

Forest Farm, Chippenham
Environmental Statement

Chapter 10
Water environment



10 Water environment

Introduction

- 10.1 Mayer Brown Limited was appointed to undertake the assessment of effects on the water environment, focusing on the potential for effects on flood risk and surface water drainage and the increased demand for wastewater treatment as a result of the proposed development. Effects during construction were scoped out of the assessment. The findings of the flood risk assessment (FRA) are summarised in this chapter and the full report is included as technical appendix H. The references and data sources used in the assessment are set out in table 10.1.

British Geological Survey online mapping: https://www.bgs.ac.uk/discovering-geology/maps-and-resources/maps/
British Standards Institution, 2022, BS EN 752:2017 Drain and sewer systems outside buildings. Sewer system management
CIRIA, 2015, C753 The SuDS Manual
Environment Agency's online mapping: https://flood-map-for-planning.service.gov.uk
JBA Consulting, 2024, Wiltshire Council Level 1 Strategic Flood Risk Assessment
Water UK, 2023, Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code")
Wessex Water, 2023, Chippenham Drainage and Wastewater Strategy
Wiltshire Council, 2024, Drainage and Betterment Strategy
Table 10.1: References and data sources

Legislation and policy

Legislation

- 10.2 The Water Framework Directive (2000/60/EC) aims to ensure all surface water and groundwater reaches 'good' status in terms of ecological and chemical quality and water quantity, as appropriate, to reduce pollution and contribute to the mitigation of flooding. It also contains provisions for controlling discharges of dangerous substances to water. The directive is implemented in England by the Environment Agency and is transposed into English law through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (as amended).
- 10.3 Water resources in England and Wales are protected by law under the Water Resources Act 1991 and the Environmental Protection Act 1990 (as amended by the Environment Act 1995). Under section 85 of the Water Resources Act 1991, it is an offence to *"cause or knowingly permit the discharge or other entry of poisonous, noxious or polluting matters or any solid waste matter into controlled waters (as defined under section 104 of the Act)."* Most waters will meet this definition, including groundwater.
- 10.4 The Water Act 2003 amends the Water Resources Act 1991 to improve long term water resource management, specifically with regard to the regulation of water abstraction and impoundment. The Water Act 2014 contains further amendments relating to water resources and environmental regulation. The Flood and Water Management Act 2010 provides for more comprehensive management of flood risk for people, homes and businesses. The Environment Act 2021 gives the government the power to set long term, legally binding environmental targets.

- 10.5 The Groundwater Directive (2006/118/EC) established a framework to prevent the input of hazardous substances and manage the input of non-hazardous pollutants into groundwater. It was transposed into English law by the Groundwater (England and Wales) Regulations 2009, which were subsequently revoked by the Environmental Permitting (England and Wales) (Amendment) Regulations 2010 and onwards. The latter require an environmental permit or registered exemption to be obtained from the Environment Agency to discharge anything other than clean, uncontaminated waters into inland freshwaters, groundwater, estuaries and coastal waters.

National policy

- 10.6 The National Planning Policy Framework (NPPF; 2024) sets out the government's planning policies for England and how they are expected to be applied. Paragraph 162 requires plans to *"take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk"*, while paragraph 163 states that *"the need to mitigate and adapt to climate change should also be considered in preparing and assessing planning applications, taking into account the full range of potential climate change impacts."*
- 10.7 Government policy on flood risk is also set out in the NPPF, together with the National Planning Practice Guidance: *Flood Risk and Coastal Change* (updated 2025). The latter contains advice to planning authorities and developers about flood risk and the role played by the Environment Agency in advising on planning applications in possible flood risk areas. It recommends that a risk-based approach should be applied to assess the risk of all forms of flooding to and from development, taking climate change into account. It also contains guidelines for carrying out a FRA.

Local policy

- 10.8 Local policy in relation to the water environment is provided by Wiltshire Council's adopted *Wiltshire Core Strategy* (2015). Core Policy 67: Flood Risk requires all development to include measures to reduce the rate of rainwater runoff and improve infiltration to soil and ground (sustainable drainage systems). Core Policy 68: Water Resources states that development must not prejudice the delivery or actions and targets of the relevant River Basin or Catchment Management Plan and should contribute to their delivery where possible.

Methodology

Baseline

- 10.9 Baseline conditions were identified through a desk study and through a programme of intrusive investigations undertaken by BRD Environmental Ltd in November 2023. The references and data sources used in the desk study are set out in table 10.1. Consultation was undertaken with the Environment Agency, Wiltshire Council as the lead local flood authority, and Wessex Water. Relevant data and published materials relating to the local and wider hydrological environment were reviewed. The Environment Agency's hydraulic modelling was reviewed to understand the levels of flood risk. The intrusive site investigations comprised 42 trial pits and 20 boreholes and

included groundwater monitoring and infiltration testing. Further details are included in the FRA in technical appendix H.

Impact assessment

- 10.10 There are no standard significance criteria for assessing effects on the water environment. The significance of effects has been derived from measures of receptor sensitivity and magnitude of change, as shown on figures 10.1 and 10.2 respectively. The sensitivity and magnitude criteria were combined to determine the degree of effect using the matrix shown in figure 10.3, which was then used to determine whether the effect was significant. As discussed in chapter 3, effects that are moderate or above are considered to be significant in EIA terms.

Baseline

Geology

- 10.11 The British Geological Survey's online geological records show that most of the site is underlain by a bedrock of Oxford Clay Formation – mudstone, while the southern part of the site is underlain by Kellaways Formation – sandstone, siltstone and mudstone. However, the site investigations recorded the Kellaways Formation, consisting of the Kellaways Sand Member and the Kellaways Clay Member, across the entire site.

Hydrogeology and groundwater

- 10.12 The bedrock below the site is classified as unproductive strata. The groundwater monitoring recorded shallow groundwater levels of less than 1 m below ground level in most of the monitoring wells. The infiltration testing found that soil permeability was too low to calculate the soil infiltration rate.

Surface water

- 10.13 A small watercourse runs from east to south through the site. There is also a series of existing ditch networks within the site that discharge to the watercourse. In addition, there is an existing ditch network on the south side of the A4 London Road. The ditches and watercourse form part of the site's drainage regime and are connected to downstream sections of watercourse that ultimately discharge into the River Avon.

Flood risk

Fluvial flooding

- 10.14 The Environment Agency's online flood map for planning shows that the whole site lies within fluvial flood zone 1, outside the 1-in-1,000 year (0.1% annual exceedance probability) extent of fluvial flooding. The site is therefore at low risk of fluvial flooding.

Surface water flooding

- 10.15 The Environment Agency's online flood risk from surface water mapping shows that most of the site is outside the mapped extent of surface water flooding and is therefore at very low risk. Areas in the centre and east of the

site are shown to be at medium to high risk, so a review of the Environment Agency's surface water flood information in conjunction with the topographic survey has been undertaken. Figure 10.4 shows the areas identified by the Agency's flood maps as being at medium and high risk of surface water flooding and the key sections of the existing ditch network (shown as a thick magenta line).

- 10.16 Area A on figure 10.4 is identified as being at risk of surface water flooding because the existing access track is slightly elevated by approximately 340 mm above the land to the immediate west and north. The catchment area for the identified extents of surface water flood risk is limited by the existing ditch network along the northern, western and southern boundaries, which would intercept any overland flows from beyond the ditch network. The only exception to this is a break in the ditch on the western boundary, but the existing topography and levels direct overland flows from beyond the site boundary to Pewsham Way and / or the London Road ditch that runs adjacent to the site's north eastern boundary. Therefore, the only flows that can contribute to the surface water flood risk in Area A are from the field itself.
- 10.17 The surface water flood extents shown as areas B, C and D on figure 10.4 are caused by topographic features on the surface water flow paths from the surrounding agricultural land to the watercourse. However, at all three locations there are existing flow paths into the existing watercourse, meaning that only localised ponding of water would be expected with the water travelling overland to the watercourse.

