
UNIVERSAL DESTINATIONS & EXPERIENCES UK PROJECT

# Former Kempston Hardwick Brickworks and adjoining land, Bedford

## Environmental Statement Volume 1

## Chapter 12 - Water Resources

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# 12. WATER RESOURCES

## 12.1. INTRODUCTION

12.1.1. This chapter has been prepared in support of the planning proposal for the Proposed Development as described in **Chapter 2: Description of the Proposed Development (Volume 1)** of the Environmental Statement (ES). This reports the outcome of the assessment of likely significant effects arising from the Proposed Development in relation to Water Resources during construction and operation.

12.1.2. "*Water Resources*" refers to this Technical Chapter Title, and "*water resources*" refers to sources of natural water e.g. rivers, surface water runoff, groundwater, and waterbodies e.g. rivers, lakes, ponds.

### SUPPORTING DOCUMENTATION

12.1.3. **Appendix 12.1: Flood Risk Assessment (Volume 3)** and **Appendix 12.3: Drainage Strategy (Volume 3)** demonstrates how foul water and surface water runoff is to be managed and that there will be no increase in on- or off-Site flood risk. A Water Strategy (WS) has been developed and shown in **Appendix 12.2: Water Strategy (Volume 3)**, which summarises the operational demand requirements for domestic and process water, along with the sustainable sources of water supplies.

12.1.4. This chapter is intended to be read in conjunction with the following supporting figures and appendices:

- **Figure 12.1: Risk of Flooding From Rivers (IDB) (Volume 2)**;
- **Figure 12.2: Risk of Flooding from Surface Water (EA) (Volume 2)**;
- **Figure 12.3: Existing Surface Water Plan Regime (Volume 2)**;
- **Figure 12.4: Proposed Surface Water Strategy (Volume 2)**;
- **Appendix 12.1: Flood Risk Assessment (Volume 3)**;
- **Appendix 12.2: Water Strategy (Volume 3)**;
- **Appendix 12.3: Drainage Strategy (Volume 3)**;
    - Proposed Surface WS (**Annex 2: WSP Drainage Strategy Drawing** of **Appendix 12.3: Drainage Strategy (Volume 3)**);
    - Proposed Foul WS (**Annex 2: WSP Drainage Strategy Drawing** of **Appendix 12.3: Drainage Strategy (Volume 3)**); and
    - Sustainable Drainage System (SUDS) Maintenance and Management Plan (**Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)**).

12.1.5. This chapter will assess impacts to the quality and quantity of groundwater resources associated with construction and operational activities. **Chapter 11: Ground Conditions, Soils and Agricultural Land (Volume 1)** assesses impacts associated with disturbance of contaminated land, including subsequent impact to controlled waters (groundwater and surface water resources). This chapter assesses potential impacts to water quality and flow in relevant surface water features. **Chapter 6: Ecology and Nature Conservation (Volume 1)** includes subsequent impact to aquatic ecology and biodiversity.

12.1.6. Where reference is made to agreements that are in place with Anglian Water, the Environment Agency or the Bedford Group Internal Drainage Board (IDB), these discussions and agreements are captured in the Summaries of Agreed Position (SoAP) with the relevant stakeholder (see **Appendix 4** of the **Planning Statement (Document Reference 6.1.0)**).

**LEGISLATIVE FRAMEWORK, POLICY, AND GUIDANCE**

12.1.7. The relevant legislation, policy, and guidance to the assessment of Water Resources effects associated with the Proposed Development are detailed in **Appendix 3.1: Legislation, Policy, and Guidance for all ES Technical Topics (Volume 3)**.

## 12.2. ASSUMPTIONS USED TO INFORM ASSESSMENT

12.2.1. The assessment presented in this chapter has been based on the Proposed Development as described in **Chapter 2: Description of the Proposed Development (Volume 1)**. This chapter has also used the following assumptions to build on the information in **Chapter 2: Description of the Proposed Development (Volume 1)** to support undertaking an assessment of a cautious worst case (where the phrase "*cautious worst case*" is used it means "*a cautious worst case that provides a robust assessment of likely significant effects*").

