A303 Sparkford to Ilchester Dualling Scheme TR010036

6.3 Environmental Statement Appendix 4.6 Flood Risk Assessment

APFP Regulation 5(2)(a)
Planning Act 2008
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Infrastructure Planning

Planning Act 2008

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

A303 Sparkford to Ilchester Dualling Scheme

Development Consent Order 201[X]

6.3 Environmental Statement
Appendix 4.6 Flood Risk Assessment

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Executive summary

Highways England has commissioned Mott MacDonald Sweco Joint Venture to undertake the Flood Risk Assessment (FRA) for the proposed A303 Sparkford to Ilchester Dualling scheme (hereafter referred to as 'the scheme').

The scheme comprises of approximately 5.6 kilometres of continuous dual carriageway linking the Podimore bypass and the Sparkford bypass. At-grade junctions would be removed and replaced with new grade-separated junctions. Sections of the existing A303 would be retained and de-trunked following construction of the new route.

The entirety of the scheme is within Flood Zone 1, where the risk of flooding from rivers or the sea is classified as low. The Flood Risk Assessment (FRA) therefore focusses on the management of surface water run-off. This FRA does therefore consider that the scheme in its location passes the sequential test.

The study identified that the majority of the existing impermeable area within the scheme extents discharges directly into ordinary watercourses. The dualling of the carriageway would increase the impermeable surface area, increasing surface water run-off with the potential to increase flood risk on-site and further downstream.

The proposed drainage strategy for the scheme introduces mitigation measures to effectively manage surface water run-off from both the existing de-trunked A303 and the proposed dualling. Discharge into ordinary watercourses will be artificially restricted to greenfield run-off rates and volumes through the provision of attenuation features.

An allowance of 40% increase in rainfall intensity reflects the total potential change anticipated for the '2080s' (2070 to 2115), in accordance with Environment Agency climate change allowance guidance.

Exterior catchment overland flow will be collected by a network of cut-off ditches, conveying to existing ordinary watercourses to replicate, as far as is reasonably practicable, the natural catchment response to rainfall.

Through the successful implementation of the proposed drainage strategy, the flood risk assessment concludes that there will be an overall betterment to the baseline flood risk condition.

1 Introduction

1.1 Purpose of this report

1.1.1 Highways England has commissioned Mott MacDonald Sweco Joint Venture to undertake a Flood Risk Assessment (FRA) for the proposed A303 Sparkford to Ilchester Dualling scheme (hereafter referred to as 'the scheme').

1.1.2 The main aims of this FRA are:

- to assess flood risk sources in and around the proposed site
- to assess the impact the scheme will have on flood risk
- to ensure the scheme is compliant with current national and local legislation and policy.

1.1.3 This FRA has been undertaken for the proposed alignment of the scheme. An outline plan can be found in Figure 1.1 and in Appendix A.

1.1.4 This report should be read in conjunction with the Drainage Strategy Report (Appendix 4.7, Volume 6.3).

1.2 Overview of the scheme

Existing corridor

1.2.1 The A303 forms part of Highways England's Strategic Road Network (SRN) and a strategic link between the south west and the rest of the south, south-east and London. The route comprises multiple road standards, including dual carriageway, single carriageway and single carriageway sections with overtaking lanes. Speed limits also vary between 40 miles per hour and 70 miles per hour, depending on the character of the road and its surroundings.

Existing road

1.2.2 The section of the A303 that is being upgraded as part of this scheme commences at the eastern limits of the existing dual carriageway, the Podimore Bypass. Travelling east, the corridor reaches the junction with the B3151 before bearing north east and rising upwards through Canegore Corner to reach the crest of Camel Hill at Eyewell. This section of the corridor is characterised by a single lane road, with double white lines negating overtaking and subject to a 50 miles per hour speed limit. There are several priority junctions along the route giving access to the settlements of Queen Camel and West Camel to the south and Downhead to the north, as well as several farm accesses and parking laybys.

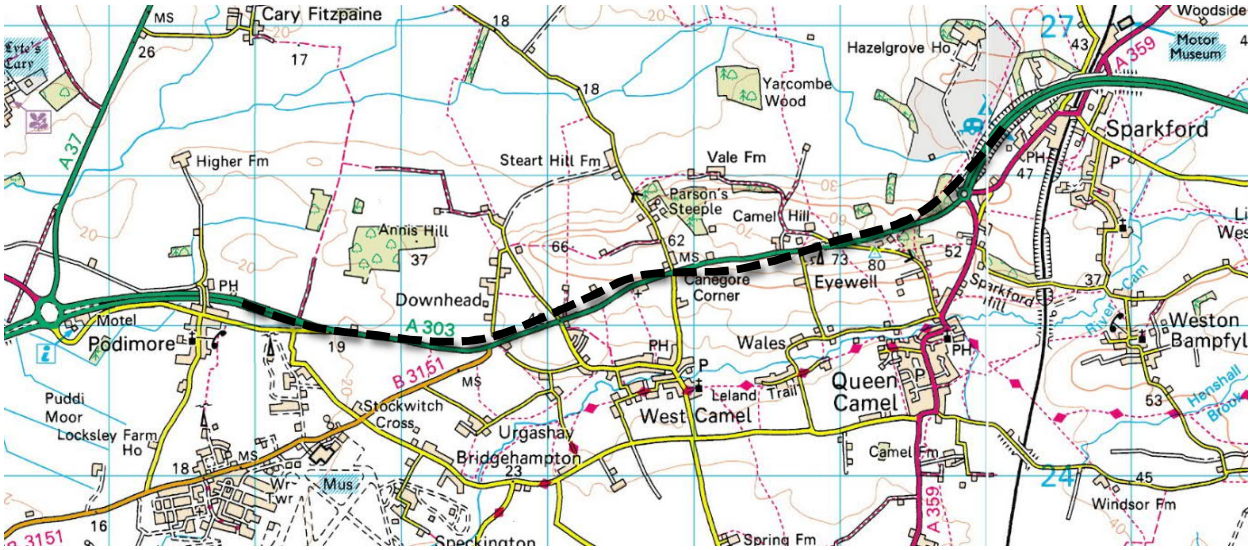
1.2.3 From the crest of Camel Hill, the corridor descends to meet the roundabout at the western limit of the dual carriageway Sparkford Bypass (Hazlegrove

Roundabout). This section comprises 2 lanes in the westbound direction, 1 lane in the eastbound direction and is also subject to a 50 miles per hour speed limit. Hazlegrove Roundabout forms a junction between the A303 and the A359 which runs south through Queen Camel and north-east through Sparkford. The roundabout also provides access to a service station, and to a school at Hazlegrove House.

1.2.4 The section of the A303 that is to be upgraded is almost 3.5 miles, or approximately 5.6 kilometres long.

1.2.5 The extents of the scheme are illustrated in Figure 1.1 below. Figure 1.1 of Volume 6.2 shows the proposed red line boundary for the scheme.

Figure 1.1: Scheme extents



Source: Mott MacDonald Sweco Joint Venture

Scheme proposals

1.2.6 The proposed scheme is to provide a continuous dual-carriageway linking the Podimore Bypass and the Sparkford Bypass. The scheme would involve the removal of at-grade junctions and direct accesses. The Hazlegrove Junction would be constructed to grade-separated standards and Downhead Junction and Camel Cross Junction would be constructed to compact grade-separated standards, as illustrated on Figure 2.3 General Arrangement Plans, contained in Volume 6.2.

1.2.7 A detailed description of the scheme is provided within Chapter 2 The Scheme of Volume 6.1.

2 Site description

2.1 Topography and route setting

2.1.1 The route follows the existing corridor of the A303 very closely. It is generally considered to be an online solution although is often deliberately aligned just to the side of the existing carriageway in order to allow re-use of the existing route for local access, avoid property or facilitate construction phasing. At its maximum offset the route is approximately 100 metres either north or south of the existing A303.

2.1.2 From west to east, the scheme starts at the existing dual carriageway north of Podimore. The surrounding land is relatively low-lying at approximately 17 metres above ordnance datum (mAOD). Travelling east, the route reaches the junction with the B3151 where it bears north-east and rises upwards, through Canegore Corner, to reach the crest of Camel Hill at Traits Lane and Gason Lane junctions. The elevation at this location is approximately 70mAOD. The landscape to the north rises further (to 74mAOD) and falls away to the south toward the settlements of Queen Camel, Wales and West Camel. From the crest of Camel Hill, the route descends to 50mAOD where it meets the dual carriageway near Sparkford

2.1.3 The proposed route mainline chainages are shown in Appendix A which are used hereafter to describe site locations. Between the scheme start at chainage 300m and 2,000 metres the route follows the existing ground. From chainage 2,000 metres to 3,200 metres the main route would be located in a cutting which at the most will be approximately 10 metres below ground level (bgl). At chainage 2,900 metres a new overbridge will cross the route. At chainage 3,200 metres the route will be on embankment above the existing ground level, which falls away to the south. At chainage 3,900 metres, and to the end of the scheme, the proposed route largely follows the natural topography. Levels will either be slightly raised or in line with existing ground levels. At chainage 5,050 metres an underpass will run below the proposed main route.

2.2 Hydrology

2.2.1 The existing A303 does not cross any main rivers within the extents of the scheme.

2.2.2 A Water Framework Directive (WFD) assessment has been completed (Appendix 4.5, Volume 6.3) and should be read in conjunction with this report.

2.2.3 Figure 2.1 shows the WFD catchments within the proximity of the scheme extents. As shown, the scheme crosses the catchments of the River Cam and River Cary, bisected by Camel Hill ridge.

2.2.4 The River Cam is located approximately 0.5 kilometres south and runs parallel to the A303 until the A303 / B3151 junction where it diverts in a south-westerly direction where it meets the River Yeo in Yeovilton. The River Yeo subsequently meets the River Parrett which outfalls into Bridgwater Bay on the Bristol Channel.

2.2.5 Dyke Brook, a tributary to the River Cary, is approximately 1 kilometre north of the A303. The River Cary joins King's Sedgemoor Drain, which continues across the moors to join the estuary of the River Parrett at Dunball.

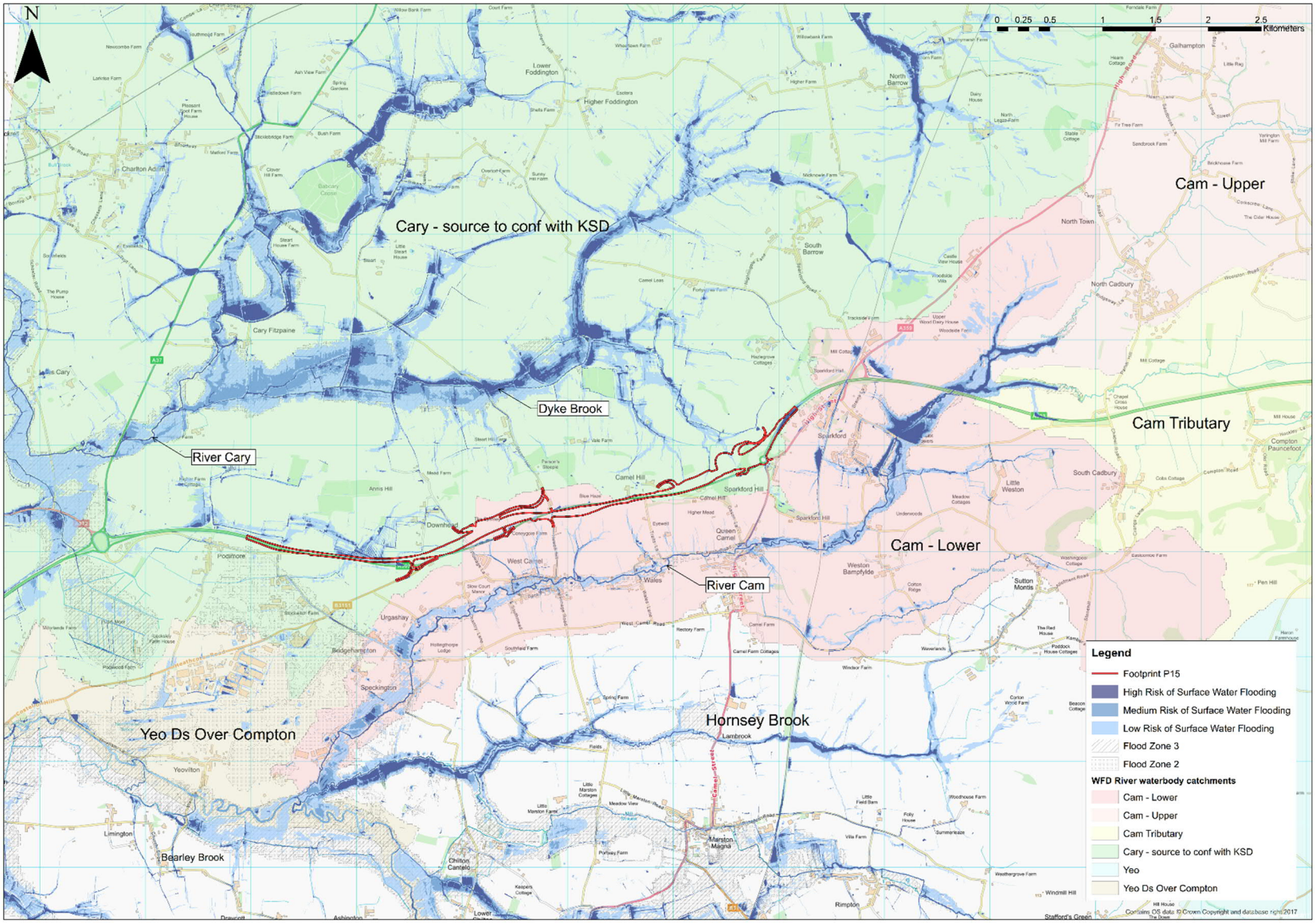
2.2.6 Park Brook, a tributary to the River Cary, is approximately 1.25 kilometres south-west of the scheme extents. West of Podimore roundabout, where park brook is culverted beneath the A303 (beyond the scheme extents), the catchment is controlled via the pumping station.

2.2.7 The A303 is located within the Parrett operational catchment which sits within the Somerset South and West Management Catchment. It is located within the catchments of the waterbodies Cam – Lower (Id: GB108052015650) and Cary – source to confluence with King’s Sedgemoor Drain (Id: GB108052015140).

2.2.8 The waterbody Cam – Lower is downstream of the waterbodies Cam – Upper and Cam Tributary. It drains into the downstream catchment of Yeo Ds Over Compton. The Cam is a main river and the overall WFD classification of Cam – Lower was Moderate for 2016 Cycle 2.

2.2.9 The waterbody Cary – source to confluence with King’s Sedgemoor Drain is a located upstream of King’s Sedgemoor Drain – Henley Sluice to mouth. It is a main river and the overall WFD classification was Moderate for 2016 Cycle 2.

Figure 2.1: WFD catchment map in relation to the proposed scheme



2.3 Geology

2.3.1 The Preliminary Sources Study Report (PSSR) for the scheme (Appendix 9.1, Volume 6.3) provides a detailed description of the geology of the site. The following general assessment of the geology of the site and ground conditions has been inferred from available information.

2.3.2 The general sequence of strata comprises limited natural superficial deposits of river terrace deposits above the underlying strata of the Lias Group (comprising the Langport Member, Blue Lias Formation and the Charmouth Mudstone Formation) and Penarth Group (Westbury Formation and Cotham Member Undifferentiated). Made ground is expected along the proposed route, associated with the construction of existing highways and with fill material within historic quarries and on-line former landfill site.

2.3.3 British Geological Society (BGS) mapping indicates a small area of river terrace deposits, comprising sand and gravel, to the west of Sparkford. The deposits are shown to be present directly below and to extend north of the proposed route at chainage 5,900 metres. River terrace deposits are also shown to be present at Podimore, extending approximately 300 metres east of the village, and south of the existing A303. These deposits are not recorded as directly beneath the proposed carriageway alignment but given the scale and the level of uncertainty of the geological mapping, it is possible that they may be encountered during the ground investigation and/or construction.

2.3.4 The BGS Geology of Britain Viewer indicates the route is principally underlain by solid strata of the Langport Member, Blue Lias Formation and the Charmouth Mudstone Formation (undifferentiated), of the Lias Group consisting of mudstones. These strata were previously referred to as the Lower Lias.

2.4 Hydrogeology

2.4.1 The PSSR reports that the underlying Blue Lias Formation is classed by BGS as a 'Secondary A – aquifer'[1]. The PSSR reports that the superficial deposits, which are limited within the site area, do not provide any groundwater resources however, they may become a consideration in terms of construction, dewatering and impacts on surface water bodies.

2.4.2 The PSSR and the Geotechnical Interpretative Report (GIR)[2] reports that some springs which are forming tributaries to the River Cam are thought to have

[1] Secondary A aquifer designation is defined as the presence of "permeable layers capable of supporting water supplies at local rather than strategic scale". (PSSR, Appendix 9.1 Volume 6.3)
[2] Highways Agency, Mott MacDonald (June 2004) A303 Sparkford to Ilchester Geotechnical Report Volume 1.

formed in the interface of the more permeable limestone and gravels, and the less permeable Lower Lias.

3 Legislation and policy

3.1 National Policy Statement for National Networks

3.1.1 The *National Policy Statement for National Networks* (NPSNN) sets out the need and Government's policies to deliver developments of nationally significant infrastructure projects (NSIPs) on the national highway and rail networks in England. The NPSNN and the NPPF are consistent in terms of strategic aim, however the objective and the function of the 2 differ. The NPPF provides a framework upon which local authorities can construct local plans, however it does not contain specific policies in regard to NSIPs. The NSIPs are considered under the NPSNN which provide transport policy to guide individual developments brought under it.

3.1.2 The scheme is classified as a NSIP, as such requires a Development Consent Order (DCO), this is considered and detailed within the flood risk section of the NPSNN. The following policy, from the subsection on applicant's assessment, applies to the scheme:

3.1.3 Policy 5.96: The policy states that for projects that may be affected by, or contribute to flood risk, discussions with the Environment Agency and any other applicable flood risk management bodies, such as lead local flood authorities, Internal Drainage Boards, sewerage undertakers, highways authorities and reservoir owners and operators should be undertaken. These discussions can be used to identify likelihood, extent and nature of any flood risk to determine the scope of the FRA, as well as identifying the information required by the Secretary of State to decide upon the submitted application. If the Environment Agency has concerns on flood risk grounds, the applicant is encouraged to discuss these with the Environment Agency and provide additional data or amend the project to satisfy the Environment Agency's concerns, and preferably prior to the DCO submission.

3.1.4 The following policies, from the subsection on decision making, apply to the scheme:

3.1.5 Policy 5.98: The policy states that where flood risk is a factor in determining an application, the Secretary of State should be satisfied that:

- the application is supported by an appropriate FRA
- the sequential test (see NPPF) has been applied as part of site selection and, if required, the exception test (see NPPF)

3.1.6 Policy 5.100: The policy states that for construction work with drainage implications, approval for the project's drainage system will form part of any DCO issued by the Secretary of State. The Secretary of State will need to be

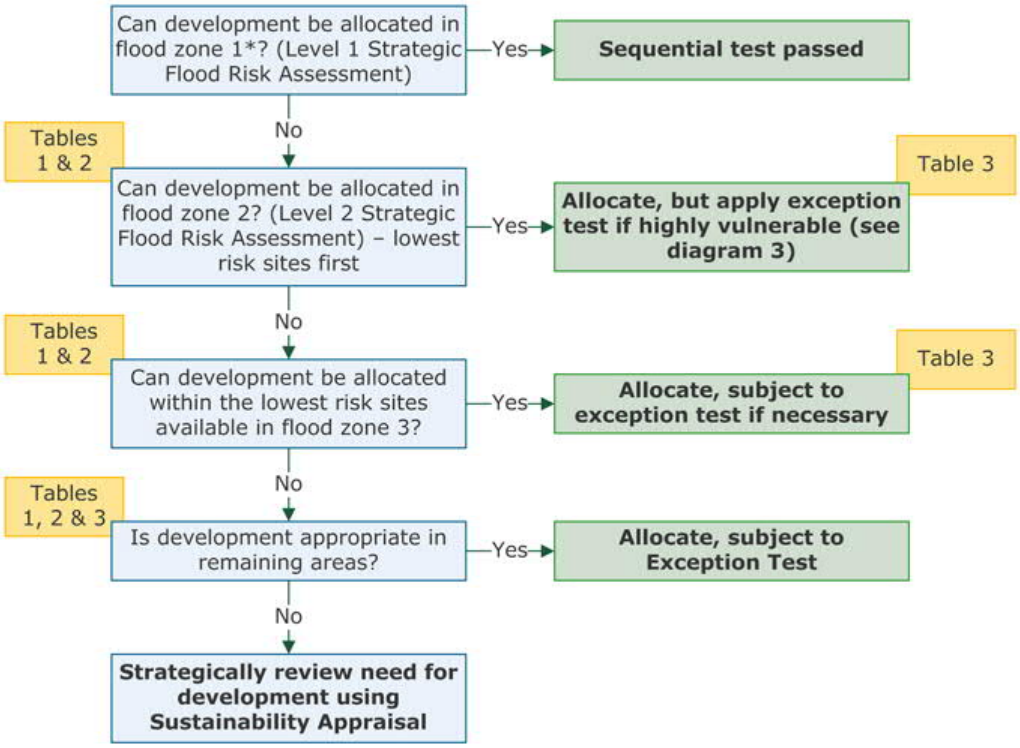
satisfied that the proposed drainage system complies with any national standards for the implementation of sustainable drainage systems (SuDS) published by Ministers. The DCO or any associated planning obligations will need to make provision for the adoption and maintenance of any SuDS, including any necessary access rights to property. The Secretary of State should be satisfied that the most appropriate body (such as applicant, landowner, local authority, Internal Drainage Board, etc.) is being given the responsibility for maintaining any SuDS.

3.1.7 Policy 5.101: The policy states that if the Environment Agency objects to the grant of a DCO on the grounds of flood risk, the Secretary of State can grant consent but would need to be satisfied that all reasonable steps were undertaken by the applicant and the EA to try and resolve the concerns.

3.2 National Planning Policy Framework

3.2.1 The *National Planning Policy Framework* (NPPF) sets out the planning policies for England. The *Planning Practice Guidance* (PPG) on Flood Risk and Coastal Change sets out how the risks associated with flooding are considered during the application process, including the sequential and exception tests. These tests are used to steer developments into areas of lower risk with the aim of protecting people and property from flooding. The sequential test is set out in Figure 3.1.

Figure 3.1: Application of the sequential test (NPPF, PPG, Paragraph 020)



3.2.2 If the sequential test is not passed, the exception test must be applied:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared.
- A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

3.2.3 This FRA will comment upon the feasibility of developing the site with respect to the NPPF, including advice on the requirements of the sequential and exception tests.

3.3 The Design Manual for Roads and Bridges

3.3.1 The *Design Manual for Roads and Bridges* (DMRB) provides a comprehensive guide to requirements, advice and published documents, relating to works on motorways and trunk highways where, in the case of England, Highways England is the overseeing authority.

3.3.2 DMRB Volume 4, Section 2, Part 1 HD 49/16[3] sets out the legislation relating to drainage design. In the context of flood risk, the DMRB sets out the 2007/60/EC *Management of Flood Risks Directive* as normative legislation, alongside the *Water Framework Directive* and the 2006/118/EC *Groundwater Daughter Directive*. In addition, the following is considered to be used as informative legislation:

- The *Management of Flood Risks Directive* (2007/60/EC)
- The *Flood Risk (England and Wales) Regulations 2009*
- The *Flood and Water Management Act 2010*
- The *Water Framework Directive* (2000/60/EC)
- The *Water Environment (Water Framework Directive) (England and Wales) Regulations 2003*
- The *Water Resources Act 1991*
- The *Groundwater Daughter Directive* (2006/118/EC)
- The *Groundwater (England and Wales) Regulations 2009*
- The *Management of Health and Safety at Work Regulations 1999*
- The *Construction (Design and Management) Regulations 2015*

3.3.3 DMRB Volume 11, Section 3, Part 10 HD 45/09[4] sets out that flood risk should be considered in line with Planning Policy Statement 25: *Development and*

[3] Highways England (2016) *Volume 4 Geotechnics and Drainage, Section 2 Drainage, Part 1 HD 49/16 'Highway Drainage Design Principal Requirements'* [online] available at: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol4/section2.htm (last accessed March 2018).

[4] Highways England (2009) *Volume 11 Environmental Assessment, Section 3, Part 10 Road Drainage and the Water Environment* [online] available at:

Flood Risk (now superseded by NPPF). The document provides guidance on how flood risk should be assessed. The document is in line with the Planning Policy Statement (PPS) (now NPPF) and stresses that Environment Agency guidance should be followed.

3.4 Local policy

Somerset's Local Flood Risk Management Strategy

3.4.1 Somerset County Council's (SCC) *Local Flood Risk Management Strategy*[5] *(LFRMS*) guides the flood risk management in the county. The strategy sets out the approach used by SCC as the Lead Local Flood Authority (LLFA) to limit the impacts of local flooding. A required framework is provided for the 'Risk Management Authorities' who operate in the county. It also promotes greater partnership working arrangements between the organisations with a responsibility for managing flood risk. The document was prepared by SCC, with the input of the district and borough councils, the Environment Agency, the water and sewerage companies, and the Internal Drainage Boards.

Somerset Water Management Partnership Flood and Water Management: Strategic Business Plan 2010/2016

3.4.2 Somerset Water Management Partnership's (SWMP) *Flood and Water Management: Strategic Business Plan 2010 / 2016* describes the local plans and visions for the Somerset area. The following policies from the strategic business plan apply to the scheme:

3.4.3 Policy G-3: Comprehensive local flood risk management: The policy states that the county council should provide flood risk management through the implementation of projects and programmes, which would allow some or all of the following objects to be achieved:

- effectively meet site-specific flood risk reduction needs
- achieve benefits that exceed the total cost of projects or programmes, including long-term maintenance costs
- reduce carbon emissions
- improve water quality
- take account of impacts of climate change
- deliver sustainable and environmentally sound management solutions
- avoid the creation of new flood assets that cannot be mitigated
- protect productive agricultural soils

3.4.4 Policy G-8: Maintaining and enhancing biodiversity: The policy describes how the county council should seek to protect flood storage, conveyance and

http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3.htm (last accessed March 2018).

[5] Somerset County Council (2014) Local Flood Risk Management Strategy.

ecological value of floodplains, wetlands and riparian corridors and, where feasible, should enhance or restore these ecological and biodiversity functions.

3.4.5 Policy S-1: Prioritising flood risks: The policy dictates that the county council should prioritise actions to address flood risk in the following order:

- the consequences of no action being taken, which should be prioritised as listed below:
    1. Threats to public safety
    2. Damage to public infrastructure
    3. Continuity of statutory service delivery
    4. Damage of private structures
    5. Impacts on the regional economy
- where urgency is a measure of when an action needs to be taken to prevent a risk from increasing in severity
- statutory responsibility and authority
- funding or partnership opportunities

3.4.6 Policy S-2: Flood risk management hierarchy: The policy states that the county council should recognise that the following flood risk management hierarchy will be considered in developing technical solutions for developments and infrastructure.

- assess – understand studies to collect data at the appropriate and level of detail to understand what the flood risk is
- avoid or prevent – risks from surface water by controlling water at source (such as SuDS) and locating infrastructure and development away from risk areas
- substitute – locate more vulnerable development or infrastructure in lowest risk areas
- control – implement flood risk management measures to reduce the impact of new development or infrastructure on flood frequency and use appropriate design
- mitigate – implement measures to mitigate residual risks

3.4.7 Policy S-3: Flood protection standard: The policy describes how all new flood risk management projects (protecting new or existing infrastructure or development) should seek protection from a 1 in 100-year flood return period, plus a margin of safety to account for predicted climate change. This is consistent with the requirements of Planning Policy Statement (PPS) 25 Practice Guide[6]. The policy also outlines that when new projects are being constructed to protect an existing development, lesser protection can be

[6] Communities and Local Government (2009) Planning Policy Statement 25: Development and Flood Risk Practice Guide [online] available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/7772/pps25guideupdate.pdf (last accessed June 2018).

considered where 100-year protection is not practical – this should be considered on an incremental cost benefit ratio basis and analysis of future conditions.

3.4.8 Policy S-4: Flood protection asset design and maintenance objectives: The policy dictates that the county council (and its stakeholders) should construct new flood protection assets and maintain, repair or replace existing assets as to:

- require minimal long-term maintenance
- ensure flood risks are not transferred to other sites
- protect or enhance aquatic, riparian and other critical habitats
- protect or enhance multiple beneficial uses of flood risk areas

Somerset Drainage Boards Consortium Development and Flood Risk in Drainage Board Areas

3.4.9 The Somerset Drainage Boards Consortium's document *Development and Flood Risk in Drainage Board Areas*[7] sets out the policy of the Somerset Drainage Boards Consortium.