Groundwater flooding

- 10.18 JBA Consulting's (2024) *Wiltshire Council Level 1 Strategic Flood Risk Assessment* shows that the site is within an area described as having 'negligible risk' of groundwater flooding. However, shallow groundwater was found at the site during the intrusive investigations. The site is therefore considered to be at low risk of groundwater flooding.

Infrastructure flooding

- 10.19 JBA Consulting's (2024) *Wiltshire Council Level 1 Strategic Flood Risk Assessment* provides a record of sewer flooding incidents, which shows that there have been between one and 10 incidents of sewer flooding in the area. The mapping covers a broad area and there is no evidence that any of these incidents affected the application site. As there are no public sewers on or immediately adjacent to the site, it is considered that the risk of sewer flooding is low.

Wastewater drainage network

- 10.20 Wessex Water is the sewerage undertaker for the area. A rising foul sewer main crosses the north of the site from north east to north west, running from a pumping station to the east of the A4 London Road to a 300 mm diameter foul sewer in the A4 Pewsham Way. Chippenham Water Recycling Centre (WRC) lies approximately 1.8 km to the west of the site.
- 10.21 Wessex Water's (2023) *Chippenham Drainage and Wastewater Strategy* identifies that the WRC is approaching capacity and that improvements will be required to ensure the WRC can accommodate forecasted increases in flows

as a result of development in the area. It identifies a range of upgrades for the WRC, including quality enhancements to increase treatment to achieve a tightened phosphorus permit and capacity enhancements. Given this, the wastewater treatment network is considered to be of high sensitivity.

Future baseline

- 10.22 In the absence of the proposed development, it is assumed that the site will continue in its current use. The existing water environment could be subject to change as a result of climate change or changes of land use in the wider catchment.

Effects post-construction

Primary mitigation

- 10.23 During the design evolution of the proposed development, the surface water drainage constraints and requirements were carefully considered to avoid and / or minimise impacts. A preliminary drainage strategy was developed based around sustainable drainage systems (SuDS), in line with the guidance provided in CIRIA's (2015) *C753 The SuDS Manual*. The proposed sustainable drainage techniques will accommodate the peak rainfall event for a 1-in-100 year storm with a 45% allowance for climate change.
- 10.24 The site was split into five catchment areas, all of which will discharge via attenuation basins to the existing watercourse at a 30% betterment on greenfield runoff rates (70% QBAR). The general locations of the proposed basins are shown on figure 2.2a. Sections of the attenuation system are located within existing flow paths identified by the Environment Agency's surface water flood risk mapping, which is considered appropriate as these areas already act as preferential flow routes to the existing watercourse / ditch network. The proposed attenuation features will formalise and manage this existing function, while providing controlled storage and discharge.
- 10.25 The surface water drainage calculations include an allowance for approximately 1,600 m² of hardstanding associated with the potential future southern distributor road. The proposed driveways will consist of permeable paving, which will collect rainwater falling on these areas.
- 10.26 Sections of the existing ditch network will require culverting / bridging where they will be crossed by a proposed access road and cycleway. In addition to this, culverting is required to sections of the existing ditch adjacent to London Road to facilitate the proposed roundabout. To maintain the existing flow paths through the site, interception drains are proposed adjacent to the access road to intercept any runoff and discharge it to the existing watercourse (matching the baseline scenario).

Flood risk and surface water

- 10.27 All the proposed built development will be located in fluvial flood zone 1 and so will not be at risk from fluvial flooding or give rise to a reduction in floodplain storage. The proposed dwellings will also be outside the existing areas of elevated surface water flood risk in areas B, C and D, although dwellings are proposed within area A. However, as discussed in paragraph 10.16, the only flows that contribute to the surface water flood risk in area A

are from the field. These will be managed by the proposed surface water drainage strategy set out above, which will capture, control and gradually release the surface water runoff. Therefore, with the proposed development in place, this area will be at low risk of surface water flooding and no significant adverse effects are predicted.

- 10.28 While no dwellings are proposed in areas B, C and D, the proposed access road has the potential to create a barrier that would prevent water passing through areas B and C. Therefore, as discussed above, it is proposed to install interception swales / drainage features to maintain existing hydraulic connectivity and prevent the road from forming a barrier to overland flow. This will ensure there will be no significant effects on surface water flood risk in these areas.
- 10.29 As discussed above, the proposed SuDS have been designed to cater for the 1-in-100 year storm event plus a 45% allowance for climate change and to provide 30% betterment over the existing greenfield runoff rates. All attenuation basins will provide a minimum 300 mm freeboard. In the event that the capacity of the proposed surface water drainage network is exceeded, the excess water will follow the topography of the ground and flow overland into soft landscaping, greenfield land surrounding the site or towards the existing ditch network at an unrestricted rate, leaving properties unaffected. With these measures in place, no significant effects are predicted on flood risk from the proposed development and the built development will not be at risk from flooding.
- 10.30 The proposed SuDS network has also been designed to prevent adverse effects on water quality from the mobilisation of untreated runoff into the drainage system. CIRIA's (2015) *C753 The SuDS Manual* identifies the pollution hazard level associated with the proposed land uses as 'low'. The proposed attenuation basins will provide treatment of surface water by retaining runoff from small rainfall events and reducing contaminant load through volumetric control. The residual runoff will also be treated through the settling of particulates at the bottom of the basins and some filtration will occur through the vegetation in the basins.
- 10.31 The proposed swales will also help to improve water quality by removing polluting suspended solids through filtration and sedimentation. The proposed permeable paving will allow rainwater to be treated by microorganisms within the paving as it passes through the drainage medium. All three elements of the proposed drainage system will provide sufficient pollution mitigation for runoff from low hazard land uses, in accordance with the requirements of *The SuDS Manual*. This will ensure that there will be no significant adverse effects on water quality post-construction.

Wastewater drainage network

- 10.32 It is proposed that the existing rising foul sewer main within the site will be diverted under a section 185 agreement with Wessex Water. Wastewater from the proposed development will discharge to the existing foul sewer within the A4 Pewsham Way. Flows will drain via gravity to a wastewater pumping station within the site, which will pump flows to a demarcation chamber before discharging into the foul sewer.

- 10.33 Based on Water UK's (2023) calculation method, which sets a peak design flow rate of 4,000 litres per dwelling per day, a peak wastewater flow of up to 27.78 l/s will be generated by the proposed up to 600 dwellings. In addition, the local retail centre is assumed to generate a wastewater flow of 0.016 l/s, based on a building footprint of 262 m² and a peak design flow rate of 0.6 l/s/ha. Overall, therefore, the proposed development is estimated to have a total peak wastewater flow rate of approximately 27.80 l/s.
- 10.34 Wessex Water has advised that it is currently strategically modelling wastewater demand for the area and the extent of any off-site reinforcement required to serve the proposed development will be confirmed in due course. Any works required would be funded through Wessex Water's infrastructure charging arrangements. As a result, no significant adverse effects are predicted on the capacity of the area's wastewater treatment network.

Mitigation and monitoring

- 10.35 As no significant adverse effects were predicted, no additional mitigation measures or monitoring are required.

Residual effects

- 10.36 No significant residual effects are predicted.

Sensitivity of receptor – Water

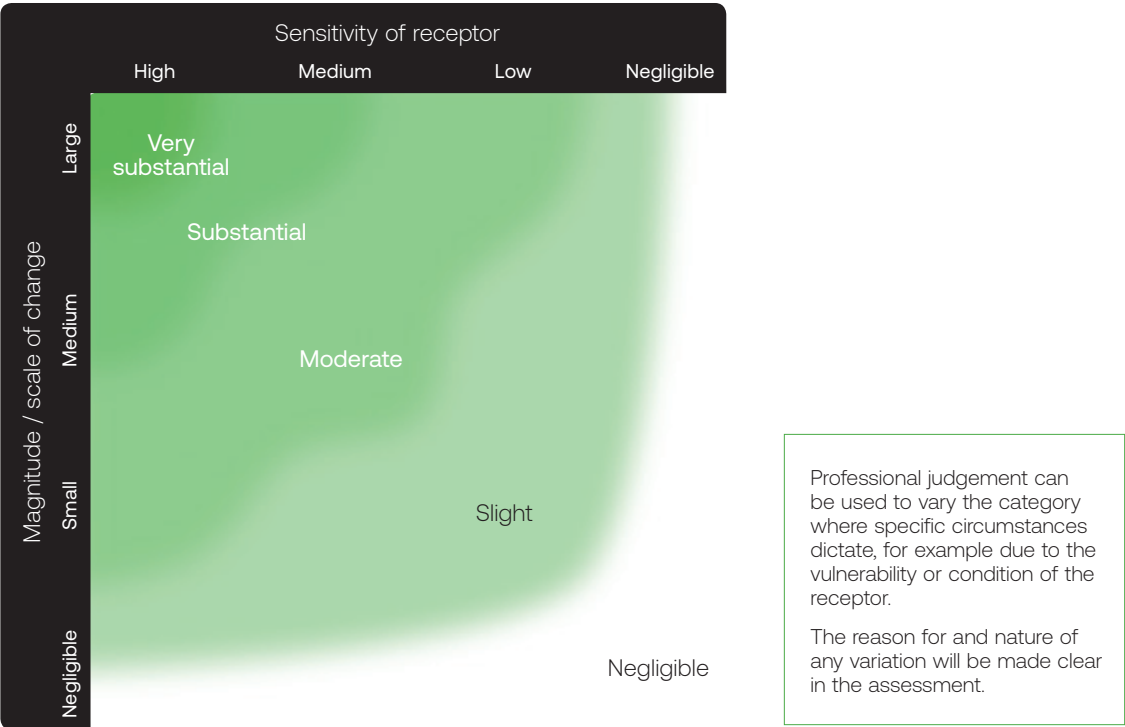
	High	Medium	Low	Negligible
Typical description of the receptor	Water body of 'high' ecological status ¹			
	Protected areas, including: designated bathing waters, shellfish waters, salmonid and fish stretches, sensitive areas (eutrophic and nitrate), water dependent Natura 2000 sites (SACs and SPAs) and drinking water protected areas			
	Water body of high amenity value, including areas of bathing and where water immersion sports are regularly practised			
	Designated groundwater, aquifer, abstraction point or well source protection zone			
	Water body of 'good' ecological status ¹ and / or non-public water supply or cyprinid fishery			
	Water body of nature conservation importance at the national or regional level or a moderately sensitive aquatic or marine ecosystem e.g. SSSI or SNCI			
	Water body of moderate amenity value incl. public parks, boating, popular footpaths adjacent to watercourses, or watercourses running through housing developments / town centres			
	Water body of 'moderate' ecological status ¹ Minor, high quality aquifer, a groundwater or surface source in close proximity to a source protection zone or abstraction point			
	Non-statutory wetlands. Water body of particular local cultural / social / educational interest			
	Minor, low quality aquifer. Water body of low amenity value with only casual access e.g. along a road or bridge in a rural area			
	Water body of no amenity value, seldom used for amenity purposes, in a remote or inaccessible area			
	Water body of 'poor' or 'bad' ecological status ¹			

¹ As designated by the Water Framework Directive, 2000

Magnitude of change – Water



Determination of significance matrix – Water



Degrees of effect

Very substantial

Wholesale change to watercourse, water chemistry, erosion and sedimentation characteristics within areas protected for their environmental importance or significance as water supply sources.

Substantial

Wholesale or fundamental changes to water bodies, which are not water supply sources, but of good quality. Wholesale and/or moderate changes to associated erosion/sedimentation patterns and water chemistry. Also, moderate changes to watercourse, water chemistry, erosion and sedimentation characteristics within areas protected for their environmental importance or significant as water supply sources.

Moderate

Wholesale and/or fundamental changes to water bodies of average quality, and features of local interest. Also minor changes to important water bodies such as those in areas protected for their environmental significance, water bodies of good quality, and both water supply and non-water supply sources.

Slight

Small changes to water bodies of local interest or of average water quality.

Negligible

No change to water bodies of poor quality and artificial watercourses.

Significance

If the degree of effect is moderate or above, then the effect is considered to be significant.



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