12.2.2. The following assumptions have been used to inform this assessment:

- National Planning Policy Framework (NPPF) (**Ref. 12.32**) is applicable, and the Sequential and Exception test has been applied in **Appendix 12.1: Flood Risk Assessment (Volume 3)** of the ES and Chapter 6: Ecology and Nature Conservation (Volume 1);
- Embedded mitigation included in A**ppendix 12.1: Flood Risk Assessment (Volume 3), Appendix 12.2: Water Strategy (Volume 3) and Appendix 12.3: Drainage Strategy (Volume 3)** is at an outline level of detail suitable for planning purposes. Detailed design will be undertaken prior to construction (relevant where this chapter refers to detailed design and stages);
- Works in relation to Elstow Brook will be subject to detailed engagement with the Bedford Group IDB (Land Drainage Consent) and Environment Agency (Water Framework Directive (WFD) Classification);
- Core Zone watercourse diversion concept strategy has been accepted in principle by the IDB however will be subject to detailed engagement with the IDB (Land Drainage Consent);
- Proposed Utility infrastructure which includes foul sewers, potable and non-potable water routes crossing the existing railway will require a Basic Asset Protection Agreement with Network Rail;
- The following applications will be made to the EA/IDB where relevant. Applications will be submitted and approved post consent during detailed design, and prior to Construction:
    - Land Drainage Consent submitted to the IDB and Environment Agency for all proposed works to existing water bodies including Core Zone watercourse diversion, Elstow Brook, and ordinary watercourses within their jurisdiction;
    - WFD Screening Scoping submitted to the Environment Agency for all proposed works to Elstow Brook including bridges, headwalls, and bank treatment;
    - Bespoke Site Specific Flood Modelling submitted to the Environment Agency and IDB under Planning Conditions and **Design Standards (Document Reference 6.3.0)**; and

- This document refers to **Appendix 2.3: Outline Construction Environment Management Plan (OCEMP) (Volume 3)** Section 3.10 The Principal Contractor will be responsible for development of a Site specific Construction Environment Management Plan (CEMP) which will be implemented with appropriate measures to manage the water environment, including both protecting water quality and managing flood risk on and off-Site, to manage construction effects.

## 12.3. ENGAGEMENT, SCOPE, AND STUDY AREA

### ENGAGEMENT

12.3.1. **Table 12-1** provides a summary of the engagement activities undertaken in support of the preparation of this assessment. Meeting minutes and correspondence is included in **Annex 3: Correspondence** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**. Also included is the SoAP with Anglian Water, the Environment Agency and IDB in **Appendix 6** of the **Planning Statement (Document Reference 6.1.0)**.

**Table 12-1 - Summary of Engagement Undertaken**

| Body/Organisation | Individual/Statutory Body/Organisation | Meeting Dates and other Forms of Engagement | Summary of Outcome of Discussions |
|---|---|---|---|
| Bedford Group IDB | Principal Engineer | 12 March 2024<br>3 April 2024 at IDB Offices<br>5 April 2024 Virtual Call<br>30 April 2025 | Introduction to the Proposed Development.<br>Existing surface water regime.<br>Emerging Surface WS Concept.<br><br>A document setting out the SoAP between UDX, the Environment Agency and the IDB in relation to Flood Risk, Surface WS and Water Re-use is submitted as **Appendix 4** of the **Planning Statement (Document Reference 6.1.0)**. |
| Anglian Water | Growth Liaison Manager<br>Pre-Development Engineer | 19 January 2024<br>20 February 2024<br>29 February 2024 Pre-Planning Enquiry Application 0200598<br>14 June 2024 | Feasibility Study Scoping.<br>Feasibility Study Meeting.<br>Water Supply connection and Foul Water disposal from the Site.<br>Water Supply Demand and Foul Drainage Strategy<br><br>A document setting out the matters agreed between UDX and Anglian Water relating to Water Resources is submitted as **Appendix 4** of the **Planning Statement (Document Reference 6.1.0)**. |

| Body/Organisation | Individual/Statutory Body/Organisation | Meeting Dates and other Forms of Engagement | Summary of Outcome of Discussions |
|---|---|---|---|
| Bedford Borough Council (BC) | Flood Investigation Officer | 8 April 2024 Email Response Request for Information | Request for Information regarding existing Flood Risk |
| Bedford BC | Highways Officer | 16 May 2024 Email Response Request for Information | Request for Information regarding existing Flood Risk |
| Environment Agency | Flood Risk | 29 January 2024<br>30 May, 10 June, and 1 August 2024<br>29 April 2025 | Flood Risk Assessment (FRA) Data<br>Flood Risk and Drainage, Elstow Brook, Rainwater Harvesting, Existing Surface Water Drainage Regime<br>A document setting out the SoAP between UDX, the Environment Agency and the IDB in relation to Flood Risk, Surface WS and Water Re-use is submitted as **Appendix 4** of the **Planning Statement (Document Reference 6.1.0)**. |

## SCOPE OF THE ASSESSMENT

12.3.2. A formal Environmental Impact Assessment (EIA) scoping process has not been undertaken in support of the preparation of this ES. However, this assessment has been undertaken in line with best practice guidance, engagement with statutory bodies and using professional judgement.

12.3.3. The assessment of Water Resources has considered the potential for the Construction Phase and Operational Phase of the Proposed Development resulting in likely significant effects.

12.3.4. The elements shown in **Table 12-2** are considered to have the potential to give rise to likely significant effects during construction and/or operation of the Proposed Development and have therefore been considered within this assessment.

**Table 12-2 - Elements scoped into the assessment**

| Element Scoped In | Construction Phase | Operational Phase |
|---|---|---|
| Diversion of existing watercourse Core Zone | ✓ | ✓ |
| Works over and alongside Elstow Brook | ✓ | ✓ |
| Increased sediment load | ✓ | ✓ |
| Increased risk of contamination | ✓ | ✓ |
| Increased risk of flooding | ✓ | |

| Element Scoped In | Construction Phase | Operational Phase |
|---|---|---|
| Increase in foul water infrastructure demand | ✓ | |
| Impacts to groundwater quantity/flow | ✓ | |
| Increase in potable water supply demand | ✓ | ✓ |
| Impact to groundwater associated users - Construction and Operation | ✓ | |

**Elements Scoped out of the Assessment**

12.3.5. The elements shown in **Table 12-3** are not considered to give rise to potentially significant effects as a result of the Proposed Development and have therefore not been considered within this assessment.

**Table 12-3 - Elements Scoped out of the Assessment**

| Element Scoped Out | Justification |
|---|---|
| Kellaway Formation principal aquifer and Cornbrash Formation secondary A bedrock aquifers – Construction and Operation | These are not in hydraulic continuity with the overlying superficial aquifers due to the overlying Peterborough Member unproductive strata which offers significant protection to these more productive underlying aquifers. |
| Groundwater Quality – Construction and Operation | Pollution risks from accidental release (fuels, oils and other construction related pollutants), material storage and turbidity impacting aquifer quality of the alluvium, which are pathways to surface water courses and the head deposits, is excluded. This will be mitigated by pollution prevention practices as set out in **Appendix 2.3: OCEMP (Volume 3)** Section 3.10 during the Construction Phase.<br>During the Operational Phase as specified in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5.6, contaminants contained within surface water runoff are mitigated by pollution prevention controls in the drainage design, as well as the hydrogeological conditions being unsuitable for drainage features which utilise groundwater discharge (i.e., low expected infiltration capacity, limited extent of aquifers which are present, etc.). |
| Springs – Construction and Operation | Based on the available information, no springs are known to be situated within 1km of the Site to be impacted. The study area is defined in the “Extent of the Study Area” section of this chapter. |
| Groundwater Dependent Terrestrial Ecosystems (GWDTEs) - Construction and Operation | The closest GWDTE (King's Wood & Glebe Meadows, Houghton Conquest) is located further than 3km from the Site boundary. Due to the limited and vertical extent of the superficial aquifers, these are highly unlikely to be hydrogeologically connected to the GWDTE; therefore, there is no impact to it anticipated. |

| Element Scoped Out | Justification |
|---|---|
| Groundwater Source Protection Zones (SPZs) - Construction and Operation | The Site is not situated within a groundwater SPZ, and there are no SPZs within 1km of the Site. |
| WFD groundwater bodies | Based on the Groundsure Report 2022 (**Annex 7: Groundsure Report** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**), there are no designated groundwater bodies located within 1km of the study area. |
| Increased risk of Flooding – Operation | The Surface WS in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 has embedded mitigation included as part of the Proposed Development, which has been devised to attenuate runoff flows to greenfield rates preventing on-and-off-Site flood risk from surface water. Proposed Site levels will be engineered to prevent flooding of sensitive receptors and strategic access and egress routes as per **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 7. |
| Increase in Foul Water Infrastructure demand - Operation | Anglian Water has confirmed capacity will be made available at the Bedford Water Recycling Centre (WRC) for domestic flows as per PPE-0200598. |
| Potential contamination of water resources - Operation | The Surface Water Drainage design in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 has embedded mitigation included as part of the Proposed Development, which will mitigate pollution to water resources originating from runoff using the SUDS treatment train.<br>A proposed foul water network will be designed to British Standards. |
| Impacts to groundwater quantity/flow - Operation | The superficial deposit secondary aquifers present beneath the Site are of a limited lateral and vertical extent, effectively representing perched aquifers. These are highly unlikely to have any effect on regional groundwater flow, and do not represent viable water resources. The reason for this is they are laterally and vertically discontinuous and not hydraulically connected to the bedrock aquifers present beneath the Site which are confined beneath a clay aquiclude. No water quantity impacts on the superficial deposit secondary aquifers are expected during the Operational Phase of the Proposed Development, as no permanent lowering of groundwater levels within those aquifers is expected. |
| Borehole groundwater abstraction – Construction and Operation | The use of groundwater as a resource for the Proposed Development (with other water supply options available) may be required for water supply in the future. If so, any new abstraction would be subject to the requirements of a groundwater abstraction licence and all associated assessments would be undertaken as part of the licence application (i.e. water features survey, hydrogeological impact assessment, etc.) which considers impacts to groundwater associated receptors, numerical modelling, and a pumping test.<br>Any proposed abstractions have a dedicated regulatory licensing process with the Environment Agency which includes a separate EIA. |
| Drainage Impact to Scheduled Monument Kempston Hardwick Moat - Construction and Operation | The Moat is located outside the Site boundary. Based on desktop information (ordinance survey map and topographical survey) there is no data to suggest any hydraulic connectivity between the Moat and surface water systems from Core or Lake Zone. The Scheduled Monument “Kempston Hardwick moated site” located off Manor Road is not affected by the Proposed Development and Surface WS. |

| Element Scoped Out | Justification |
|---|---|
| Impact to existing watercourses within 1km of the Site – Construction and Operation | Existing retained watercourses within 1km of the Site are protected under the *Land Drainage Act 1991* (**Ref. 12.25**) and under IDB jurisdiction. Potential Construction effects are mitigated as stated in **Appendix 2.3: OCEMP (Volume 3)** Section 3.10.<br>Existing abandoned/diverted watercourses will be replaced with strategic SUDS as stated in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 and **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)**. |
| Impact to downstream waterbodies greater 1km from the Site – Construction and Operation | Downstream waterbodies greater than 1km from the Site are scoped out as it is unlikely that any impacts on the water environment would be attributable to the Proposed Development. |

### EXTENT OF THE STUDY AREA

12.3.6. Based on the available information and the hydrogeological characteristics of the ground in the Site (e.g. the limited lateral extent and thickness of the superficial aquifers), the study area to be used for the assessment has been defined as approximately up to 1km from the Site boundary. The Site boundary is depicted in **Site Location Plan (Document Reference 1.6.0).**

12.3.7. This distance used for the study area is considered appropriate for the assessment of effects, that is associated with overland migration of pollutants directly to surface features, pollutants conveyed in drainage systems and works to the existing watercourse in Core Zone. There are unlikely to be impacts upon the water environment, beyond 1km from the Site boundary, attributable to the Proposed Development. A distance of up to 1km is considered appropriate based on professional judgement and knowledge of the Proposed Development.

12.3.8. The study area for the assessment of flood risk is defined by the extent to which the Proposed Development could change flood risk to identified receptors. A distance of up to 1km is considered appropriate based on professional judgement and knowledge of the Proposed Development.

## 12.4. METHODOLOGY

### METHOD OF BASELINE DATA COLLATION

#### Desk Study

12.4.1. A desk study has collected existing baseline data using the following sources of information available.

- Ordnance Survey Mapping (**Ref. 12.1**);
- Department for Environment, Food and Rural Affairs (Defra) Light Detection and Ranging (LiDAR) Digital Terrain Model (**Ref. 12.2**);
- Defra ‘Magic Map’ online GIS portal (**Ref. 12.3**);
- British Geological Survey (BGS) Geology of Britain Viewer (**Ref. 12.4**);
- Environment Agency Flood Map for Planning (**Ref. 12.5)**;
- Environment Agency Catchment Data Explorer (**Ref. 12.6**);
- BGS GeoIndex online database (**Ref. 12.7**);

- **Appendix 11.2: Ground Investigation Technical Note (Volume 3);**
- Topographical Survey undertaken in 2023 by 40SEVEN (A**nnex 1: Topographical Survey of Appendix 12.1: Flood Risk Assessment (Volume 3)**);
- Bedford Business Park at Land South of Bedford, ES, November 2018 (**Ref. 12.10**);
- Bedford Group of IDBs Board Area Map (**Ref. 12.13**);
- Anglian Water's Water Resources Management Plan (WRMP) 2019 (**Ref. 12.14**);
- Anglian Water's Draft WRMP 2024 (2023) (**Ref. 12.15**);
- Anglian Water Pre-Planning Assessment Report Project Nectarine InFlow Reference: PPE-0200598 (2024) (**Annex 3: Correspondence of Appendix 12.1: Flood Risk Assessment (Volume 3)**);
- Environment Agency Water Stressed Areas – Final Classification report (2021) (**Ref. 12.17**);
- Bedford BC Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA) (**Ref. 12.18a and Ref. 12.18b**);
- Coronation Pits Restoration Development (**Ref. 12.19 and Ref. 12.20**);
- Marston Vale Surface Waters Management Plan (**Ref. 12.21**);
- ES Volume 2 Development of Borrow Pits at Whitbred Land Kempston – BP3 (2008) (**Ref. 12.22**);
- Environment Agency Flood risk assessments: climate change allowances (**Ref. 12.23**); and
- Environment Agency Nitrate Vulnerable Zones (NVZs) (**Ref. 12.24**).

**Site Visit Surveys**

12.4.2. A Site walkover was undertaken for drainage purposes on Wednesday 3 April 2024 and Monday 22 April 2024 to visually inspect the alignment, form, and function of existing ditches, drains, watercourses, piped outfalls, Elstow Brook, Kempston Hardwick Clay Pits, and existing topography.

12.4.3. A Site visit walkover was undertaken on Thursday 17 April 2025 to visually inspect the condition of Core Zone watercourse, and record water levels in Kempston Hardwick Clay Pits (North and South), and the overflow watercourse connection to Elstow Brook in Lake Zone.

12.4.4. A Topographical Survey was undertaken in March 2023 for the Core Zone and the Lake Zone by 40 Seven Limited (drawing reference 2950_P Rev A Sheets 1 to 117). This is appended to **Annex 1: Topographical Survey** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**.

12.4.5. LiDAR Digital Terrain Model was obtained from the Government website for areas not covered by the topographical survey.

## ASSESSMENT METHODOLOGY

12.4.6. **Table 12-4** sets out the methodology used in the assessment of the elements scoped in for Water Resources. Further details on the methodology used in the assessment of Water Resources are presented in **Appendix 3.2: Significance Criteria for All ES Technical Topics (Volume 3)** Section 7.

**Table 12-4 - Assessment Methodology**

| Elements Scoped in | Methodology |
|---|---|
| Diversion of existing watercourse Core Zone | A Site-specific assessment of the altered drainage regime has been undertaken and is included in the FRA and DS. |

| Elements Scoped in | Methodology |
|---|---|
| Works over and alongside Elstow Brook | A review of the WFD quality and chemical status has been undertaken and impacts assessed for construction and operation purposes. |
| Increased sediment load | Consideration of increased sediment load as a result of construction activities which could affect receiving water bodies, has been undertaken. |
| Increased risk of contamination | Pollutants originating from construction activities and the pathway to the receiving water bodies has been assessed. |
| Increased risk of flooding | Flood risk from pluvial, fluvial, groundwater and reservoir sources has been assessed for the Construction Phase and the likely receptors. |
| Increase in Foul Water Infrastructure demand | A Site-specific foul water Drainage Strategy has been undertaken in engagement with the Local Water Authority Anglian Water and included in Pre-Planning Application PPE 0200598 (**Annex 3: Correspondence** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**). |
| Groundwater quantity/flow | An assessment of potential impacts of the Site on groundwater quantity has been undertaken with respect to groundwater attributes and other groundwater dependent receptors.<br>A qualitative groundwater level and flow assessment has been undertaken, as well as an assessment of a change to the identified groundwater flood risk. |
| Increase in water supply demand | A Site-specific domestic water supply strategy has been undertaken in engagement with Anglian Water and included in Pre-Planning Application PPE 0200598 (**Annex 3: Correspondence** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**).<br>An assessment of increased water supply for process water has been undertaken and included in **Appendix 12.2: Water Strategy (Volume 3)** Section 2. |

## SIGNIFICANCE CRITERIA

12.4.7. The assessment has been undertaken in accordance with DMRB LA113 Road Drainage and the Water Environment (formerly HD 45/09) (**Ref. 12.33**) which sets the requirements for assessment and management of potential impacts on the water environment from highway construction, operation, improvement and maintenance. Although LA113 is intended to guide assessment of highways projects, it is routinely applied to assessing water environment effects of different development types and the broad principles are applicable to the Proposed Development. Tables detailing Receptor Importance, Magnitude of Impact and Significance Matrix are shown in **Appendix 3.2: Significance Criteria for All ES Technical Topics (Volume 3)** Section 7.

## 12.5. BASELINE CONDITIONS

### EXISTING LAND USE

12.5.1. **Chapter 1: Introduction and Site Description (Volume 1)** provides a description of the existing land use, which includes areas of grass scrub and arable farmland, with the northern area of the Site as brownfield land and flooded clay pits (artificial), part of the former Kempston Hardwick Brickworks. There are small areas of residential land along Manor Road. Kempston Hardwick Station is located along Manor Road, and the A421 bounds the western part of the Site. Coronation Business Park is located to the east, outside of the Site where the British Car Auction is based.

### EXISTING SITE LEVELS AND TOPOGRAPHY

12.5.2. As shown in **Annex 1** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**, the Site is relatively flat and includes small areas of trees at the Zone boundaries. Site levels generally fall from south - north ranging from 35.2m above ordnance datum (AOD) and 21.2m AOD. Section 4.6 of **Appendix 12.1: Flood Risk Assessment (Volume 3)** summarises the individual Zones and topographical levels. The zones are shown on the **Zonal Plan (Document Reference 1.26.0)**.

### EXISTING SURFACE WATER AND FOUL WATER SEWERS

12.5.3. There are no existing surface water sewer and foul water sewer drainage networks serving the Site. As shown in **Figure 12.3: Existing Surface Water Plan Regime (Volume 2)**, this comprises of rainfall runoff draining via overland flows towards ditches and watercourses, eventually reaching Elstow Brook located to the west and northwest of the Site. There is a possibility of existing localised drainage networks in the Site for Highways and Network Rail infrastructure, which will be confirmed at further detailed stages. It is also likely that the drainage system originally serving the former brickworks is abandoned and redundant, which will be proven through additional surveys at the detailed design stages. **Annex 6** of **Appendix 12.1: Flood Risk Assessment (Volume 3)** shows localised field drainage historic records for Core and Lake Zone, to the receiving watercourse and Brook respectively**.**

12.5.4. Existing Anglian Water sewer records in **Annex 2** of **Appendix 12.1: Flood Risk Assessment (Volume 3)** show an existing foul rising main to the south and east of Core Zone, decommissioned effluent sewers located in Manor Road, and a surface water sewer located to the northwest of Lake Zone. Existing surface water and foul networks are located north of the A421, in Woburn Road Industrial Estate, Kempston, and in Kiln Road, Coronation Business Park, Kempston Hardwick, east of the Site.

12.5.5. As the Site currently comprises of greenfield and former brickworks, there is no foul water demand on the existing infrastructure. The Site is located within the catchment of Bedford WRC.

12.5.6. Anglian Water has advised that Bedford WRC does not currently have capacity to treat flows from the Site. However as stated in the Site-specific Pre-Planning Application reference PPE-0200598 located in **Annex 3: Correspondence** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**, Anglian Water acknowledged that they are obligated to accept the domestic foul flows (flows from toilets and kitchens, etc.) from this development. As set out in the SoAP with Anglian Water, Anglian Water anticipates providing connection point(s) to the foul water network and will continue to work with UDX regarding flow rates and loading. The final point of connection location strategy is awaiting further investigation and design development. The installation of the potable water supply and foul water drainage connections and any upgrades deemed necessary by Anglian Water to existing Anglian Water infrastructure can be delivered by Anglian Water using Anglian Water's statutory powers and permitted development rights or, where applicable, another regulated provider's statutory power, to the extent permitted development rights are not available planning permission will be sought.

### EXISTING SURFACE WATER FEATURES

12.5.7. There are no statutory designated sites (Ramsar, Sites of Special Scientific Interest, Special Areas of Conservation, etc.) within the study area. The non-statutory designated sites in the form of County Wildlife Site (CWSs) include Coronation Pit and Kempston Hardwick Pits, see **Chapter 6: Ecology and Nature Conservation (Volume 1)** for further information. The notable surface water features shown in **Figure 12.3: Existing Surface Water Plan Regime (Volume 2)** are summarised as follows:

- Coronation Pit Restoration Scheme located to the east of Core Zone. The former clay pit is designated as a CWS and has been restored for surface water collection and habitat / landscape creation. This currently does not drain to an off-Site network, however once surface water is collected over a long period of time (e.g. 25 years) and reaches a final water level of 32.4m AOD, water will overflow into Core Zone Watercourse routing towards Elstow Brook (**Ref. 12.20**);
- Ordinary Watercourse located in Core Zone, routing from southeast to northwest, which outfalls underneath Manor Road and is understood to connect to existing Kempston Hardwick Pits (north) – artificial lake;
- Elstow Brook is a WFD minor river maintained by the IDB, located in West Gateway Zone routing north and alongside Lake Zone which routes to the River Great Ouse. Levels, depth, and bank slopes are mentioned in Section 4.6 of **Appendix 12.1: Floor Risk Assessment (Volume 3)**. There is an existing ordinary watercourse located immediately upstream of Elstow Brook in West Gateway Zone and also in Lake Zone. Bedford Group IDB have confirmed in an email dated 02 July 2024 shown in **Annex 3: Correspondence** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**, that there are no records of Elstow Brook undermining the railway embankment over the past 20 years, and that there is no requirement to undertake proposed remedial works (such as channel stabilisation) to Elstow Brook in proximity to Lake Zone;
- Kempston Hardwick Clay Pits (north) located in Lake Zone, has filled with rainwater since the Brickworks closed in the 1980's (**Ref. 12.10**). Existing accumulation of water in Kempston Hardwick Clay Pits (North) – Disused Pit originates from localised runoff only, and the pits do not receive flows from surrounding catchments;

- The pits comprise two main bodies; the artificial lake which is approximately 7.5ha with a surveyed water level of 28.57m AOD and overflows to Elstow Brook, and the Disused Pits which are approximately 25ha with a surveyed water level of 23m to 20m AOD and does not drain to an off-Site network (e.g. fills with rainwater) and has been emptied by the previous landowner in 2018. Based on the topographical survey (**Annex 1: Topographical Survey** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**), existing levels show that the artificial lake (28.57m AOD) is 0.9m lower than the overflow outfall watercourse (29.47m AOD). The overflow watercourse channel levels continue to rise 0.79m to 30.26m AOD, before falling 1.41m toward Elstow Brook (28.85m AOD). Based on the topographical survey, surface water runoff from Core Zone, Kempston Hardwick Clay Pits (South and North) does not drain directly to Elstow Brook for regular rainfall events. Further detail of the existing surface water regime is shown in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5.2;
- Kempston Hardwick Clay Pits (south) located outside of the Site boundary to the southeast, will remain as existing, and includes a small overflow to Kempston Hardwick Clay Pits (north) overflowing to Elstow Brook; and
- A421 Borrow Pit located outside of the Site boundary to the north of Lake Zone and is currently an artificial lake with an overflow to the receiving network, to remain as existing (**Ref. 12.22**).

### WATERCOURSE THROUGH CORE ZONE

12.5.8. The existing watercourse routes through the Core Zone from southeast to northwest. It is approximately 1.5km length and has an average gradient of 1:1000. The watercourse is generally 1.1m depth, with 1:1 side slope banks. The width varies in isolated locations and a max depth of approximately 2m is noted on the topographical survey (**Annex 1: Topographical Survey** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**). Piped connections and culverts are identified ranging from 375mm diameter at the head of the run to a 1000mm diameter (visually approximated) outfall culvert understood to drain to Kempston Hardwick Clay Pits (North) – artificial lake ultimately reaching Elstow Brook.

12.5.9. During site visits in April 2024 and April 2025 upon visual inspection of the watercourse, the condition appeared to be poor, having been overgrown in places with brown cloudy stagnant water.

### ELSTOW BROOK WATER QUALITY

12.5.10. The Site drains to Elstow Brook and as the current land use comprises arable and derelict former brickworks, may result in pollution from surface water runoff to the Brook.

12.5.11. *The* WFD was transposed into national law through *The Water Environment (Water Framework Directive) (England & Wales) Regulations 2017* (**Ref. 12.34**). The *WFD* applies to surface waters and groundwaters, and focuses on ensuring good qualitative and quantitative health, reducing, and removing pollution and ensuring adequate quantity of water to support wildlife at the same time as human needs. As part of the *WFD*, River Basin Management Plans (RBMPs) have been established.

12.5.12. Elstow Brook and the River Great Ouse fall within the Anglian River Basin Zone. The river basin is in the Upper and Bedford Ouse Management Catchment, specifically Great Ouse Bedford Operational Catchment. The RBMP establishes requirements to comply with the *WFD* (e.g. prevent deterioration of surface water and groundwaters, achieve "*Protected Area*" standards, aim for all waterbodies to reach "*Good*" status, and aim for "*Good*" ecological potential and chemical status for artificial and heavily modified water bodies).

12.5.13. Elstow Brook is monitored against the objectives of the *WFD* and is referenced as 'