10km north-east	Y	River Tone River Parrett	Nationally important grazing marsh and ditch system. Peaty soils with high water levels and winter flooding. Diverse aquatic communities. Also supports significant bird population and otters.	Y	Marsh and ditch system
West Sedgemoor	SSSI	Approx. 4.9km north-east	Y	West Sedgemoor Main Drain	Fields and meadows within complex of ditches and rhynes. Supports rich invertebrate populations and diverse flora as well as large numbers of wintering birds.	Y	Low-lying fields linked by ditch system

Designated site name	Designation [1]	Location (relative to the proposed scheme)	Surface water dependent (Y/N)	Associated water body	If Yes, relevant species/ habitats/ vegetation	Ground-water dependent (Y/N)	If Yes, relevant species/habitats/ vegetation
Barrington Hill Meadows	NNR/SSSI	1.7km south	Y	Veneer's Water	Molinia meadows on calcareous, peaty or clayey-silt laden soils	Y	Molinia meadows on calcareous, peaty or clayey-silt laden soils
West Moor	SSSI	9.6km north-east	Y	River Isle	Grazing marsh grasslands, aquatic plant communities,	Y	Grazing marsh grasslands
Wet Moor	SSSI/SPA/ Ramsar	13km north-east	Y	River Isle	Lowland wet grasslands and wetland habitats; wintering waterfowl, birds of international importance	Y	Lowland wet grasslands and wetland habitats
Ruttersleigh	SSSI	4.8km south-west	N	N/A	N/A	Y	Broadleaved woodland, scrub, bracken, mires and unimproved grass land
Prior's Park and Adcombe Wood	SSSI	7.8km west	N	N/A	N/A	Y	Marshy grassland
Deadman	SSSI	7.5km south-west	N	N/A	N/A	Y	Wet heath, bog pools, marshy grassland
Severn Estuary	SPA, Ramsar and SAC	Approx. 25km downstream along the Tone and the Parrett	Y	NA	Primarily designated for estuaries, mudflats and sandflats not covered by seawater at low tide and Atlantic salt meadow habitats	Y	

[1] SSSI – Site of Special Scientific Interest, SAC – Special Area of Conservation SPA – Special Protection Area, NNR – national nature reserve, LNR – local nature reserve

Abstractions and discharges

13.6.30 Abstractions and discharges located in the study are shown on Figure 13.3 Groundwater and surface water features.

13.6.31 There are two known groundwater abstraction points within the study area, both of which have two licences attributed to them. The first of the abstraction points on Henlade Estate Gardens has one licence for spray irrigation and another for potable use. The second abstraction point on Ashe Farm has two licences one for general farming and domestic and the other for general use. None of the abstractions fall within or adjacent to the red line boundary and therefore will not be assessed as there is no risk of potential impact.

13.6.32 There are 34 consented discharges within the study area, one of which has two licences associated with it. A total of 12 of the consented discharges fall within or adjacent to the red line boundary, as listed in Table 13-10, and will therefore be assessed in this report.

13.6.33 All identified features are assigned an importance value as outlined in Table 13-13.

Table 13-10 Discharge consents and abstraction locations to be included in the assessment

Receptor ID	Primary use of feature	Location (Grid reference)
Discharge consents		
DIS-001	Pumping Station on Sewerage Network (water company)	Stepley (ST266235)
DIS-002	Making of Glass/Ceramics/Cement/Cutting Stone	Thornfalcon (ST273239)
DIS-003	Holiday Accom/Camp Site/Caravan Site/Hotel/Hostel	Greenway Lane (ST270234)
DIS-004	Domestic property (single) (including farm house)	Mattock's Tree Hill (ST281232)
DIS-005	Holiday Accom/Camp Site/Caravan Site/Hotel/Hostel	West Hatch (ST286219)
DIS-006	WwTW/Sewage Treatment Works (water company)	Village Road (ST294218)
DIS-007	Domestic property (multiple) (including farm houses)	Capland Lane (ST305187)
DIS-008	Farms (not house)/ Crop + Animal Rearing/Plant Nursery	Neroche Farm (ST310182)
DIS-009	Domestic property (single) (including farm house)	Kenny (ST314178)
DIS-010	Making of Coke + Refined Petroleum Products	Ashill (ST317176)
DIS-011	WwTW/Sewage Treatment Works (water company)	Ashill A358 (ST322176)
DIS-012	Domestic property (multiple) (including farm houses)	Hastings Cross (ST329168)
Abstractions		
ABS-001	Spray irrigation – Direct	Henlade Estate Gardens (ST269244)
ABS-002	Drinking, cooking, sanitary, washing, (Small Garden) – Commercial/Industrial/Public Services	
ABS-003	General Farming and Domestic	Ashe Farm (ST279223)
ABS-004	General use for Industrial/Commercial/Energy/Public Services	

13.6.34 Details of private abstractions and potentially unlicenced abstractions are awaited and will be assessed in the ES.

Springs, issues and sinks

13.6.35 Springs, issues and sinks have been identified within the study area from interrogation of Ordnance Survey mapping. Those located in the study area are shown on Figure 13.3 Groundwater and surface water features.

13.6.36 Sinks represent a location where surface water enters a subsurface feature such as a culvert or land drainage pipe. However, it can also represent a point where a pathway is introduced between surface water and groundwater, where water 'sinks' into groundwater.

13.6.37 Issues are points where water emerges at the surface. This can be water discharging from a culvert, a land drainage pipe or from a formal drainage system but in some instances is groundwater emergence. Springs are defined as a specific form of issue where groundwater emerges at the surface.

13.6.38 All identified features have been assigned an importance value, but only features that lie within the red line boundary will be assessed and their importance value outlined in Table 13-12.

13.6.39 Within the study area, three springs have been identified. These features all have a receptor importance value of high as they are assumed to be issuing from superficial deposits linked to the Quaternary period (assigned a high importance value as per Table 13-12). None of the three springs are within the red line boundary and therefore will not be assessed unless there is a potential release of existing contaminants. This will be assessed in conjunction with Chapter 9 Geology and soils of the PEI Report.

13.6.40 Within the study area, 14 sinks have been identified. All 14 of the sinks identified can be attributed to either land or road drainage and therefore have all been assigned an importance value of low. Three sinks lie within the red line boundary (Table 13-11) and will therefore be assessed in Table 13-16.

Table 13-11 Sinks located within the study area

Receptor ID	Location with respect to the proposed scheme	Grid Ref
SINK-001	160m, south	ST270235
SINK-002	115m, north east	ST275236
SINK-003	Adjacent to existing A358	ST321176

13.6.41 Within the study area, 47 issues have been identified. 39 of the issues identified can be attributed to either land or road drainage and therefore have all been assigned an importance value of low (see Table 13-12). Eight of the issues have a clear and direct link to a watercourse and will be assessed and their importance values determined based on the watercourses that they feed (see Table 13-12).

Table 13-12 Issues located within the study area that directly feed watercourses

Receptor ID	Location with respect to the proposed scheme	Grid Ref	Linked watercourse
ISS-001	110m, south-west	ST261238	Black Brook Tributary 4
ISS-002	180m, south-west	ST276232	Black Brook Tributary 6
ISS-003	180m, south-west	ST2763232	Thornwater Stream
ISS-004	140m, south-west	ST275233	Thornwater Stream

Receptor ID	Location with respect to the proposed scheme	Grid Ref	Linked watercourse
ISS-005	290m, north-east	ST275238	Thornwater Stream
ISS-006	360m, south-west	ST307179	Fivehead River Tributary 5
ISS-007	780m, south-west	ST288191	Fivehead River Main Channel 1
ISS-008	0m (Caplands Link)	ST321177	Venner's Water

13.6.42 One issue (ST269234) cannot be attributed to drainage or linked to a watercourse and could therefore be a groundwater-surface water interaction. However, this issue is not within the red line boundary and will not be assessed as there is no risk of a potential impact.

Flood risk

13.6.43 The baseline flood risk conditions are discussed within the Preliminary FRA provided as Appendix 13.1 PEIR Flood Risk Assessment to this PEI Report.

Future baseline

Water quality

13.6.44 The current water quality for road drainage and water environmental are not expected to undergo any notable changes in the foreseeable future. Therefore, the current conditions are considered to provide the most reasonable basis for assessment

Flood risk

13.6.45 The following developments have the potential to introduce new flood risk receptors into the study area and, in combination with the works required for the proposed scheme, exacerbate the impacts of the proposed scheme on local flood risk:

- Application 17/03800/OUT – Erection of 25 dwellings and formation of access (outline) – Located in close proximity to areas of fluvial and surface water flood risk in vicinity of Ashill.
- Application 19/03418/FUL – Erection of 10 No. dwellings with garages and ancillary parking. – Located in close proximity to area of fluvial flood zone and surface water flood risk in Kenny.
- Application 20/03697/REM – Landscaping, ecological mitigation, surface and foul water drainage and cycle/footpath links associated with residential development - Located in close proximity to areas of fluvial and surface water flood risk in vicinity of Ashill.
- Application 19/00012/OUT – Outline planning application for the erection of flexible class buildings, dwellings and access - Noted that application site comprises of large area located adjacent to fluvial flood zone associated with River Isle.
- Application 19/03070/FUL – Erection of 25 No. dwellings along with associated vehicular access and landscaping - Noted that application is located adjacent to fluvial flood zone associated with the River Ding.

Importance of features

13.6.46 Table 13-13 summarises the assessment of the importance of water environment attributes to be assessed as part of the PEI Report in line with Table 13-3, and as per the methodology outlined in Section 13.3. The classifications presented are

the basis for the assessment. Biodiversity classifications are based upon the watercourses being within or supporting designated sites or the watercourses supporting protected species. An assessment of potential effects on individual species is presented in Chapter 8 Biodiversity of the PEI Report.

Table 13-13 Water environment receptors, attributes and importance

Receptor	Attribute/ features	Importance of receptor	Overall importance of receptor	Quality measure assigned to attribute
Surface water				
Broughton Brook	Water quality	High	High	Watercourse having a WFD classification shown in a RBMP and Q95 <1.0m^3/s
	Biodiversity	High		Supports water dependent nationally and internationally designated sites/habitats approximately 3.5 km downstream
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (M5) as per NPPF
Black Brook	Water quality	Medium	High	Watercourse not having a WFD classification and Q95 >0.001m^3/s
	Biodiversity	High		Supports water dependent nationally and internationally designated sites/habitats approximately 3.5 km downstream
	Flood risk	Very High	More vulnerable	Maximum vulnerability of flood risk receptor is more vulnerable as per NPPF
Black Brook Tributaries 1 to 3	Water quality	Medium	Medium	Watercourse not having a WFD classification and Q95 > 0.001m^3/s
	Biodiversity	Medium		Aquatic habitat supports protected species
Black Brook Tributary 1 to 2	Flood risk	Medium	Medium	Maximum vulnerability of flood risk receptors are less vulnerable as per NPPF
Black Brook Tributary 3	Flood risk	High	High	Maximum vulnerability of flood risk receptors are more vulnerable as per NPPF
Black Brook Tributaries 4 to 6	Water quality	Medium	Medium	Watercourse not having a WFD classification and Q95 > 0.001m^3/s
	Flood risk	Medium	Medium	Maximum vulnerability of flood risk receptors are less vulnerable as per NPPF
River Tone	Water quality	High	High	Watercourse having a WFD classification shown in a RBMP and Q95 <1.0m^3/s
	Biodiversity	High		Supports water dependent nationally and internationally designated sites/habitats approximately 3.5 km downstream
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (Bristol to Exeter (rail line) as per the NPPF
Thornwater Stream	Water quality	Medium	Medium	Watercourse not having a WFD classification and Q95>0.001m^3/s

Receptor	Attribute/ features	Importance of receptor	Overall importance of receptor	Quality measure assigned to attribute
	Conveyance of flow			
	Biodiversity	Medium		Aquatic habitat supports protected species
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (A358) as per NPPF
River Tone Tributaries 2 to 6	Water quality	Low	Low	Watercourse not having a WFD classification and Q95 ≤0.001m^3/s
	Flood risk	NA	NA	Covered by Flood Zone associated with River Tone
Meare Stream	Water quality	High	High	Watercourse having a WFD classification shown in a RBMP and Q95 <1.0m^3/s
	Biodiversity	High		Supports water dependent nationally designated site/habitats approximately 5 km downstream
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (A358) as per NPPF
Meare Stream Tributary 1	Water quality	Medium	Medium	Watercourse not having a WFD classification and Q95 > 0.001m^3/s
	Flood risk	High	High	Maximum vulnerability of flood risk receptor is more vulnerable as per NPPF
Fivehead River Main Channel 1	Water quality	High	High	Watercourse having a WFD classification shown in a RBMP and Q95 <1.0m^3/s
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (A358) as per NPPF
Fivehead River Tributaries 1 to 5	Water quality	Low	Low	Watercourse not having a WFD classification and Q95 ≤0.001m^3/s
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (A358) as per NPPF
Fivehead River Main Channel 2	Water quality	High	High	Watercourse having a WFD classification shown in a RBMP and Q95 <1.0m^3/s
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (A358) as per NPPF
Venner's Water	Water quality	Medium	Medium	Watercourse not having a WFD classification and Q95 >0.001m^3/s
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (A358) as per NPPF
Cad Brook drainage network	Water quality	Medium	Medium	Watercourse not having a WFD classification and Q95 >0.001m^3/s
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (A358) as per NPPF

Receptor	Attribute/ features	Importance of receptor	Overall importance of receptor	Quality measure assigned to attribute
Cad Brook	Water quality	Medium	Medium	Watercourse not having a WFD classification and Q95 >0.001m^3/s
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (A358) as per NPPF
River Isle drainage network and tributary 1	Water quality	Low	Low	Watercourse not having a WFD classification and Q95 ≤0.001m^3/s
	Flood risk	Medium	Medium	Maximum vulnerability of flood risk receptor is less vulnerable as per NPPF
River Ding	Water quality	High	High	Watercourse having a WFD classification shown in a RBMP and Q95 <1.0m^3/s
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (A358) as per NPPF
River Ding Tributaries 1 and 2	Water quality	Medium	Medium	Watercourse not having a WFD classification and Q95>0.001m^3/s
	Flood risk	Medium	Medium	Maximum vulnerability of flood risk receptor is less vulnerable as per NPPF
Back Stream	Water quality	Medium	Medium	Watercourse not having a WFD classification and Q95 >0.001m^3/s
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (A358) as per NPPF
River Isle	Water quality	High	High	Watercourse having a WFD classification shown in a RBMP and Q95 <1.0m^3/s
	Biodiversity	High		Supports water dependent nationally designated site/habitats approximately 13km downstream
	Flood risk	Very High	Very High	Maximum vulnerability of flood risk receptor is Essential Infrastructure (A303) as per NPPF
Groundwater				
Quaternary deposits: Secondary aquifers (undifferentiated) Secondary A aquifers	Water supply/ quantity	Medium	High	No groundwater SPZs within study area. Small number of non-potable abstractions
	Vulnerability	High		Medium to high vulnerability within study area
	Biodiversity/ Conveyance of flow	High		Strata associated with multiple water dependent locally, nationally and internationally designated site/habitats within study area
Triassic/Jurassic sequence: Secondary aquifers (undifferentiated)	Water supply/ quantity	Medium	Medium	No groundwater SPZs within study area. Small number of non-potable abstractions
	Vulnerability	Medium		Medium to high vulnerability within study area, with small areas of low vulnerability and unproductive strata in the vicinity of Ashill

Receptor	Attribute/ features	Importance of receptor	Overall importance of receptor	Quality measure assigned to attribute
Secondary A aquifers Secondary B aquifers	Biodiversity/ Conveyance of flow	Medium		Strata associated with multiple water dependent locally and nationally designated site/habitats within study area
Discharges				
DIS-001	N/A	N/A	High	Discharge part of a sewage network and is therefore of high importance as it cannot be easily relocated
DIS-002	N/A	N/A	High	Discharge point related to industrial use and therefore large volumes of low quality water are expected and would be difficult to move
DIS-003	N/A	N/A	Medium	Discharge related to a holiday accommodation site and could have significant volumes of water making the point difficult to move
DIS-004	N/A	N/A	Low	Discharge related to an individual farm which is only of localised importance and most likely discharging low volumes of water.
DIS-005	N/A	N/A	Medium	Discharge related to a holiday accommodation site and could have significant volumes of water making the point difficult to move
DIS-006	N/A	N/A	High	Discharge part of a sewage treatment works and is therefore of high importance as it cannot be easily relocated
DIS-007	N/A	N/A	Medium	Discharge point linked to multiple properties with an associated increase in discharge volume making the point inconvenient to relocate.
DIS-008	N/A	N/A	Medium	Discharge point linked to multiple properties with an associated increase in discharge volume making the point inconvenient to relocate.
DIS-009	N/A	N/A	Low	Discharge related to an individual farm which is only of localised importance and most likely discharging low volumes of water.
DIS-010	N/A	N/A	High	Discharge point related to industrial use and therefore large volumes of low quality water are expected and would be difficult to move
DIS-011	N/A	N/A	High	Discharge part of a sewage network and is therefore of high importance as it cannot be easily relocated
DIS-012	N/A	N/A	Medium	Discharge point linked to multiple properties with an associated increase in discharge volume making the point inconvenient to relocate.
Sinks				

Receptor	Attribute/ features	Importance of receptor	Overall importance of receptor	Quality measure assigned to attribute
SINK-001	N/A	N/A	Low	Presence of sinks attributed to either land or road drainage and therefore are of local importance.
SINK-002	N/A	N/A	Low	
SINK-003	N/A	N/A	Low	
Issues				
ISS-01	N/A	N/A	Medium	Importance value attributed based on watercourse that issue discharges to.
ISS-02	N/A	N/A	Medium	
ISS-03	N/A	N/A	Medium	
ISS-04	N/A	N/A	Medium	
ISS-05	N/A	N/A	Medium	
ISS-06	N/A	N/A	Low	Importance value attributed based on the fact that the issue is linked to either land or road drainage
ISS-07	N/A	N/A	High	Importance value attributed based on watercourse that issue discharges to
ISS-08	N/A	N/A	Medium	

13.7 Potential impacts

Construction impacts

13.7.1 During construction, there is the potential for the proposed scheme to impact on flood risk, surface water and groundwater quality and WFD waterbodies.

13.7.2 The potential impacts to the road drainage and water environment during construction are outlined below (note that there are a number of synergies with the potential impacts discussed in Chapter 8 Biodiversity and Chapter 9 Geology and soils):

- Release of sediment and construction related pollutants (e.g. fuels, lubricants, alkaline materials such as concrete and cement and waterproofing materials), particulates, chemicals (as a result of accidental spills) and other materials into the local watercourses during routine construction activities affecting surface water quality.
- Creation of pollution pathways, for example through the installation of piling, to the surface water and groundwater receptors including WFD waterbodies.
- Mobilisation of groundwater contaminants, remaining from historical and associated with current industrial and agricultural land use, as a result of earthworks activities or below ground works.
- Increase in surface water and fluvial flood risk due to an increase in the volume and rate of water reaching watercourses and a decrease in groundwater recharge associated with an increase in the extent of impermeable surface area.
- Increase in surface water and fluvial flood risk as a result of storage of construction materials and construction activities in areas of high flood risk currently used as flood storage (Flood Zones 2 and 3 and area identified to be at risk of surface water flooding by the Environment Agency's Risk of Flooding from Surface Water (RoFSW) mapping.

- Disruption of existing surface water and groundwater flow paths due to construction activities. Specifically, earthworks activities and installation of buried structures such as foundations.
- Reduction in groundwater levels, disruption to existing groundwater flows and damage to existing groundwater abstractions as a result of the introduction of cuttings or shallow earthworks and dewatering of underlying geological strata to facilitate excavation.
- Impacts to the hydromorphological and ecological quality of watercourses associated with works within or in close proximity to watercourses, including physical change to the watercourses and longer-term changes due to sediment deposition (and any associated contaminants within that sediment).
- Damage and disruption to existing pipe, culverts, bridges and other hydraulic structures present within the study area.
- Displacement/removal of groundwater surface water features such as abstraction and discharge points and sinks, springs and issues as a result of construction. It is assumed that any features removed as a result of the proposed scheme will be replaced like-for-like.

13.7.3 The key impacts to the road drainage and water environment associated with the construction of the proposed scheme are related to working in and around watercourses.

13.7.4 These impacts have the potential to affect all the watercourses identified to be spanned by the proposed scheme as well as the other watercourses identified to be located within land required for construction of the proposed scheme. Watercourses that are not crossed or within the land required for construction will not be routinely assessed unless a specific impact is identified.

13.7.5 There may also be impacts to channel form through plant movements and operations. All works close to watercourses should be carefully designed and supervised.

13.7.6 Groundwater related impacts are likely to be of less magnitude as there are no deep cuttings, excavations or deep sub surface structures proposed that could have result in large scale changes in groundwater flow, level or yield. However, there is still a risk of construction activities introducing localised pathways to more vulnerable groundwater receptors following shallower excavations and impacts to features such as springs and issues from groundwater and sinks to groundwater located within the land required by the proposed scheme.

Operational impacts

13.7.7 During operation, there is the potential for the proposed scheme to impact on flood risk, surface water and groundwater quality and WFD waterbodies.

13.7.8 The potential impacts of the proposed scheme on road drainage and water environment during operation are outlined below:

- Release of routine highway runoff to surface water receptors affecting surface water quality and indirectly aquatic habitats, abstractions and discharges. These may include hydrocarbons, particulates and maintenance materials.
- Increased surface and fluvial flood risk as a result of permanent impingement in areas of high flood risk currently used as flood storage (Flood Zones 2 and 3 and areas identified to be at risk of surface water flooding identified by RoFSW mapping).

- Reduced infiltration and increased surface water runoff due to increased impermeable surfaces.
- Changes to existing surface water flow paths including both overland flow routes (associated with cuttings and embankments) and changes to alignment of existing watercourses and land drainage features.
- Modifications to baseline watercourse hydromorphology on watercourses that require new bridge/culvert structures, extension of existing bridge/culverts and where diversion and/or realignments are required, such as the Black Brook Tributary 3 and Back Stream. These impacts have the potential to impact on WFD status and future objectives on the affected watercourses.
- Displacement/removal of groundwater surface water features such as abstraction and discharge points and sinks, springs and issues.

13.7.9 As with the construction stage, the key impacts to the road drainage and water environment associated with the construction of the proposed scheme are related to working in and around watercourses.

13.7.10 Finally, the physical changes to watercourses in terms of new culverts and bridge, extension of existing culverts and bridges and works to channels will cause permanent changes to channel hydromorphology and associated ecological receptors. Potential impacts on ecological receptors are described in Chapter 8 Biodiversity of the PEI Report.

13.7.11 Existing structures over Broughton Brook and Black Brook are to be reconfigured as a result of changes to Nexus roundabout. The existing structures at Meare Stream, Meare Stream Tributary 1, Venner's Water, Fivehead River Tributary 3, Fivehead River Tributary 5, Cad Brook drainage network, Cad Brook and River Ding (Ding Mill culvert) are to be extended.

13.7.12 New culvert crossings of Black Brook Tributary 1 and 2 and Thornwater Stream will be constructed, and new bridge crossings will be required for Fivehead River Main Channel 1 and 2 and Back Stream.

13.7.13 In addition to these structures, the proposed scheme would involve a major diversion of Black Brook Tributary 3 and a major realignment of Back Stream. In addition, small realignments of Thornwater Stream, Fivehead River Main Channel 2, Venner's Water and Cad Brook.

13.7.14 Installation of structures and channel works would potentially result in a loss of existing bed, banks and existing hydromorphological features associated with the existing channels. These in turn may result in the loss of associated habitat niches. Potential ecological impacts are assessed in Chapter 8 Biodiversity.

13.7.15 There may be opportunities to deliver enhancement through the design of the diverted and realigned channels.

13.7.16 As with the construction stage groundwater related impacts are likely to be of less magnitude as there are no deep cuttings, excavations or deep sub surface structures proposed.

13.8 Design, mitigation and enhancement measures

Construction mitigation

13.8.1 The EMP, to be provided as part of the ES, will include measures that are considered standard good practice to be implemented by the construction

contractor to reduce the likelihood of impacts, or their magnitude if they were to occur. The EMP will include ground and surface water monitoring plans.

13.8.2 Requirements for monitoring will be derived during the detailed design phase.

13.8.3 The standard measures to be included in the EMP will be based on the Environment Agency guidance on pollution management (introduced to replace the *Pollution Prevention Guidelines* (PPG) withdrawn in 2015 and consistent with the *Guidance for Pollution Prevention*[3]) and relevant CIRIA publications and best practice measures outlined in the PPGs replacement series, *Guidance for Pollution Prevention* (GPP).

13.8.4 Examples of standard practice mitigation measures that will be included in the EMP include the provision of spill kits, restricting site traffic to dedicated haul roads and ensuring hard-standing areas are regularly swept and maintained.

13.8.5 Works would also be carried out in accordance with any additional permitting requirements, for example Ordinary Watercourse Consent. Land drainage consents will be obtained from the LLFA, and will include information on all works, including temporary works, methodology and permanent design approval.

13.8.6 Measures that are non-standard or site-specific are described below and these would be incorporated into the contractor's construction method statement.

13.8.7 Site-specific measures would include:

- A surface water management system using measures such as temporary silt fencing, cut off ditches, settlement ponds and bunds set up early in the construction period to capture all runoff and prevent ingress of sediments and contaminants into existing drainage ditches where necessary. This would be managed by the EMP in accordance with CIRIA guidelines and the Environment Agency's approach to groundwater protection and groundwater protection guidelines.
- Water with a higher risk of contamination which requires discharge, including groundwater abstracted out of piles during concrete pouring, would be contained and treated using appropriate measures such as coagulation of sediments, dewatering and pH neutralisation prior to discharge. The discharge of water with a higher risk contamination would be regulated via environment permits issued by the Environment Agency.
- Areas of exposed sediment deemed at risk of erosion during heavy rainfall or flood inundation should be protected using either temporary measures (e.g. sheeting) or semi-permanent measures (for example coir matting) until vegetation is able to establish on these surfaces.
- Works would be suspended during out-of-bank river flows or during intense rainstorms.
- A water quality monitoring programme prior to and during construction works would be agreed with Environment Agency
- Consideration of local groundwater catchment and flow regimes that may be affected by dewatering and discharging abstracted water to the same groundwater catchment, down gradient.

[3] It is recognised that whilst the *Guidance for Pollution Prevention* is not formally supported by the Environment Agency, it does provide an industry accepted approach and is thus considered appropriate to consider at this stage.

- Discharge from dewatering activities such as earthworks, works within a floodplain or within eight metres of a watercourse will have a tailored risk assessment, consent and licences from the Environment Agency. Dewatering abstractions may also require transfer licences from the Environment Agency.

13.8.8 Good practice guidance will also be implemented during construction, including:

- DMRB LA 113 *Road drainage and the water environment* [1] and CC501 *Design of highway drainage systems.* [20]
- *SuDS Manual* (C753) CIRIA (2015). [21]
- *Control of water pollution from construction sites: Guidance for consultants and contractors* (C532) CIRIA. (2001)
- Environment Agency guidance on pollution prevention, reporting environmental incidents, discharging to surface and groundwater, managing water on land and working on or near water.

Operational mitigation

13.8.9 A preliminary surface water drainage design for the proposed scheme has been developed in accordance with DMRB CG501 *Design of highway drainage systems* [22] and DMRB LA 113 *Road drainage and the water environment* [1] and in line with best practice for sustainable drainage design. This provides appropriate measures to attenuate and treat (including pollution control devices where necessary) surface water runoff from the proposed scheme.

13.8.10 In addition, the preliminary scheme design implements the following measures in relation to watercourse crossings to minimise impacts on the affected surface watercourses:

- New crossings of watercourses would be minimised and only implemented where essential.
- The length of crossings along the watercourse would be kept to a minimum.
- The width and height would be based on existing crossings to maintain baseline conditions, although an iterative assessment process would be applied so that impacts in terms of flood risk, water quality and hydro-geomorphology can be reduced as far as it technically feasible.
- Any new crossings (including clear span bridges or culverts) would be designed to minimise effects on the existing flow regime and hydro-geomorphological conditions of the channel.

13.8.11 Channel diversions and realignments have been designed to match existing conditions (as far as possible) to maintain existing flood risk, water quality and hydro-geomorphological conditions.

13.8.12 Replacement floodplain storage has been incorporated into the preliminary scheme design at locations where existing floodplain is lost due to the creation of the proposed scheme.

Enhancement

13.8.13 In line with DMRB LA 113 *Road drainage and the water environment* [1], enhancement opportunities have been considered jointly with the biodiversity, landscaping, soils and geology and drainage design teams in relation to water quality, hydro-geomorphology and habitat quality, improvements to WFD waterbodies, flood risk and resilience to climate change. All environmental enhancement opportunities will be reported in the ES.

13.8.14 Measures that help reduce local flood risk and enhance hydro-geomorphology, habitat establishment and biodiversity will be discussed with the relevant consultee, including Highways England, Environment Agency and Natural England.

13.8.15 Such measures have been considered in the preliminary design of the diversion of Black Brook 3 and Back Stream. Sinuosity has been introduced into the planform of the alignments. It is also proposed that newly created channels display multi form cross sections that vary along the length of the diversion/realignment. In this way depth/velocity variations will form encourage ecological niches to establish. This can be further enhanced through the planting regime and by introducing granular bed material. The design of these channel alignment changes will be developed and informed by fluvial hydraulic analysis, which will also take account of sediment transport characteristics.

13.8.16 The existing channel of the Fivehead River Main Channel 1 is a concrete lined channel at the existing bridge crossing and so is considered ‘channelised’. The channelisation extends up and downstream of the existing bridge. It has been proposed to remove some of the existing concrete channel and to establish natural bed and banks, not only within both the existing and the new bridges but also away from these structures. This will have a beneficial impact on local hydromorphology and the establishment of associated ecological habitats.

13.8.17 Furthermore, the following watercourses have been identified where there is the potential to implement channel enhancements. This would include reprofiling the channel to provide a more sinuous planform and creating multi form cross sections so that natural depth/velocity variation can become established and to encourage habitat niches to form. The locations identified are along the following watercourses:

- Fivehead River Tributary 3
- Fivehead River Tributary 5
- Cad Brook

13.8.18 Opportunities to enhance local conditions, such as removing existing structures or sections of heavily modified channel, will continue to be identified and reviewed as part of the design development process

13.9 Assessment of likely significant effects

13.9.1 The potential effects of construction activities and operation of the proposed scheme have been reviewed in the context of the existing baseline information described within this chapter. Potential environmental impacts associated with drainage and the water environment (groundwater and surface water) have been identified in Table 13-14 and are assessed in Table 13-15 (construction) and in Table 13-16 (operation). The assessment is preliminary, based upon currently available information and professional judgement. At this point a precautionary view has been taken, however, these effects could reduce as the EIA process progresses. The preliminary assessment presented in Table 13-15 and Table 13-16 will be updated within the ES.

Construction effects

13.9.2 The following watercourses are situated within the study area but are upstream of the proposed scheme. They have therefore been scoped out of the assessment of potential impacts associated with the construction phase:

- Fivehead River Tributaries 1 and 4
- River Ding Tributary 1

13.9.3 The following watercourses are situated within the study area but are sufficiently downstream of the proposed scheme that any direct impacts associated with the construction phase are considered highly unlikely to give rise to significant effects; they have therefore been scoped out of the assessment:

- River Tone
- River Tone Tributaries 2-6
- Fivehead River Tributary 2
- River Ding Tributary 2
- River Isle

13.9.4 The remaining watercourses within the study area have the potential to be directly or indirectly affected by the impacts outlined in 13.7.2.

13.9.5 The majority of the potential construction stage impacts as identified in 13.7 can be adequately dealt with by applying the mitigation measures that will be contained in the EMP (see paragraph 13.8.4) or the site specific measures outlined in 13.8.7. This means that the impacts related to the following activities can be limited to **negligible** at all locations:

- Release of sediment and construction related pollutants;
- Creation of pollution pathways
- Mobilisation of groundwater contaminants;
- Localised increase in surface water runoff and associated decrease in groundwater recharge;
- Increase in surface water and fluvial flood risk; and
- Reduction in groundwater levels.

13.9.6 This will result in **neutral effects** at the following **moderate or low importance** receptors:

- Black Brook Tributaries 1 to 6
- Thornwater Stream
- Meare Stream tributary 1
- Fivehead River Tributaries 1 to 5
- Venner's Water
- River Isle drainage network
- Cad Brook drainage network
- Cad Brook
- Back Stream

13.9.7 This magnitude of impact will result in **slight adverse, not significant effects** at the following **high importance** receptors:

- Broughton Brook
- Black Brook

- Meare Stream
- Fivehead River Main Channel 1
- Fivehead River Main Channel 2
- River Ding

Table 13-14 Identification of activities affecting each receptor

Feature / receptor	Overall receptor value	General description of activities affecting each receptor				
		Details of works associated with watercourses	Online carriageway construction	Offline carriageway construction	Direct Interaction with Watercourse	Fluvial and/or surface water floodplain
Broughton Brook	High	Reconfiguration of existing bridge		✓	✓	✓
Black Brook	High	Reconfiguration of existing newly built culvert and watercourse diversion to facilitate		✓	✓	✓
Black Brook Tributaries 1	Medium	New culvert and slight watercourse channel realignment		✓	✓	✓
Black Brook Tributaries 2	Medium	New culvert and watercourse diversion		✓	✓	✓
Black Brook Tributaries 3	Medium	Major diversion and transfer of water into Black Brook Tributaries 2		✓	✓	✓
Black Brook Tributaries 4-6	Medium	No construction works but watercourses within potential construction activity area				
Groundwater feature	Medium	Cutting at Henlade		✓		
Thornwater Stream	Medium	New culvert and slight watercourse channel realignment		✓	✓	✓
Groundwater feature	High/Medium	Cutting at Mattocks Tree junction		✓		
Meare Stream	High	Culvert extension	✓		✓	✓
Groundwater feature	Medium	Cutting north of Griffin Lane	✓			
Meare Stream Tributary 1	Medium	Bridge extension	✓			✓
Groundwater feature	High/Medium	Cutting at Bickenhall	✓			
Fivehead River Main Channel 1	High	New bridge	✓		✓	✓
Fivehead River Tributary 3	Low	Culvert extension				✓
Fivehead River Main Channel 2	High	New bridge	✓		✓	✓
Fivehead River Tributary 5	Low	Culvert extension	✓		✓	✓
Venner's Water	Medium	Extension of existing bridge, construction of new bridge and slight watercourse realignment	✓		✓	✓
Cad Brook drainage network	Medium	Culvert extension	✓		✓	
Cad Brook	Medium	Bridge extension and new culvert	✓		✓	✓
River Isle drainage network & tributary 1	Low	Inflows from junction and side roads	✓			✓
River Ding	High	Culvert extension	✓		✓	✓
Back Stream	Medium	Construction of new bridge and channel diversion		✓	✓	✓

Table 13-15 Preliminary assessment of construction effects

Applicable scenarios	Relevant water features (from Table 13-14)	Potential impacts	Duration	Direct/ indirect	Magnitude	Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[4]	Conclusion
Surface water									
Works within close proximity (<400m) from watercourses (online/offline)	All watercourses	Creation of pollution pathways to the surface water from potentially contaminated soils	Temporary/ short-term	Direct	Minor adverse	All construction activities to be completed in compliance with EMP which will include items such as: • Management of chemicals and fuels; • Sediment/surface water run-off control; • Storage of materials; • Dewatering design plus management protocol; • Piling risk assessments (where included in final design); and • Working near watercourses protocol.	Negligible	Neutral	No significant effects predicted
		Release of sediment, silt and construction related pollutants (e.g. fuels, lubricants and waterproofing materials) and particulates into the local watercourses	Temporary/ short-term	Direct	Minor adverse		Negligible	Slight	No significant effects predicted
Works within surface water or fluvial floodplain	Broughton Brook Black Brook Tributaries 1-3 Thornwater Stream Meare Stream Meare Stream Tributary 1 Fivehead River Main Channel 1 Fivehead River Tributary 3 Fivehead River Main Channel 2 Fivehead River Tributary 5 Venner's Water Cad Brook River Isle drainage network & tributary 1 River Ding Back Stream	Localised increase in surface water runoff as a result of an increase in impermeable surface area (both existing road and newly constructed carriageway would be in existence, and also area of bare soil would be increased) resulting in an increase in surface water and fluvial flood risk	Medium-term	Indirect	Negligible		Negligible	Slight	No significant effects predicted
		Increase in surface water and fluvial flood risk as a result of storage of construction materials in areas of flood risk	Medium-term	Indirect	Negligible		Negligible	Slight	No significant effects predicted
		Disruption of existing surface water flow paths due to construction activities	Medium-term	Direct	Minor adverse		Negligible	Slight	No significant effects predicted
Works with direct interaction with watercourse	Black Brook Tributaries 1-3 Thornwater Stream Meare Stream Fivehead River Main Channel 1 Fivehead River Main Channel 2 Fivehead River Tributary 5 Venner's Water Cad Brook drainage network Cad Brook	Damage and disruption to existing culvert and hydraulic structures present along watercourses on the existing A358 route	Temporary/ short-term	Direct	Negligible		Negligible	Slight	No significant effects predicted
		Disruption to hydromorphology and condition of existing banks and channels of watercourses crossed by the existing A358 route	Temporary/ short-term	Direct	Moderate adverse		Minor adverse	Slight	No significant effects predicted

[4] The residual significance of effect has been determined based on the receptor identified as having the highest environmental importance.

Applicable scenarios	Relevant water features (from Table 13-14)	Potential impacts	Duration	Direct/ indirect	Magnitude	Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[4]	Conclusion
	River Ding Back Stream								
Groundwater features									
Works intercepting groundwater table (e.g. cutting excavation)	Triassic/Jurassic sequence: Secondary aquifers	Reduction in groundwater levels and disruption to existing groundwater flows as a result of dewatering of underlying geological strata to facilitate excavation and construction of cuttings.	Temporary/ short-term	Direct	Negligible		Negligible	Neutral	No significant effects predicted
		Disruption or damage to existing groundwater abstractions as a result of dewatering of underlying geological strata to facilitate excavation and construction of cuttings. One small scale groundwater abstraction approximately 0.5km from cutting at Mattocks Tree, sourced from the Mercia Mudstone Formation.	Temporary/ short-term	Direct	Negligible		Negligible	Neutral	No significant effects predicted
		Disruption of existing groundwater flow paths due to construction activities. No springs, sinks or issues associated with Triassic/Jurassic strata located within footprint of any proposed cutting.	Temporary/ short-term	Direct	Negligible		Negligible	Neutral	No significant effects predicted
	Quaternary deposits of Secondary aquifers	Reduction in groundwater levels and disruption to existing groundwater flows as a result of dewatering of underlying geological strata to facilitate excavation and construction of cuttings.	Temporary/ short-term	Direct	Negligible		Negligible	Slight	No significant effects predicted
		Disruption or damage to existing groundwater abstractions as a result of dewatering of underlying geological strata to facilitate excavation and construction of cuttings. No abstractions from Quaternary deposits within vicinity of proposed cuttings.	Temporary/ short-term	Direct	No change		Neutral	Neutral	No significant effects predicted
		Disruption of existing groundwater flow paths due to construction activities. No springs, sinks or issues associated with Quaternary strata located within footprint or within 200m of any proposed cutting.	Temporary/ short-term	Direct	Negligible		Negligible	Slight	No significant effects predicted
Works within areas of high risk of groundwater flooding		Potential for disruption to construction activities in the event of groundwater flooding.	Temporary/ short-term	Direct	Negligible		Negligible	Slight	No significant effects predicted
Discharges									
Works with direct interaction with consented discharge located	DIS-002 DIS-005 DIS-007 DIS-008	Temporary damage or temporary loss of discharge during construction	Medium-term	Direct	Moderate adverse	All construction activities to be completed in compliance with EMP which will include measures to provide alternative discharging arrangements for affected discharges.	Minor adverse	Slight	No significant effects predicted

Applicable scenarios	Relevant water features (from Table 13-14)	Potential impacts	Duration	Direct/ indirect	Magnitude	Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[4]	Conclusion
within or adjacent to red line boundary	DIS-011								
No direct works to consented discharge located within or adjacent to red line boundary	DIS-001 DIS-003 DIS-004 DIS-006 DIS-009 DIS-010 DIS-012	No direct impacts identified that will affect consented discharges	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
Sinks									
Works with direct interaction with sinks located within red line boundary	SINK-001 SINK-002 SINK-003	Temporary damage to sink during construction	Medium-term	Direct	Moderate adverse	All construction activities to be completed in compliance with EMP which will include measures to avoid impacts on sinks.	Minor adverse	Slight	No significant effects predicted
Issues									
Works with direct interaction with issues with a direct link to watercourses located within the study area	ISS-05 ISS-08	Temporary damage to issue during construction	Medium-term	Direct	Moderate adverse	All construction activities to be completed in compliance with EMP which will include measures to avoid impacts on issues.	Minor adverse	Slight	No significant effects predicted
No direct works to issues with a direct link to watercourses located within the study area	ISS-01 ISS-02 ISS-03 ISS-04 ISS-06 ISS-07	No direct impacts identified that will affect issues	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted

Operational effects

13.9.8 The potential operational impacts of the proposed scheme on watercourses and groundwater features are assessed in Table 13-16.

13.9.9 The impacts and effects associated with routine runoff of highway drainage have been assessed to be **negligible** based on the implementation of the drainage strategy. This will ensure that the existing rate, volume and quality of discharges of surface water to receiving watercourses is maintained.

13.9.10 Potential impacts and effects associated with the proposed scheme impinging on floodplain and spanning watercourses either with new bridges or culverts or extensions have been addressed in the preliminary scheme design through appropriate sizing of structures to account for the 1 in 100 year return period flow plus an allowance for climate change and through the provision of floodplain compensation. Therefore, at this preliminary scheme design stage it is assumed that fluvial flood risk impacts are negligible. This will be examined detail in the following stages of design informed by fluvial hydraulic modelling. The assessment of flood risk will be discussed in the Final FRA. Flood risk impacts will be assessed against the flood risk receptors identified in the Preliminary FRA.

13.9.11 The assessment of impacts related to changes in hydromorphology has entailed examining whether the proposed structures (e.g. culverts and/or bridges), realignment or diversion can be constructed without damaging the existing channel and then determining the percentage of the channel damaged compared to the total length of the channel (measured from source to nearest downstream confluence). Impacts on hydrogeomorphology are permanent and are therefore reported as operational effects. The preliminary design of the proposed structure, reinstatement of the existing channel and the nature of the proposed channel have been considered as mitigation to determine the assessment of residual effects.

13.9.12 This assessment has determined that new bridges, culverts and extensions to existing structures proposed at the following receptors will have a negligible impact related to changes in hydromorphology:

- Broughton Brook
- Black Brook
- Thornwater Stream
- Meare Stream
- Fivehead River Main Channel 1
- Fivehead River Main Channel 2
- Fivehead River Main Tributary 3
- Fivehead River Main Tributary 5
- Venners Water
- Cad Brook
- River Ding

13.9.13 However, greater magnitudes of impact in relation to hydromorphology and direct works to watercourse channels have been identified for the receptors discussed below.

13.9.14 A new culvert is proposed to span Black Brook Tributary 1. Culvert sizing and good practice design has been applied to the structure. Therefore, the natural bed and bank will be able to be reinstated. However, the construction process will still affect the hydromorphology of approximately 30m of the existing channel. The overall length of Black Brook 1 is approximately 2km. Therefore, approximately 1.5% the existing channel is affected. This is considered a **minor impact** to a **medium value receptor** leading to a **slight adverse, not significant effect**.

13.9.15 A new culvert is also proposed to span Black Brook Tributary 2 for the main A358 carriageway. Immediately downstream a proposed maintenance access track is proposed to span the watercourse and finally there is a proposed realignment of the channel at the culvert approach of approximately 200m. The construction process will still affect the hydromorphology of approximately 230m of the existing channel. The overall length of Black Brook 2 is only 600m. Therefore, approximately 30% the existing channel is affected. However, as with Black Brook Tributary 1, good practice design has been applied to the proposed culverts and the realignment has been designed to maintain existing gradient while seeking to improve flow variation across and along the

channel in order to improve aquatic biodiversity. Therefore, with mitigation, the magnitude of impact is **minor** to a **medium value receptor** leading to a **slight adverse, not significant effect.**

13.9.16 Black Brook Tributary 3 is being diverted approximately 300m to the west as the existing channel is being crossed by the proposed embankment. This results in a direct loss of 170m of existing channel which is approximately 15% of the total channel length from its existing source to the Black Brook Tributary 2. However, the proposed diversion has been designed to maintain existing gradient while seeking to improve flow variation across and along the channel in order to improve aquatic biodiversity. With correct planting and management this could result in localised benefits. Therefore, with mitigation, the magnitude of impact is **minor** to a **medium value receptor** leading to a **slight beneficial, not significant effect**.

13.9.17 At Back Stream a new bridge and channel realignment works affect approximately 330m of the existing channel. This is approximately 5% of the existing channel from source to nearest downstream confluence. However, taking account of the bridge and channel realignment design principles and the retention of a section of the existing channel downstream of the proposed scheme as a backwater area it is considered that with this mitigation there could be beneficial impacts and the magnitude of impact is **minor** to a **medium value receptor** leading to a **slight beneficial, not significant effect.**

13.9.18 The surface water flow assessment has examined the length of any channel that will be isolated from the downstream feed once a realignment or diversion has been created. The length of dry channel has also been compared to the overall length of the watercourse from source to nearest downstream confluence. The ability for the existing channel to retain some residual flow through inputs from the proposed highway drainage system or as flood storage area has been considered as mitigation to determine the residual effect assessment.

13.9.19 This assessment has determined that the diversions or realignments required at the Fivehead River Main Channel 2 and Venner's Water will only change flow conditions in short lengths of channel. When these lengths are compared to the overall length of the watercourse, they represent less than 1% of the total watercourse length. This is considered a **negligible impact** leading to a slight adverse, not significant effect on Fivehead River Main Channel 2 (high value receptor) and a neutral effect on Venner's Water.

13.9.20 The other diversions and realignment have been assessed to have greater impact magnitudes in relation to surface water flow. These are described below:

- The diversion of Black Brook Tributary 3 isolate 220m of downstream channel This represent 20% of total watercourse length. However, the channel will continue to receive water from the construction stage drainage system, local overland flow and land drainage and act as a local flood storage area. Therefore, the impact is considered **minor**, to a **medium value receptor** resulting in a **slight adverse, not significant effect**.
- The realignment at Thornwater Stream isolates approximately 80m of existing channel this represents approximately 5% of channel with reduced flow. Applying mitigation it is likely that the impact will be **negligible** to a **medium value receptor** resulting in a **neutral effect**
- The realignment of Back Stream diverts water away from 300m of existing channel, representing approximately 6% of existing channel length. Applying mitigation it is likely that the impact will be **negligible** to a **medium value receptor** resulting in a **neutral effect**

13.9.21 The proposed surface water management system has been assessed against existing natural catchments. Small changes to existing surface water catchments have been identified where water is being transferred from one catchment to another. This has the potential to reduce the water balance in the following catchments:

- Meare Stream Tributary 1
- Fivehead River Tributary 5
- River Isle Drainage network

13.9.22 All these impacts have been assessed as negligible, leading to neutral effects at these low and medium values receptors.

13.9.23 The potential increase in flows to the receiving watercourses (Meare Stream, Fivehead River Main Channel 2 and Cad Brook) has also been assessed but again the impacts have been determined to be negligible when the scale of the catchment changes are considered. This results in a slight adverse impact, when the value of the flood risk receptors associated with these watercourses are taken into account.

Table 13-16 Preliminary assessment of operational effects

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
Surface water features										
Broughton Brook	High (Quality)	Surface water quality	Small area of additional hardstanding created on the existing M5 slips. Potential deterioration of water quality due to routine runoff from the motorway via existing outfall into watercourse	Long-term	Direct	Negligible	Preliminary drainage design compliant with CG501 including appropriate pollution prevention measures	No change	Neutral	No significant effects predicted
		Surface water flood risk	Potential for small increase in impermeable area due to need to realign M5 slip roads	Long-term	Direct	Negligible	Preliminary drainage design compliant with CG501 including appropriate attenuation volumes	Negligible	Slight	No significant effects predicted
Black Brook	High (Quality) High (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway via new outfall into watercourse	Long-term	Direct	Minor adverse	SuDS based preliminary drainage design. Drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT assessment.	Negligible	Slight	No significant effects predicted. Pollution risks to be confirmed at ES through HEWRAT assessment
		Hydrogeomorphology	Reconfiguration of existing Nexus 25 roundabout culvert and associated realignment	Long-term	Direct	Minor adverse	Adopt culvert design good practice. Maintain existing cross section and long section conditions in realignment	Negligible	Slight	No significant effects predicted
		Fluvial flood risk	Reconfiguration of existing culvert crossing and development within area of existing floodplain. Has the potential to increase flood level, extent or hazard to flood risk receptors. More vulnerable receptors as per NPPF, with a value of high, are the highest value flood risk receptors that could be affected by Black Brook	Long-term	Direct	Minor adverse	Adopt culvert design good practice. Size structure to convey 1%+CC flow. Provide floodplain compensation Maintain existing cross section and long section conditions in realignment	Negligible	Slight	No significant effects predicted
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk More vulnerable receptors as per NPPF, with a value of high, are the highest value flood risk receptors that could be affected by Black Brook	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	Slight	No significant effects predicted

[5] The residual significance of effect has been determined based on the receptor identified as having the highest environmental importance.

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
Black Brook Tributaries 1-3	Medium (Quality) Medium (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway via new outfalls into watercourses	Long-term	Direct	Minor adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT assessment.	Negligible	Neutral	No significant effects predicted. Pollution risks to be confirmed at ES through HEWRAT assessment
		Hydrogeomorphology	Black Brook Tributary 1. 6m wide culvert. Approximately 50m of existing natural bed and bank lost. Loss equates to approximately 1.5% of existing channel.	Long-term	Direct	Minor adverse	Culvert sizing and good practice design has been applied to the structure. Therefore, natural bed and bank will be able to be reinstated	Minor adverse	Slight	No significant effects predicted
		Hydrogeomorphology	Black Brook Tributary 2. 6m wide culvert. Approximately 50m of existing natural bed and bank lost. In addition, approximately 230m of existing channel loss and a realignment is required. These works represent approximately 30% of existing channel.	Long-term	Direct	Moderate adverse	Culvert sizing and good practice design has been applied to the structure. Therefore, natural bed and bank will be able to be reinstated Sinuous open channel design to the 200m realignment of Black Brook Tributary 2.	Minor adverse	Slight	No significant effects predicted
		Hydrogeomorphology	Black Brook Tributary 3. Direct loss of 170m of existing channel which is approximately 15% of the total channel length	Long-term	Direct	Moderate adverse	Sinuous open channel design to the 300m diversion of Black Brook Tributary 2. Represents channel enhancement	Minor beneficial	Slight beneficial	No significant effects predicted
		Fluvial flood risk	New culvert crossings of Black Brook Tributaries 1 and 2 and channel realignments. In addition, development within area of existing floodplain. Has the potential to increase flood level, extent or hazard to flood risk receptors. Less vulnerable receptors as per NPPF, with a value of medium, are the highest value flood risk receptors that could potentially be affected by flooding from the Black Brook Tributaries	Long-term	Direct	Moderate adverse	Adopt culvert design good practice. Size structure to convey 1%+CC flow. Provide floodplain compensation Maintain existing cross section and long section conditions in realignment	Negligible	Neutral	Full assessment only possible after completion of hydrological modelling and reported in the ES.
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk. Less vulnerable receptors as per NPPF, with a value of medium,	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate	Negligible	Neutral	No significant effects predicted

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
			are the highest value flood risk receptors that could potentially by flooding from the Black Brook Tributaries				change allowance.			
		Catchment hydrology	Changes to water balance caused by changes to drainage and overland flow paths. Drainage catchment changes and diversion of Black Brook Tributary 3, removing flow of water to existing channel	Long-term	Direct	Moderate adverse	Retain inflow from routine runoff to existing channel	Minor	Neutral	No significant effects predicted
Black Brook Tributaries 4-6	Medium (Quality)	No impacts identified	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
River Tone	High (Quality)	No impacts identified	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thornwater Stream	Medium (Quality) High (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway via new outfalls into watercourse .	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT assessment.	Negligible	Neutral	No significant effects predicted Pollution risks to be confirmed in the ES through HEWRAT assessment
		Hydrogeomorphology	New culvert and channel realignment works affect approximately 80m of the existing channel. This is approximately 5% of the existing channel .	Long-term	Direct	Moderate adverse	Culvert sizing and good practice design has been applied to the structure. Therefore, natural bed and bank will be able to be reinstated Sinuous open channel design to the short length of realignment and existing channel will be retained	Negligible	Neutral	No significant effects predicted
		Fluvial flood risk	New culvert crossing of Thornwater Stream and development within area of existing floodplain. Has the potential to increase flood level, extent or hazard to flood risk receptors. More vulnerable receptors as per NPPF, with a value of High, are the highest value flood risk receptors that could potentially be affected by Thornwater Stream	Long-term	Direct	Moderate adverse	Adopt culvert design good practice. Size structure to convey 1%+CC flow. Provide floodplain compensation Maintain existing cross section and long section conditions in realignment	Negligible	Neutral	Full assessment only possible after completion of hydrological modelling and reported in the ES.
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk. More vulnerable receptors as per NPPF, with a value of High, are	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	Neutral	No significant effects predicted

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
			the highest value flood risk receptors that could be affected by Thornwater Stream							
		Catchment hydrology	Changes to water balance caused by changes to drainage and overland flow paths. Realignment of channel removing flow of water existing channel	Long-term	Direct	Minor adverse	Retain inflow from routine runoff to existing channel	Negligible	neutral	No significant effects predicted
River Tone Tributaries 2-6	Low	No impacts identified	none	N/A	N/A	N/A	N/A	N/A	NA	NA
Meare Stream	High (quality) High (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway outfalls	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT assessment.	Negligible	Slight	No significant effects predicted. Pollution risks to be confirmed in the ES through HEWRAT assessment
		Hydrogeomorphology	Extension of existing culvert. Loss of natural bed and bank. Loss represents less than 1% of overall channel length	Long-term	Direct	Negligible	None required	Negligible	Slight	No significant effects predicted
		Fluvial flood risk	Culvert extension and loss of floodplain. Has the potential to increase flood level, extent or hazard to flood risk receptors. More vulnerable receptors as per NPPF, with a value of High, are the highest value flood risk receptors with the potential to be affected by the Meare Stream	Long-term	Direct	Moderate adverse	Provide floodplain compensation	Negligible	Slight	No significant effects predicted
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk More vulnerable receptors as per NPPF, with a value of High, are the highest value flood risk receptors with the potential to be affected by the Meare Stream	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	Slight	No significant effects predicted
		Catchment hydrology	Changes to water balance caused by changes to drainage and overland flow paths. Existing surface water catchment feeding Meare Stream 1 diverted into Meare Steam	Long-term	Direct	Negligible	None	Negligible	Neutral	No significant effects predicted
Meare Stream Tributary 1	Medium	Surface water quality	Deterioration of water quality due to routine runoff from highway outfalls	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT	Negligible	Neutral	No significant effects predicted. Pollution risks to be confirmed in the ES

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
							assessment.			through HEWRAT assessment.
		Hydrogeomorphology	No Impact	N/A	N/A	N/A	None	N/A	Neutral	No significant effects predicted
		Fluvial flood risk	No impact as no loss of fluvial flood plain	N/A	N/A	N/A	None	N/A	Neutral	No significant effects predicted
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk More vulnerable receptors as per NPPF, with a value of High are the highest value flood risk receptors with the potential to be affected by the Meare Stream Tributary 1	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	Neutral	No significant effects predicted
		Catchment hydrology	Changes to water balance caused by changes to drainage and overland flow paths. Existing surface water catchment feeding Meare Stream 1 diverted into Meare Steam	Long-term	Direct	Negligible	None	Negligible	neutral	No significant effects predicted
Fivehead River Main Channel 1	High (quality) Very High (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway via existing outfall	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT assessment.	Negligible	Slight	No significant effects predicted. Pollution risks to be confirmed in the ES through HEWRAT assessment.
		Hydrogeomorphology	Extension of bridge (approx. 25m) under which the existing channel is heavily engineered	Long-term	Direct	Negligible	Removal of existing concrete bed. Natural bed and banks reinstated	Negligible	Slight beneficial	No significant effects predicted
		Fluvial flood risk	New bridge and loss of floodplain. Has the potential to increase flood level, extent or hazard to flood risk receptors. Essential infrastructure (A358), as per NPPF, with a receptor value of very high is the highest potential receptor to be affected by the Fivehead River Main Channel 1	Long-term	Direct	Moderate adverse	Adopt bridge design good practice. Size structure to convey 1%+CC flow. Provide floodplain compensation Maintain existing cross section and long section conditions in realignment	Negligible	Slight	No significant effects predicted
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk Essential infrastructure (A358), as per NPPF, with a receptor value of very high is the highest potential receptor to be affected	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	Slight	No significant effects predicted

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
			by the Fivehead River Main Channel 1							
Fivehead River Tributaries 1, 2 and 4	Low	No impacts identified	NA	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fivehead River Tributary 3	Low (Quality) Medium (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway via existing outfall into watercourse	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT assessment.	Negligible	Neutral	No significant effects predicted. Pollution risks to be confirmed in the ES through HEWRAT assessment.
		Hydrogeomorphology	Access track directly adjacent to existing channel	Long-term	Direct	Negligible	None	Negligible	Neutral	No significant effects predicted
			Investigate channel enhancement works at a long stretch of channel that extends from Village Road to Stock Lane	Long-term	Direct	Minor beneficial	Proposed works are included to offset adverse changes in hydrogeomorphology at other locations within the Fivehead River WFD waterbody	Minor beneficial	Neutral	No significant effects predicted
		Fluvial flood risk	No impact as no loss of flood zone	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk Less vulnerable, as per NPPF, with a receptor value of Medium is the highest potential receptor to be affected by the Fivehead River Tributary 3	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	Neutral	No significant effects predicted
Fivehead River Main Channel 2	High (Quality) Very High (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway via existing outfall into watercourse	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT assessment.	Negligible	Slight	No significant effects predicted. Pollution risks to be confirmed at ES through HEWRAT assessment.
		Hydrogeomorphology	New High Bridge Underbridge	Long-term	Direct	Moderate adverse	Bridge sizing and good practice design has been applied to the structure. Therefore, natural bed and bank will be able to be reinstated Sinuous open channel design to the short length of realignment downstream of the structure and existing channel will be retained	Negligible	Slight	No significant effects predicted.
		Fluvial flood risk	New bridge and loss of floodplain. Has the potential to increase flood level, extent or hazard to flood risk receptors.	Long-term	Direct	Moderate adverse	Adopt bridge design good practice. Size structure to convey 1%+CC flow. Provide floodplain compensation	Negligible	Slight	No significant effects predicted

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
			Essential infrastructure (A358), as per NPPF, with a receptor value of very high is the highest potential receptor to be affected by the Fivehead River Main Channel 2				Maintain existing cross section and long section conditions in realignment			
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk. Drainage strategy indicates that water from the Fivehead River Tributary 5 catchment will be crossed into the Fivehead River Main Channel 2 catchment.	Long-term	Direct	Negligible	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance. .	Negligible	Slight	No significant effects predicted
		Catchment hydrology	Changes to water balance caused by changes to drainage and overland flow paths. Existing surface water catchment feeding Fivehead River Tributary 5 diverted into Fivehead River Main Channel 2	Long-term	Direct	Negligible	None required	Negligible	Neutral	No significant effects predicted
Fivehead River Tributary 5	Low (quality) Very High (Flood Risk)	Surface water quality	No impact as no outfalls from routine runoff to watercourse as part of proposed scheme	N/A	N/A	N/A	None	N/A	Neutral	No significant effects predicted
		Hydrogeomorphology	Extension of existing culvert. Loss of natural bed and bank.	Long-term	Direct	Negligible	None	Negligible	Neutral	No significant effects predicted
		Fluvial flood risk	Culvert extension and loss of floodplain. Has the potential to increase flood level, extent or hazard to flood risk receptors. Essential infrastructure (A358), as per NPPF, with a receptor value of very high is the highest potential receptor to be affected by the Fivehead River Main Tributary 5	Long-term	Direct	Moderate adverse	Provide floodplain compensation	Negligible	Slight	No significant effects predicted
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk. Essential infrastructure (A358), as per NPPF, with a receptor value of very high is the highest potential receptor to be affected by the Fivehead River Main Tributary 5 Potential of cross catchment transfer from Tributary 5 to Fivehead Main Channel 2	Long-term	Direct	Negligible	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	Slight	No significant effects predicted

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
		Catchment hydrology	Changes to water balance caused by changes to drainage and overland flow paths. Existing surface water catchment feeding Fivehead River Tributary 5 diverted into Fivehead River Main Channel 2	Long-term	Direct	Negligible	None required	Negligible	Neutral	No significant effects predicted
Venner's Water	Medium (Quality) Very High (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway via existing outfall into watercourse.	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT assessment.	Negligible	Neutral	No significant effects predicted. Pollution risks to be confirmed in the ES through HEWRAT assessment.
		Hydrogeomorphology	Extension of existing bridge and construction of new bridge for Stewley Link and associated channel realignment.	Long-term	Direct	Moderate adverse	Bridge sizing and good practice design has been applied to the structure. Therefore, natural bed and bank will be able to be reinstated Sinuous open channel design to the short length of realignment downstream of the structure and existing channel will be retained	Negligible	Neutral	No significant effects predicted
		Fluvial flood risk	Bridge extension, new bridge construction and loss of floodplain. Has the potential to increase flood level, extent or hazard to flood risk receptors. Essential infrastructure (A358), as per NPPF, with a receptor value of very high is the highest potential receptor to be affected by the Venner's Water	Long-term	Direct	Moderate adverse	Adopt bridge design good practice. Size structure to convey 1%+CC flow. Provide floodplain compensation Maintain existing cross section and long section conditions in realignment	Negligible	Slight	No significant effects predicted
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk. Essential infrastructure (A358), as per NPPF, with a receptor value of very high is the highest potential receptor to be affected by the Venner's Water	Long-term	Direct	Moderate Adverse	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	Slight	No significant effects predicted
River Isle drainage network	Medium (Quality) Medium (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway via existing outfall into watercourse.	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT assessment.	Negligible	Neutral	No significant effects predicted. Pollution risks to be confirmed in the ES through HEWRAT assessment.

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk. Less vulnerable, as per NPPF, with a receptor value of Medium is the highest potential receptor to be affected by the River Isle drainage network	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	Slight	No significant effects predicted
		Catchment hydrology	Changes to water balance caused by changes to drainage and overland flow paths. Existing surface water catchment feeding River Isle drainage network diverted into Cad Brook	Long-term	Direct	Negligible	None	Negligible	Slight	No significant effects predicted
Cad Brook including Cad Brook drainage network	Medium (Quality) Very High (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway via existing outfall into watercourse (increase in impermeable area of approximately 3.6ha)	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT assessment.	Negligible	Neutral or slight	No significant effects predicted. Pollution risks to be confirmed in the ES through HEWRAT assessment.
		Hydrogeomorphology	Extension of existing bridge and construction of new bridge for Broadway Link.	Long-term	Direct	Moderate adverse	Bridge sizing and good practice design has been applied to the structure. Therefore, natural bed and bank will be able to be reinstated	Negligible	Neutral	No significant effects predicted
		Fluvial flood risk	Bridge extension, new bridge construction and loss of floodplain. Has the potential to increase flood level, extent or hazard to flood risk receptors. Essential infrastructure (A358), as per NPPF, with a receptor value of very high is the highest potential receptor to be affected by the Cad Brook	Long-term	Direct	Moderate adverse	Adopt bridge design good practice. Size structure to convey 1%+CC flow. Provide floodplain compensation Maintain existing cross section and long section conditions in realignment	Negligible	Slight	No significant effects predicted
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk. Surface water flow path from Ashill Junction and routine highway runoff diverted to the Cad Brook when previously was discharging into the River Isle Drainage Network.	Long-term	Direct	Negligible	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	Slight	No significant effects predicted
River Ding	High (Quality) Very High (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway via existing outfall into watercourse.	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control	Negligible	Slight	No significant effects predicted. Pollution risks to be confirmed in the ES

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
							measures as required by HEWRAT assessment.			through HEWRAT assessment.
		Hydrogeomorphology	Extension of existing culvert. Loss of natural bed and bank. Loss represents less than 1% of overall channel length	Long-term	Direct	Negligible	None required	Negligible	Slight	No significant effects predicted
		Fluvial flood risk	Culvert extension and loss of floodplain. Has the potential to increase flood level, extent or hazard to flood risk receptors. More vulnerable receptors as per NPPF, with a value of High, are the highest value flood risk receptors with the potential to be affected by the Meare Stream	Long-term	Direct	Moderate adverse	Provide floodplain compensation	Negligible	slight	No significant effects predicted
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk More vulnerable receptors as per NPPF, with a value of High, are the highest value flood risk receptors with the potential to be affected by the River Ding	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	slight	No significant effects predicted
River Ding Tributaries 1 and 2	Medium	No impacts	N/A	N/A	N/A	NA	N/A	NA	Neutral	No significant effects predicted
Back Stream	Medium (Quality) Very High (Flood Risk)	Surface water quality	Deterioration of water quality due to routine runoff from highway via existing outfall into watercourse.	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501 and incorporating pollution control measures as required by HEWRAT assessment.	Negligible	Slight	No significant effects predicted. Pollution risks to be confirmed in the ES through HEWRAT assessment.
		Hydrogeomorphology	Direct loss of 100m of existing channel which is less than % of the total channel length as a result of embankment over existing channel and new bridge	Long-term	Direct	Negligible adverse	Sinuous open channel design to the 300m realignment of Back Stream. Section of existing channel being retained. Represents channel enhancement	Minor beneficial	Slight beneficial	No significant effects predicted
		Fluvial flood risk	New for the A358 and access track bridge and loss of floodplain. Has the potential to increase flood level, extent or hazard to flood risk receptors. Essential infrastructure (A358), as per NPPF, with a receptor value of very high is the highest potential receptor to be affected by the Back Stream	Long-term	Direct	Moderate adverse	Adopt bridge design good practice. Size structure to convey 1%+CC flow. Provide floodplain compensation Maintain existing cross section and long section conditions in realignment	Negligible	Slight	No significant effects predicted

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
		Surface water flood risk	Generation of additional surface water run-off from increased hardstanding results in increase in surface water flood risk More vulnerable receptors as per NPPF, with a value of High, are the highest value flood risk receptors with the potential to be affected by the River Ding	Long-term	Direct	Moderate adverse	Preliminary drainage design compliant with CG501. Flows restricted to undeveloped rate of run-off, including climate change allowance.	Negligible	slight	No significant effects predicted
		Catchment hydrology	Changes to water balance caused by changes to drainage and overland flow paths. Diversion of Back Stream, removing flow of water to existing channel	Long-term	Direct	Moderate adverse	Retain inflow from routine runoff to existing channel	Minor	neutral	No significant effects predicted
River Isle	High	No Impacts	N/A	N/A	N/A	NA	N/A	NA	Neutral	No significant effects predicted
Groundwater features										
Quaternary deposits	High	Water supply/quantity	No impact as proposed scheme does not affect any abstractions	N/A	N/A	N/A	The current preliminary drainage design does not include any discharge to ground. However, if required, surface water run-off from the proposed scheme will be intercepted and treated prior to discharge to ground.	N/A	Neutral	No significant effects predicted
		Vulnerability	Potential for discharge of contamination run-off from the proposed scheme.	Long-term	Direct	Minor adverse		Negligible	Slight	No significant effects predicted
		Biodiversity Conveyance of flow	No impact as cuttings not located in areas of significant groundwater flow	N/A	N/A	N/A		N/A	Neutral	No significant effects predicted
Triassic/Jurassic sequence	Medium	Water supply/quantity	No impact as proposed scheme does not affect any abstractions	N/A	N/A	N/A		N/A	Neutral	No significant effects predicted
		Vulnerability	Potential for discharge of contamination run-off from the proposed scheme.	Long-term	Direct	Minor adverse		Negligible	Slight	No significant effects predicted
		Biodiversity Conveyance of flow	No impact as cuttings not located in areas of significant groundwater flow	N/A	N/A	N/A		N/A	Neutral	No significant effects predicted
Discharges										
DIS-001	High	N/A	No works impacting discharge point.	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
DIS-002	High	Damage to consented discharge	Potential impact as works are close to discharge point but unlikely for discharge point to need to be removed	Long-term	Direct	Minor Adverse	Measures to be taken as part of the preliminary scheme design to avoid discharge point	Negligible	Slight	No significant effects predicted
DIS-003	Medium	N/A	No works impacting discharge point.	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
DIS-004	Low	N/A	No works impacting discharge point.	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
DIS-005	Medium	Damage to consented discharge	Potential impact as works are close to discharge point but	Long-term	Direct	Minor Adverse	Measures to be taken as part of the preliminary scheme design to avoid discharge point	Negligible	Slight	No significant effects predicted

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
			unlikely for discharge point to need to be removed							
DIS-006	High	N/A	No works impacting discharge point.	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
DIS-007	Medium	Damage to consented discharge	Potential impact as works are close to discharge point but unlikely for discharge point to need to be removed	Long-term	Direct	Minor Adverse	Measures to be taken as part of the preliminary scheme design to avoid discharge point	Negligible	Slight	No significant effects predicted
DIS-008	Medium	Damage to consented discharge	Discharge point located beneath existing A358 so no further impacts are expected	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
DIS-009	Low	N/A	No works impacting discharge point.	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
DIS-010	High	N/A	No works impacting discharge point.	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
DIS-011	High	Damage to consented discharge	Potential impact as works are close to discharge point but unlikely for discharge point to need to be removed	Long-term	Direct	Minor Adverse	Measures to be taken as part of the preliminary scheme design to avoid discharge point	Negligible	Slight	No significant effects predicted
DIS-012	Medium	N/A	No works impacting discharge point.	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
Sinks										
SINK-001	Low	Damage to sink	No proposed works affecting sink assumed to be linked to existing drainage on Greenway Lane	N/A	N/A	N/A	None required	Negligible	Neutral	No significant effects predicted
SINK-002	Low	Damage to sink	No proposed works affecting sink which is clearly linked to existing A358 drainage	N/A	N/A	N/A	None required	Negligible	Neutral	No significant effects predicted
SINK-003	Low	Damage to sink	No proposed works affecting sink which is clearly linked to existing A358 drainage	N/A	N/A	N/A	None required	Negligible	Neutral	No significant effects predicted
Issues (Linked watercourse)										
ISS-001 (Black Brook Tributary 4)	Medium	Damage to issue	No works impacting issue	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
ISS-002 (Black Brook Tributary 6)	Medium	Damage to issue	No works impacting issue	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
ISS-003 (Thornwater Stream)	Medium	Damage to issue	No works impacting issue	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
ISS-004 (Thornwater Stream)	Medium	Damage to issue	No works impacting issue	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
ISS-005 (Thornwater Stream)	Medium	Damage to issue	Potential impact to issue as a result of works to existing A358	Long-term	Direct	Minor adverse	Measures to be taken as part of the preliminary scheme design to avoid issue location	Negligible	Slight	No significant effects predicted

Surface water feature/ receptor	Overall receptor value	Category of impact	Proposed change/ potential impacts	Impacts			Proposed or potential embedded mitigation/ management measures	Magnitude of impact (with embedded mitigation)	Residual significance of effects[5]	Conclusion
				Duration	Direct/ indirect	Magnitude				
			(including proposed footpath) in vicinity of the issue							
ISS-06 (Fivehead River Tributary 5)	Low	Damage to issue	No works impacting issue	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
ISS-07 (Fivehead River Main Channel 1)	High	Damage to issue	No works impacting issue	N/A	N/A	N/A	None required	N/A	Neutral	No significant effects predicted
ISS-08 (Venner's Water)	Medium	Damage to issue	New Caplands Link being built over issue location. Issue has direct link to Venner's Water. Issue location will be displaced.	Long-term	Direct	Minor adverse	Issue point to be relocated as part of the preliminary drainage design	Negligible	Slight	No significant effects predicted

13.10 Monitoring

13.10.1 Water quality sampling will take place at the locations shown in Figure 13.4 Water quality survey locations in order to inform baseline and EIA and will be reported within the ES. The need for long-term water quality monitoring will be discussed with consultees and agreed as necessary.

13.11 Summary

13.11.1 The assessment undertaken for road drainage and water environment has identified the potential impacts of the proposed scheme on surface water and groundwater receptors located within the study area. The implementation of appropriate mitigation measures during construction should ensure that there are no significant effects on water receptors.

13.11.2 During operation, no potentially significant effects have been identified on surface water features. The potential impact of the proposed scheme on pollution risk to surface water receptors will be determined using HEWRAT and reported in the ES. The impact of the proposed scheme on flood risk for Black Brook Tributaries 1-3, River Tone Tributary 1, West Sedgemoor Main Drain, Fivehead River Main Channels 1 and 2, Venner's Water, River Ding and Tributaries 1 and 2 and Back Stream will be assessed in the ES utilising hydraulic modelling.

13.11.3 During operation, no potentially significant effects have been identified on groundwater receptors.

Abbreviations List

Please refer to PEI Report Chapter 17 Abbreviations.

Glossary

Please refer to PEI Report Chapter 18 Glossary.

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