3.4.10 Although the scheme is located outside the boundary of the Somerset Drainage Boards Consortium the A303 scheme could be affected by the following policies:

- Paragraph 2.1 - Construction and changes in land management activity will have an influence on the run-off that results from rainfall within a river catchment. When this activity is significant and occurs in a catchment that lies within, or drains into, an Internal or District Drainage Board area then the Drainage Board for that area must be consulted on the proposed changes.
- Paragraph 3.5 - No person shall, without previous consent of the Board, for any purpose, by means of any channel, siphon, pipeline or sluice or by any other means whatsoever introduce any water into the district or, whether directly or indirectly increase the flow or volume of water in any watercourse in the district.
- Paragraph 4.2 - Where development is proposed within a catchment that drains through a drainage board area but is located outside the board area, it is expected that the surface water arising from the development should be managed in a sustainable manner to mimic the surface water arising from the undeveloped site whilst reducing the flood risk to the site itself and elsewhere.

[7] Somerset Drainage Boards Consortium (2007) Development and Flood Risk in Drainage Board Areas [online] available at: http://www.somersetdrainageboards.gov.uk/Policyondevelopmentandfloodrisk.pdf (last accessed March 2018).

- Paragraph 5.3 - Development of land outside of drainage board areas, yet within a catchment that discharges into a drainage board area, will also be subject to control by the drainage board. The use of SuDS and on-site storage should be installed and seek to reduce downstream flood risk.

Somerset Rivers Authority

3.4.11 The Somerset Rivers Authority (SRA) was set up in 2015. The purpose of the SRA is to "deliver higher standards of flood protection than would be funded nationally, and to create better flood protection and resilience against further flooding by joint planning and delivery (where possible)"[8]. The work that the SRA undertakes is guided by the 20 Year Flood Action Plan[9]. The plan was produced by a range of organisations as an overarching plan that will guide water and land management policies and investment on Somerset's Levels and Moors for the next 20 years.

3.4.12 The SRA is run by a board of partners from Somerset County Council, the 5 district councils, the Environment Agency, the Parrett and Axe Brue Internal Drainage Boards, Natural England, and the Wessex Regional Flood and Coastal committee.

[8] Somerset Rivers Authority (2018) About Somerset Rivers Authority [online] available at: http://www.somersetriversauthority.org.uk/about-us/ (last accessed March 2018)
[9] Somerset County Council (2014) The Somerset Levels and Moors Flood Action Plan [online] available at: https://somersetnewsroom.files.wordpress.com/2014/03/20yearactionplanfull3.pdf (last accessed July 2018)

4 Stakeholders and consultation

4.1.1 The following have been identified as statutory consultees for the scheme:

- Environment Agency
- Somerset County Council (lead local flood authority)
- Somerset Drainage Boards Consortium

4.2 Environment Agency

4.2.1 The Environment Agency's regulatory, licensing and advisory powers and duties derive from the following key acts and regulations, including:

- *Environment Act 1995*
- *Environmental Permitting (England and Wales) Regulations 2010*
- *Water Resources Act 1991*
- *Flood and Water Management Act 2010*
- *Salmon and Freshwater Fisheries Act 1975*
- *The Planning Act 2008 (the 2008 Act) and secondary legislation made under the 2008 Act*
- *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003*

4.2.2 The *Flood and Water Management Act* gives the Environment Agency a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remedying of flood damage for main rivers and coastal areas.

4.2.3 Correspondence from the Environment Agency supporting the FRA is shown in Appendix C. No additional observations or specific concerns were raised.

4.3 Somerset County Council

4.3.1 Under the *Flood and Water Management Act*, Somerset County Council are the lead local flood authority for Somerset and responsible for the management of local flooding (from surface water, groundwater and ordinary watercourses).

4.4 Somerset Drainage Boards Consortium

4.4.1 The Somerset Drainage Boards Consortium manages the operations and affairs of the Axe Brue and Parrett Internal Drainage Boards. The organisation was formed in April 2005 and was formed to give the boards access to professional engineering, financial and administrative services. The individual boards remain the legal corporate bodies that retain the powers and duties that fall to them from the *Land Drainage Act 1991*.

4.5 Meeting minutes

4.5.1 Meeting minutes for the aforementioned consultation have been included within Appendix B.

5 Sources of flood risk

5.1.1 Given the residual risk and variability associated with flooding, Mott MacDonald Sweco Joint Venture takes no liability for, and gives no warranty against, actual flooding of any property (client's or third party) or the consequences of flooding in relation to the outputs of this report. This report has been prepared for the purposes of supporting promotion of the A303 Sparkford to Ilchester Dualling scheme for inclusion in the planning application only.

5.2 Background information

5.2.1 To inform the assessment, the following data sources were used:

- Environment Agency's flood risk from rivers of the sea[10,11]:
  - Flood zone 3 – Areas which have a probability of 1% or greater to flood from rivers in any year (or 0.5% or greater probability to flood from the sea)
  - Flood zone 2 – Areas which have a probability between 0.1% and 1% to flood from the rivers in any year (or 0.1% - 0.5% probability to flood from the sea)
  - Flood zone 1 – Areas which have less than 0.1% probability to flood in any year.
- Environment Agency's risk of flooding from surface water[12]
  - High risk – Flooding occurring as a result of rainfall with a greater than 1 in 30 chance in any given year (annual probability of flooding 3.3%)
  - Medium risk - Flooding occurring as a result of rainfall of between 1 in 100 (1%) and 1 in 30 (3.3%) chance in any given year
  - Low risk – Flooding occurring as a result of rainfall of between 1 in 1,000 (0.1%) and 1 in 100 (1%) chance in any given year
  - Very Low risk - Flooding occurring as a result of rainfall with less than 1 in 1,000 (0.1%) chance in any given year.
- Environment Agency's flood risk from reservoirs[13]
- Drainage Database Management System of Highways England (HADDMS)[14]

[10] Environment Agency. Flood Map for Planning (Rivers and the Sea) – Flood Zone 2 [online] available at: https://data.gov.uk/dataset/flood-map-for-planning-rivers-and-sea-flood-zone-2 (last accessed March 2018)
[11] Environment Agency. Flood Map for Planning (Rivers and the Sea) – Flood Zone 3 [online] available at: https://data.gov.uk/dataset/flood-map-for-planning-rivers-and-sea-flood-zone-3 (last accessed March 2018)
[12] Environment Agency. Flood Risk from Surface Water. [online] available at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map (last accessed April 2018)
[13] Environment Agency. Flood risk from reservoirs. [online] available at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map (last accessed April 2018)
[14] Note: HADDMS is an internal Highways England data management system.

- South Somerset District Council Level 1 SFRA (2008)[15]
- Somerset County Council Preliminary FRA (2011)[16]
- Ordnance Survey mapping
- Existing utilities records
- A303 Sparkford to Ilchester *Dualling Preliminary Sources Study Report* (PSSR) (Appendix 9.1, Volume 6.3 of this Environmental Statement)
- *A303 Geotechnical Interpretive Report* Volume 1 (Mott MacDonald and Highways England, June 2004)[17]
- *West of England Sustainable Drainage Developer Guide* (SDDG)[18]
- *Cam Flood Alleviation Study*(FAS) (Royal Haskoning, February 2002)[19]

5.2.2 LiDAR 1 metre Digital Terrain Model (DTM) has been used to further understand the natural catchments in the area, and how the scheme and its associated drainage would affect the run-off rates in the area.

5.2.3 Additionally, Mott MacDonald Sweco Joint Venture drainage team attended a site visit on 3 November 2017. During this site visit observations were made of the existing highway drainage and external catchment run-off system.

5.3 Scope of assessment

5.3.1 The following sources of flooding were screened and scoped (where applicable)[20]:

- Fluvial flooding: Exceedance of the flow capacity of the channel of a river, stream or other natural watercourse, typically associated with heavy rainfall events. Excess water spills onto the flood plain.
- Surface water flooding: Water flowing over the ground surface that has not reached a natural or artificial drainage channel. This can occur when intense rainfall exceeds the infiltration capacity of the ground, or when the ground is so highly saturated that it cannot accept any more water.

[15] Halcrow Group Limited (2008) South Somerset District Council Strategic Flood Risk Assessment Level 1 SFRA [online] available at: https://www.southsomerset.gov.uk/planning-and-building-control/spatial-policy/evidence-base/district-wide-documents/south-somerset-strategic-flood-risk-assessment/ (last accessed March 2018)
[16] Somerset County Council (2011) Preliminary Flood Risk Assessment Report [online] available at: www.somerset.gov.uk/EasySiteWeb/GatewayLink.aspx?alId=42919 (last accessed March 2018).
[17] Highways Agency, Mott MacDonald (June 2004) A303 Sparkford to Ilchester Geotechnical Report Volume 1.
[18] Bath and North East Somerset Council, Bristol City Council, North Somerset Council, Somerset County Council and South Gloucestershire Council (2015) West of England Sustainable Drainage Developer Guide [online] available at: https://www.bristol.gov.uk/documents/20182/34524/West+of+England+sustainable+drainage+developer+guide+section+1/864fe0d2-45bf-4240-95e2-a9d1962a0df9 (last accessed March 2018).
[19] Environment Agency, Royal Haskoning, Somerset Local Flood Defence Committee (February 2002) Pre-feasibility report Cam Flood Alleviation Scheme.
[20] CIRIA C624 (2004) Development and flood risk – guidance for the construction industry pp. 28

- Groundwater flooding: Raised groundwater levels, typically following prolonged rain (may be slow to recede). High groundwater levels may result in increased overland flow flooding.
- Flooding from artificial drainage systems: Blockage or overloading of pipes, sewers, canals, and drainage channels or failure of pumping systems. Typically following heavy rain or as a result of high water levels in a receiving watercourse.
- Coastal and tidal flooding, including estuarine and tide locking: High tides, storm surges and wave action, often in combination. Often involving high tidal levels and high fluvial flows in combination.
- Flooding from infrastructure failure: Structural, hydraulic or geotechnical failure of infrastructure that retains, transmits or controls the flow of water.

5.4 Flood risk map

5.4.1 Supporting flood risk information has been compiled onto a flood risk map, included within Appendix A.

5.5 Fluvial flooding

5.5.1 The Environment Agency provides maps showing the risk of flooding from rivers and the sea in England. The Environment Agency dataset *Flood risk from rivers or the sea* shows that the highway is wholly located within flood zone 1.

5.5.2 Ranging from approximately 0.5 kilometre – 0.75 kilometre south of the carriageway, the scheme runs in parallel to the River Cam and its associated flood zones 2 and 3. Two major settlements, Queen and West Camel, are centred about the River Cam, which has a history of flooding. In December 1979 a significant event resulted in flooding of the 2 villages which prompted the construction of a flood alleviation scheme (FAS). This was at the time of construction designed with a standard of protection (SoP) of 1 in 50 years (2% annual exceedance probability (AEP)). On 30 October 2000 a significant flood event resulted in the flooding of 29 properties and a school in addition to highway and field flooding, with flood depths in excess of 1 metre. This was caused by systemic incapacity of the fluvial network and exceedance of the SoP afforded by the defences. More recently, flooding has occurred in 2008, 2009, 2012 and 2013-14 with approximately 20 properties affected. The Environment Agency last carried out a pre-feasibility study for the River Cam FAS in 2002 and has more recently developed a new hydraulic model of the River Cam in 2017.

5.5.3 The Dyke Brook runs 1.25 kilometres north of the scheme extents and the associated fluvial flood zones. The Dyke Brook passes through a rural setting.

5.5.4 At the western scheme extents (Podimore), between chainage 300 metres and 700 metres, the outer edge of flood zone 2 is located approximately 50 – 100 metres south of the carriageway bounded approximately by Church Street and an unnamed road. This area of land is dominated by Royal Naval Air Station Yeovilton and its supporting infrastructure, situated within a rural setting.

5.6 Surface water flood risk

5.6.1 The Environment Agency dataset *flood risk from surface water* shows where surface water may collect as a result of intense rainfall events. Furthermore, it helps identify smaller watercourses (with a catchment less than 3km^2) that have not been included within the national programme of flood mapping. To note, the dataset does not take into account any existing flood protection (such as positive drainage systems).

5.6.2 The mapping shows that the majority of the scheme extents is not within an area of high, medium or low risk from surface water flooding.

5.6.3 An area of significant interaction with the highway is at the foot of Camel Hill, where surface water can be seen to abut the eastbound carriageway for approximately 700 metres. The area is low-lying with relatively flat topography and is dominated by agricultural land uses. HADDMS reports 8 instances of flooding along this section of highway, 1 of which is a direct result of water entering the highway from an adjacent field. High risk surface water flooding zone centres around the location of the existing cross carriageway culvert.

5.6.4 Surface water flooding is shown to occur between marker post (MP) 191.2 and 192.1 where the carriageway is within a cutting. HADDMS does not provide any reports on flooding in this area which suggests that surface water flooding would be caused by either drainage system failure or an extreme storm event (design exceedance).

5.6.5 At the junction of Steart Hill and the A303, an area of high surface water flood risk is shown adjacent to the carriageway which can be attributed to the surrounding topography and highway profile. This corresponds with a flooding incident reported on HADDMS.

5.6.6 At the junction of Plowage Lane and the A303, an area of high surface water flood risk is shown on and adjacent to the carriageway. This can be attributed to the vertical profile of the highway in this location as it forms a slight sag. Further downstream the mapping highlights a minor tributary to the River Cam, heading south toward West Camel at the junction of Fore Street and Frog Lane. During the site visit on 3 November 2017 it was noted that this watercourse was culverted prior to Fore Street, with an overflow channel.

5.7 Groundwater flood risk

5.7.1 The Ordnance Survey maps shows a number of springs are present both north and south of the A303, formed at the interface of the more permeable limestone and gravels, and the less permeable Lower Lias.

5.7.2 The BGS dataset *susceptibility to groundwater flooding* indicates that the scheme is wholly located within an area of limited potential for groundwater flooding to occur. An area immediately south of the A303, near Podimore and its surrounds, is susceptible to groundwater flooding at the surface. A short section immediately west of Higher Farm Lane overbridge (between MP198 and MP197.6) is considered to have potential for groundwater flooding to occur at surface, this is just beyond the scheme extents.

5.7.3 BGS reports that a Secondary A aquifer exists south-west of the A303 near Podimore.

5.7.4 The HADDMS dataset *susceptibility of groundwater flooding* shows that between MP196.9 and MP196.2 the A303 groundwater flooding susceptibility is classed a 3 (moderate) and between MP196.2 and MP195.3 the susceptibility is classed as 2 (low). Elsewhere the susceptibility is either classed as 1 (very low) or 0 (negligible).

5.7.5 Table 5.1 below summarises the GIR and PSSR findings relating to the local groundwater conditions. It should be noted that the GIR levels are based on piezometer readings from 1992 – 1993 and 2003. For the purpose of this FRA, the worst-case levels have been reported however for all sections seasonal variations are to be expected.

Table 5.1: Geology and groundwater characteristics along route based

Section (proposed approx. chainage)	GIR groundwater description (approx. GIR chainage)	PSSR description (approx. PSSR chainage)
Start of scheme to Camel Cross (Chainage 300-2,000m)	Chainage 0-1,700m Groundwater table expected near surface. Groundwater readings as high as 0m bgl. Ponds are found in the area and standing water is present in places in the winter.	Chainage 300-2,000m Thin layer of topsoil up to 0.5m thick, underlain by predominantly firm to very stiff clay. Some layers contain calcareous material (shells and concretions). Occasional thin beds of slightly laminated mudstone (thought to comprise the Lower Lias).
Camel Cross to Plowage (Chainage 2,000-2,400m)	Chainage 1,700-2,100m Groundwater does not rise at same rate as ground level with deep groundwater levels (6-8m bgl) at chainage 1,800 however rising to 1-2m bgl near chainage 2,100.	Chainage 2,000-3,500 Around ch.2,000m the boreholes show stiff to very hard silty clay – sometimes containing shells. A thin layer of topsoil (approx. 0.3m) overlays a variable thickness

Section (proposed approx. chainage)	GIR groundwater description (approx. GIR chainage)	PSSR description (approx. PSSR chainage)
Plowage to Canegore Corner (Chainage 2,400-3,500m)	Chainage 2,100-3,300m Groundwater table is high in the Lower Lias Clay – typically found at 0.5m bgl.	superficial deposits of sand and gravel. The Camel Hill fault crosses the proposed route at a chainage of approximately 3,200m. The west of the Camel Hill fault the superficial geology consists of Lower Lias clay and to the east Blue Lias.
Canegore Corner to Traits Lane (Chainage 3,500-4,200m)	Chainage 3,300-4,700m Groundwater levels are typically 5-8 m bgl. However, levels one borehole near Traits Lane recorded a peak level of 3.2m bgl in January 2004 – likely due to seasonal fluctuations.	Chainage 3,500-5,000m Superficial deposits of sand and gravel can be found to a depth of 1.45m bgl. Below this limestone is proved a depth of 15m bgl. To the south of the highway a up to 1m thick deposits of gravel are recorded.
Traits Lane to Hazlegrove Roundabout (Chainage 4,200-5,300m)	Chainage 4,700-5,000m The measured groundwater table in this area varies between 5 and 0m bgl. The higher levels can in particular be found in the eastern chainages.	
Hazlegrove Roundabout to end of scheme (Chainage 5,300-5,900m)	Chainage 5,000-5,520m The water table can be found near the surface with the highest recorded level at 0.1m bgl.	Chainage 5,000-6,000m A layer of topsoil is logged to an average depth of approximately 0.3m below ground level. This is occasionally underlain by moderately dense gravel to a maximum of 0.7m thick. The site is underlain by Lower Lias clay and mudstone.

5.8 Flooding from artificial drainage systems

Highway drainage

5.8.1 The extents of the existing highway drainage system within the area of interest span from Podimore Roundabout east along the A303, through to the railway bridge in Sparkford. There are 4 principal highway catchments, as shown in Figure 5.1, outfalling into ordinary watercourses near Podimore Roundabout, north of Stockwitch Farm, Plowage Lane and Hazlegrove Roundabout.

5.8.2 Locations of flooding incidents as recorded on HADDMS have been provided within Appendix A. The recorded incidents are generally causing low levels of flooding of the carriageway with the root cause being blocked drains or an exceedance of the drainage system capacity. There is an instance of run-off from an adjacent field entering the carriageway. This indicates the existing drainage system is either in a poor condition or is not adequately sized to deal with high levels of run-off.

5.8.3 A condition survey between MP197.2 and 192.7 (approximate chainage 400metres to chainage 4,900 metres) undertaken in February and March 2015 showed that several portions of the existing system is collapsed, blocked or

suffers from cross-sectional losses. For many sections, the survey also had to be abandoned due to high water levels. The cross-sectional losses were generally due to debris, heavy siltation or ingress of roots.

5.8.4 Just to the north of Hazlegrove Roundabout the 2.8 hectares of highway catchment (approximately 40% of the existing highway effected by the development) discharges via an existing attenuation pond. The plan area of the pond is approximately 1,200m^2 and it was evident from the site visit that the embankments were very steep and sits within a cutting of a sloping site. The effective storage volume is approximately 1,500m^3. A condition survey undertaken 21 January 2014, identified that a flap valve appeared stuck or seized, with water in the inlet chute higher than water in the chamber. A site visit undertaken by Mott MacDonald Sweco Joint Venture in December 2017 by the drainage team, concluded that the feature was heavily vegetated with trees and shrubs, which would impede its ability to effectively attenuate storm water.

5.8.5 Approximately 60% of the existing carriageway (4.2 hectares) discharges to ordinary watercourses unrestricted, with the potential to increase flood risk downstream. The rational method as set out in the HR Wallingford (1981)[21] was used to estimate the existing highway peak run-off for each of the catchments. Subsequently, the equivalent greenfield response was calculated using the Institute of Hydrology methodology (IoH124)[22]. Results are presented within Table 5.2.

5.8.6 As a result of climate change, there will be an increase in peak rainfall intensity. Flood risk from existing artificial drainage systems have historically not been designed to incorporate the effects of climate change and / or less onerous design standards. As rainfall intensity increases the risk of flooding from artificial drainage sources will increase.

[21] HR Wallingford, (1981), Wallingford Procedure
[22] Institute of Hydrology (1994) IH124 method [online] available at: http://www.uksuds.com/FAQRetrieve.aspx?ID=55033 (last accessed March 2018).

Figure 5.1: A303 existing highway drainage catchments

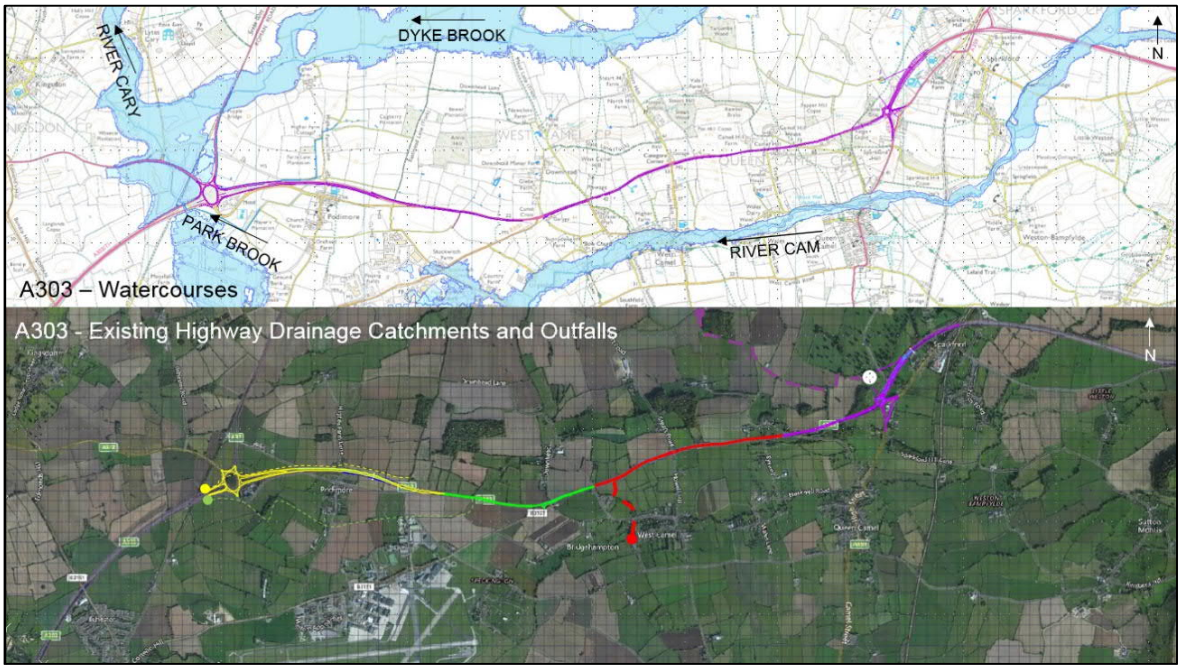


Table 5.2: A303 existing highway drainage peak discharge rates and equivalent greenfield response comparison

Catchment	Watercourse destination	AEP (%)	Existing peak run-off (l/s)	Equivalent greenfield run-off (l/s)
1 (yellow)	River Cary	100	356	20
		33.3	904	50
		1	1143	62
2 (green)	River Cary via Park Brook	100	69	3
		33.3	175	8
		1	221	10
3 (red)	River Cam	100	77	6
		33.3	194	14
		1	246	18
4 (purple)	River Cary via Dyke Brook	100	214	17
		33.3	544	41
		1	688	52

5.8.7 HADDMS reports the presence of a culvert at the foot of Camel Hill at approximately chainage 1,250m, which is believed to convey surface water run-off from the exterior catchment. There are numerous cross carriageway pipes associated with the positive drainage system of the carriageway. Of note, approximately 160 metres west of Hazlegrove Roundabout there is a cross carriageway pipe to an invalidated soakaway on the northern side of the carriageway. Approximately 450 metres east of Hazlegrove Roundabout there is a 1,050 millimetre diameter pipe, 270 metres in length, passing highway run-off into the attenuation pond. For further details, refer to the *Drainage Strategy Report* (Appendix 4.7, Volume 6.3).

Sewer flooding

5.8.8 Flooding from sewers is often the result of surface water entering the system either through historic combined networks, misconnections or infiltration. Flooding from sewers poses a significant risk to human health as well as the flood risk.

5.8.9 Within the scheme extents there is 1 crossing of a Wessex Water sewer. This conveys effluent from approximately 11 residences and a garage north to south at Canegore Corner. The size of the sewer is DN150.

5.8.10 Based on the information available, the likelihood of flooding from this minor spur is low, however wherever sewers are located there is a risk of some flooding.

5.9 Flooding from coastal or tidal sources

5.9.1 The site is located 36 kilometres from the coast and 32 kilometres from nearest estuary. The lowest point of the existing A303 is approximately 17mAOD. It is therefore considered that there is no or an extremely low risk of coastal or tidal flooding.

5.10 Flooding from infrastructure failure

5.10.1 The nearest reservoir or lake to the A303 is Compton Castle Lake 4.9 kilometres east of Hazlegrove Roundabout. The A303 is not located directly downstream of the lake. It is therefore considered that there is no or an extremely low risk of coastal or tidal flooding.

5.11 Existing flood risk summary

5.11.1 Table 5.3 shows a summary of the existing flood risk.

Table 5.3: Existing flood risk summary

Data source	Flood risk source					Comment
	Fluvial	*Surface water*	*Groundwater*	*Infrastructure failure*	*Artificial systems*	
Environment Agency online flood maps: - Flood risk from rivers or the sea	×	×	×	×	×	The mapping indicates the flooding associated with the River Cam or Dyke Brook have **no** direct effect on the A303.
Environment Agency online flood maps: - Flood risk from surface water	×	✓	×	×	×	The mapping indicates there is some surface water flood risk – ranging from low to high flood risk - near or on the A303.
Environment Agency online flood maps: - Flood risk from reservoirs	×	×	×	×	×	The mapping indicates the flood risk associated with reservoirs have **no** direct effect on the A303.
South Somerset District Council Level 1 SFRA	×	×	×	×	×	The SFRA reported incidents of flooding along the highway A303 however did not specify specific highway sections. No mapped flooding incidents in the SFRA were within the area of the proposed development however there were incidents in downstream catchments of the A303 by the River Cam.
HADDMS and BGS (Areas susceptible to Groundwater Flooding)	×	×	✓	×	×	HADDMS reports sections of the A303 have a susceptibility level up to '3 – Medium susceptibility'
HADDMS (Flood event records)	×	×	×	×	✓	There are 16 recorded events between junction A303 / A359 and Hazlegrove Roundabout. These generally relate to drain blockages or water entering the carriageway from adjacent fields. Climate change will result in peak rainfall intensity increase. Existing drainage systems may not be able to cope with future run-off.
OS mapping	The contours around the A303 suggest the landscape is undulating with some small catchments draining directly in the direction of the A303 as well as away from the A303.					
Existing utilities	The records show a Wessex Water foul sewer crossing the A303. Wherever these are located some sewer flooding risk exists from blockages or breakages.					

6 Post development impact on flood risk

6.1.1 In compliance with the NPPF / PPS 25, the scheme is required to be 'safe, without increasing flood risk elsewhere', and where possible 'reduce flood risk overall'.

6.1.2 The sources of flood risk study undertaken in section 5 identified surface water, groundwater and artificial drainage systems as the principle sources of flood risk on-site, and where the scheme could affect flood risk elsewhere.

6.1.3 The scheme would increase the overall footprint as a result of the new dual carriageway. The existing and proposed impermeable area associated with the scheme is presented in Table 6.1 (accurate at the time of writing);

Table 6.1: Existing and proposed catchment areas

	Existing (ha)*	Proposed (ha)**
Impermeable catchment area	6.9	20.5

*Mainline impermeable areas
**Mainline, de-trunked A303 to remain, associated links and grade-separated junctions

6.1.4 The scheme therefore has the potential to cause an adverse effect on flood risk as greater volumes of run-off are generated, which could be discharged rapidly to receiving watercourses.

6.1.5 Where the scheme bisects natural catchments, surface water run-off, as highlighted by the surface water flood maps, has the potential to cause flooding of the carriageway and overwhelm the highway drainage system.

6.1.6 The proposed vertical profile of the carriageway is such that in places the carriageway is approximately 10 metres bgl within a cutting. This would increase the susceptibility of the carriageway to groundwater flooding.

6.1.7 To ensure the adverse effects of the scheme, with respect to flood risk are mitigated against, the scheme would incorporate multiple mitigation measures as described in section 6.2 below.

6.2 Proposed drainage strategy

Highway drainage

6.2.1 The proposed drainage philosophy being applied is to replicate, as far as reasonably practicable, an un-developed site creating a betterment. The proposals are not measured against the existing drainage performance.

6.2.2 The highway drainage strategy will seek to capture the run-off from the highway, its associated earthworks and structures as well as existing lengths of the A303 that are to be retained and de-trunked.

6.2.3 The proposed discharge criterion limits off-site discharge, up to and including the 1% annual probability (1 in 100 year event) to no greater than the undeveloped rate of run-off as determined by the calculation of Q_{BAR}. These are presented in Table 6.2 (accurate at the time of writing);

Table 6.2: Proposed discharge rates

Catchment reference	Proposed area (Ha)		Watercourse destination	Pond volume (m³)		Qbar discharge rate (l/s)
	Permeable	Impermeable		Flood storage	Treatment volume	
1	1.20	2.27	River Cary via Park Brook	1835	402	9.97
2	6.77	4.82	River Cary via Park Brook	3922	946	56.05
3	8.54	4.21	River Cary via Park Brook	3759	940	61.86
4	2.80	0.66	River Cam	715	224	16.81
5	5.99	2.55	River Cary via Dyke Brook	8283	1706	104.95
6	6.49	5.98	River Cary via Dyke Brook	As existing	As existing	

6.2.4 Run-off up to the 1% annual probability event will be managed within the site extents within boundary ditches and maintenance strips.

6.2.5 A 40% allowance for climate change has been incorporated within the design. Table 6.3 below shows the Environment Agency's suggested intensity allowances until the 2080s. 40% reflects an upper bound estimate for the effects of climate change.

Table 6.3: Environment Agency's peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across all England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

Source: Reproduced from Table 2 of EA Guidance: Flood risk assessments: climate change allowances

6.2.6 The drainage philosophy seeks to avoid the use of below ground drainage systems where possible through incorporating grass surface water channels, un-lined ditches and open storage basins. The provision of sustainable drainage features provides biodiversity and water quality benefits, as well as water quantity improvements. Further details are provided in Drainage Strategy Report (Appendix 4.7, Volume 6.3).

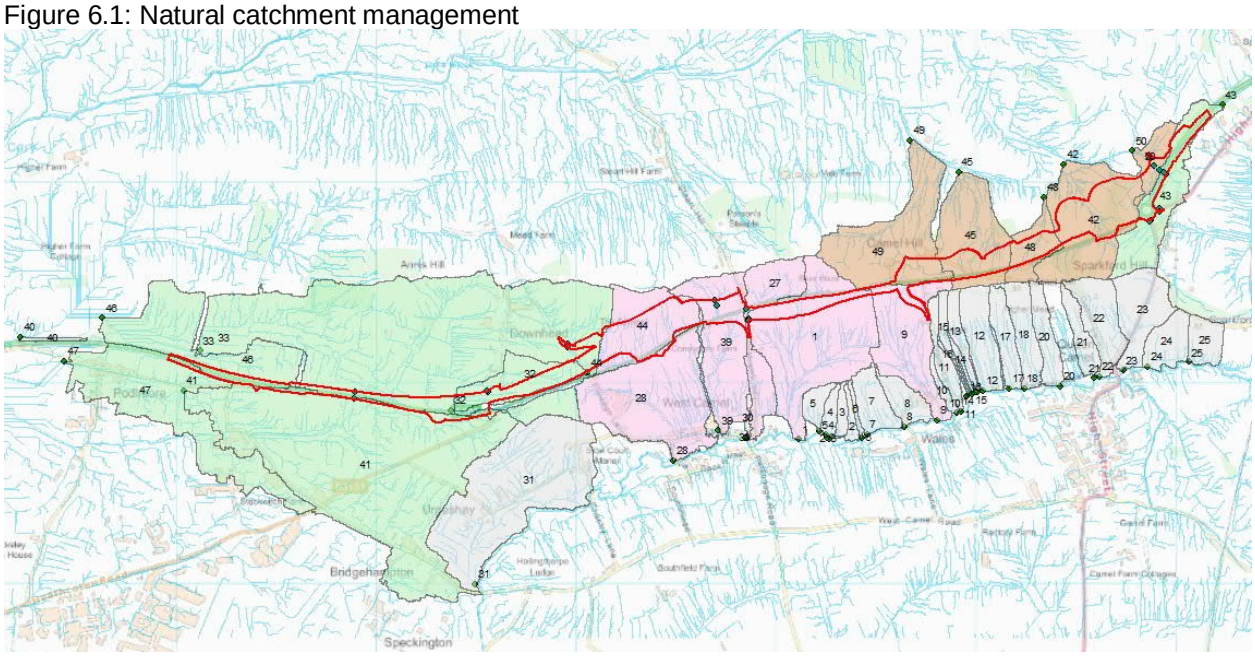
6.2.7 In accordance with discharge hierarchy, opportunities to discharge via infiltration were explored, the main composition of the Lower Lias Clay however deterred this as a viable option. Groundwater, particular at the foot of Camel Hill, coupled with surface water run-off also reduced the likelihood of achieve viable infiltration rates. Results of the geotechnical investigations (GI) including

soakaway testing and groundwater monitoring, as well as the Geotechnical Interpretive Report, are likely to be available in July / August 2018. At this stage it is envisaged that infiltration is not suitable as the sole means of discharge. Should soakaway tests and seasonal groundwater fluctuations permit infiltration it should be adopted into the drainage strategy.

External catchments

6.2.8 Exterior catchment overland flow (as shown in Figure 6.1) will be collected by a network of cut-off ditches, conveying to existing ordinary watercourses to replicate, as far as is reasonably practicable, the natural catchment response to rainfall. Where necessary, culverts will be provided to convey exterior catchment run-off.

Figure 6.1: Natural catchment management



6.2.9 As the route passes through existing agricultural areas, buried field drains may need to be diverted or incorporated into the external catchment management system.

Groundwater

6.2.10 The proposed additional impermeable area would reduce the likely volume of water infiltrating into the ground. Sustainable drainage features, such as grass channels and ditches, would enable a portion of the run-off to infiltrate into the ground (permeability and levels of ground water dependent). In addition, the proposed cuttings would reduce the available groundwater storage capacity.

6.2.11 During the construction phase groundwater ingress will be required to be carefully managed as historic data indicates that high groundwater levels can be found across the site. It will be particularly important to manage the

groundwater in the cutting between chainage 1,950 metres and 3,200 metres as the new highway level will be significantly lower than the existing; over 10 metres difference in some locations.

6.3 Effects on flood risk elsewhere

6.3.1 The routing of run-off from the proposed highway and retained portions of the existing A303 though attenuation features will reduce offsite flood risk when compared to the baseline,

6.3.2 The risk of flooding from sewers would remain during construction and post-development. It is not considered necessary to further assess the impacts of sewer flood risk elsewhere due to the perceived low risk which would be managed through diversion and construction works (to be agreed with Wessex Water development services).

7 National Planning Policy Framework – sequential test

7.1.1 As outlined in paragraph 3.2.1, the aim of the sequential test is to steer developments into areas with the lowest probability of flooding, ultimately in flood zone 1. However, within each flood zone all other sources of flooding must also be taken into account when applying the sequential approach (PPG paragraph: 019, reference ID: 7-019-20140306)[23].

7.1.2 The scheme is wholly located in flood zone 1 and at least 450 metres from the existing flood plains of the River Cam and Dyke Brook, as shown in the flood risk map in Appendix A.

7.1.3 There is some surface water flood risk at the location of the scheme. However, the surface water flood risk exists intermittently across the whole area over which options for the scheme has been assessed. The proposed location of the development avoids a large number of these surface water flood risk areas. The scheme can therefore be considered appropriate as long as measures are taken to manage the surface water run-off from the development and the flood risk already existing in the area. This was also observed in the PSSR (Appendix 9.1 of Volume 6.3).

7.1.4 This FRA does therefore consider that the proposed development in its location passes the sequential test.

[23] Ministry of Housing, Communities & Local Government (2014) Planning Practice Guidance The aim of the Sequential Test [online] https://www.gov.uk/guidance/flood-risk-and-coastal-change#sequential-approach (last accessed March 2018)

8 Conclusions

8.1.1 The scheme comprises of approximately 5.6 kilometres of continuous dual carriageway linking the Podimore bypass and the Sparkford bypass. At-grade junctions will be removed and replaced with new grade-separated junctions. Sections of the existing A303 will be retained and de-trunked following construction of the new route.

8.1.2 The existing and the proposed A303 route are wholly located outside flood zones 2 and 3. The route is elevated above the fluvial floodplains and it is not expected that climate change would result in a fluvial flood risk to the scheme. This FRA considers that the proposed development in its location passes the sequential test.

8.1.3 The surface water flood map shows that the majority of the scheme extents is not within an area of high, medium or low risk from surface water flooding. An area of significant interaction with the highway is at the foot of Camel Hill. Overland flow will be managed via a network of cut-off ditches. Where necessary, culverts will be provided to convey exterior catchment run-off.

8.1.4 Approximately 60% of the existing carriageway runoff discharges to ordinary watercourses unrestricted, with the potential to increase flood risk downstream. Artificial drainage systems have historically not been designed to incorporate the effects of climate change and / or less onerous design standards. The proposed drainage philosophy being applied is to replicate, as far as reasonably practicable, an un-developed site creating a betterment. The proposed discharge criterion limits off-site discharge, up to and including the 1% annual probability (1 in 100 year event) to no greater than the undeveloped rate of run-off as determined by the calculation of Q_{BAR}. An allowance of 40% increase in rainfall intensities has been considered.

8.1.5 A number of springs are present both north and south of the A303, formed at the interface of the more permeable limestone and gravels, and the less permeable Lower Lias. During the construction phase groundwater ingress will be required to be managed, particularly within the cutting between chainage 1,950 metres and 3,200 metres. Within cuttings the subsurface drainage system will need to manage groundwater to ensure that the proposed carriageway is not at risk, particularly in wet winters. Despite this the scheme is not expected to significantly increase the risk from this source.

8.1.6 HADDMS reports that the existing highway has experienced some flooding incidents, with the likely causes attributed to blockages or exceedance of the system. Ongoing maintenance of the existing and proposed drainage assets is critical to the management of surface water flood risk. The proposed drainage

strategy incorporates surface features to aid visual inspection and subsequent maintenance.

8.1.7 This FRA has considered the flood risk from all sources of flooding to and from the proposed site. The entirety of the scheme is within Flood Zone 1. The assessment identified surface water runoff as the most significant risk and through implementation of the proposed drainage strategy the scheme will not increase flood risk elsewhere, furthermore improving upon the baseline condition.

Appendix A: Flood risk map

RIVER CARY
DYKE BROOK
CARY CATCHMENT
SPARKFORD
HAZLEGROVE ROUNDABOUT
FARM LANE OVERBRIDGE
CANEGORE CORNER
TRAITS LANE
PLOWAGE
PARK BROOK
PODIMORE
PODIMORE ROUNDABOUT
CAMEL CROSS
WEST CAMEL
QUEEN CAMEL
RIVER CAM
CAM CATCHMENT
HORNSEY BROOK CATCHMENT
HORNSEY BROOK
RIVER YEO
YEO DS OVER COMPTON CATCHMENT
SPR
4329
507
147
4336
4276
484
278
4319
4372
4323
4549
4349
14828
13718
3980
436

1:10,000 0 500m 1000m

NOTES

1. PROPOSED HIGHWAY ALIGNMENT SHOWN IS BASED ON 2D MODEL (HE551507-MMSJV-HML-000-M2-CH-0110)
2. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE FLOOD RISK ASSESSMENT (HE551507-MMSJV-HDG-000-RP-CD-0101)
3. FLOOD ZONE 2 AND 3 DATA OBTAINED FROM ENVIRONMENT AGENCY, REVISION DATE 31/10/2017
4. RISK OF FLOODING FROM SURFACE WATER DATA OBTAINED FROM HIGHWAYS ENGLAND 22/11/2017
5. EXISTING FLOOD DEFENSE DATA OBTAINED FROM ENVIRONMENT AGENCY, REVISION DATE 31/01/2018
6. HADDMS FLOOD INCIDENT DATA OBTAINED OCTOBER 2017
7. SPRINGS SHOWN ON MAP ARE BASED ON SPRING LOCATIONS ON ORDNANCE SURVEY BACKGROUND MAPPING
8. FURTHER FLOOD INCIDENT DETAILS LISTED IN THE FLOOD RISK ASSESSMENT (HE551507-MMSJV-HDG-000-RP-CD-0101)

KEY TO SYMBOLS

- 0.000 — MAIN ALIGNMENT CHAINAGE
- HIGH RISK OF FLOODING FROM SURFACE WATER
- MEDIUM RISK OF FLOODING FROM SURFACE WATER
- LOW RISK OF FLOODING FROM SURFACE WATER
- FLOOD ZONE 2 (RIVERS AND THE SEA)
- FLOOD ZONE 3 (RIVERS AND THE SEA)
- 001 — FLOOD INCIDENTS FROM HADDMS (FLOOD EVENT ID)
- SPR — SPRING
- EXISTING FLOOD DEFENCE
- WFD CATCHMENT BOUNDARY

REFERENCE DRAWINGS

HE551507-MMSJV-HDG-000-DR-CD-0100
HE551507-MMSJV-HDG-000-DR-CD-0101
HE551507-MMSJV-HDG-000-DR-CD-0102
HE551507-MMSJV-HDG-000-DR-CD-0103
HE551507-MMSJV-HDG-000-DR-CD-0104

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
C01	03/04/18	DCO SUBMISSION	AC	TL	ER

Project Title: A303 SPARKFORD TO ILCHESTER DUALLING

Drawing Title: FLOOD RISK MAP

Drawing Status	Suitability
Published - DEFINITION	A3

Scale	Designed	Drawn	Checked	Approved
AS SHOWN	ST	AC	TL	ER
Original Size	**Date**	**Date**	**Date**	**Date**
A1	28/03/18	03/04/18	03/04/18	04/04/18

Drawing Number: HE PIN | Originator | Volume — HE551507 - MMSJV - HDG - | Location | Type | Role | Number — 000 - DR - CD - 0105

Project Ref. No.: 389107

Revision: C01

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Appendix B: Stakeholder consultation minutes

A303 Sparkford to Ilchester Dualling
Road Drainage and the Water Environment

Date:	23 January 2018	**Time:**	9:30
Location:	Somerset Drainage Board Consortium Bradbury House, Market St, Highbridge TA9 3BW		
Attendees:	Simon Bunn (SB) – Development Control Officer, Somerset Drainage Boards Consortium Dan Martin (DM) - Service Manager, Flood Risk Management Somerset District Council (LLFA) Tom Lake (TL) – Drainage Lead, Mott MacDonald Sweco		
Apologies:	John Southwell (JS) – Environment Agency		

<table>
<tr><th>No.</th><th>Actions/Key Messages</th><th>Owner</th></tr>
<tr><td>1.0</td><td>Introduction</td><td>All</td></tr>
<tr><td></td><td>Overview of the preferred route and key dates:
<table>
<tr><td>November 2017</td><td>EIA Scoping Report submitted to the Planning Inspectorate (PINS)</td></tr>
<tr><td>January 2018</td><td>Receipt of Scoping Opinion from PINS</td></tr>
<tr><td>January to March 2018</td><td>Statutory Consultation</td></tr>
<tr><td>March 2018</td><td>Design amendments following feedback from the Statutory Consultation</td></tr>
<tr><td>January to June 2018</td><td>Environmental Statement and additional environmental deliverables.</td></tr>
<tr><td>July 2018</td><td>DCO submission</td></tr>
</table></td><td></td></tr>
<tr><td>2.0</td><td>Drainage Philosophy</td><td></td></tr>
<tr><td></td><td>A summary of the existing drainage design, known flooding issues and proposed drainage design was given.

Approximately 60% of the existing carriageway is unattenuated. The proposed drainage strategy has been developed to date to reduce post development peak runoff rates to the equivalent greenfield response up to and including the 1% Annual Exceedance Probability (AEP) event (+ 40% allowance for climate change).</td><td>TL</td></tr>
</table>

No.	Actions/Key Messages	Owner
	Attenuation would largely be provided through open storage basins with permanent ponds to aid water quality treatment. Linear features would be used where possible to collect, treat, store and convey water as close to source as possible. The proposed storage basins have currently been designed with 1:4 slopes, with 750 millimetre effective storage depth. Need for impermeable liner to be determined upon confirmation of seasonal groundwater levels (ground investigation to inform). Post development, the overall peak runoff rates from the A303 would reduce, although there would be an increase in the volume of runoff due to the additional impermeable area. SB declared that the Somerset Drainage Board Consortium (SDBC) would seek to impose a reduction in flow rates and volume. TL / SB confirmed in practice this is delivered through the provision of 'long-term-storage' limiting offsite discharge to 2 l/s/ha or QBAR for all. *[Post meeting notes for completeness:]* **S4. Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.** **S5. Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.** **S6. Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.** TL to develop strategy considering volume restriction.	
4.0	**Opportunities for enhancements**	
	TL inquired as to whether any alternative mitigation may prove more beneficial to the catchment response considering a holistic approach to flood risk management. For example, improvements to pumped areas of the catchment. SB to investigate with catchment engineers for any potential opportunities.	SB
5.0	**AOB**	
	Consenting – under the Land Drainage Act SDBC require application. Although not within the 'boundary' of the Parrett Drainage Board (DB), as the scheme will be discharging to an	

No.	Actions/Key Messages	Owner
	ordinary watercourse contributing to the discharge, there will be the need to apply for consents. TL to investigate through which mechanism this application will be undertaken. SB noted that for Development Consent Order (DCO) applications in the past, there could be legal arrangements drafted to combine LLFA and SDBC powers. DM / SB agreed that working together in best interest for all. TL informed SB / DM that public consultation will be occurring in the next few weeks. SB flagged that 'Garden Town' is a project of interest within the community and to expect queries. DM was keen to understand any concerns raised by the public at the meetings. TL to develop a list and forward as appropriate. TL to pass on named SCC to DM to ensure all communication documented and due process followed. *[Note post meeting: TL passed on contact name Richard Gorst (RG) as the named SCC engineering representative. All future correspondence to be undertaken through RG. It is planned for a drainage meeting in the next few weeks where DM / TL will update on progress to-date].*	TL TL TL

Appendix C: Stakeholder consultation correspondence

Sophie Bennett
Mott MacDonald Sweco JV
Stoneham Place
Stoneham Lane
Southampton
Hampshire
SO50 9NW

Our ref: WX/2018/131402/02-L01
Your ref: TR010036-000004

Date: 22 May 2018

Dear Ms Bennett

PROPOSED DUALLING SCHEME A303 SPARKFORD TO ILCHESTER - SUBMISSION OF WFD SCREENING AND SCOPING ASSESSMENT HAWRAT ASSESSMENT AND FLOOD RISK ASSESSMENT (FRA)

Thank you for your consultation regarding the above.

WFD Screening and Scoping Assessment

The Agency accepts the approach to the assessment and concur that it is unlikely the scheme will affect the WFD status of the waterbodies identified. Any potential impact pathways can be mitigated by the measures included in the HAWRAT. Additionally, the Agency agrees that a Stage 3 WFD impact assessment is not necessary.

HAWRAT Assessment

The HAWRAT provides a thorough assessment of potential impacts of pollution from surface water run-off on the watercourses within the Zone of Impact and those within the wider catchment area. Where such impacts would result in a failure to meet ecological quality standards, mitigation measures in the form of SUDS and treatment systems are proposed to ensure that any run-off meets quality standards before it enters a watercourse. The Agency accepts this approach and has no objection to the proposed location of the treatment systems.

As previously discussed, the design of the ponds, drainage channels and ditches should include the provision of measures to maximise wildlife interest and habitat for the species noted in the Biodiversity section of the Preliminary Environmental Information Report.

FRA

The Agency can confirm that it has no additional observations or specific concerns regarding the submitted FRA.

Cont/d..

With regard to the submitted schedule of scoping opinion comments/responses, the Agency is satisfied that the previously highlighted issues have been satisfactorily addressed.

Should you wish to discuss this matter further please contact the undersigned direct.

Yours sincerely

Dave Pring
Planning Specialist

Direct dial 02030 250153
Direct fax 01278 452985
Direct e-mail nwx.sp@environment-agency.gov.uk

End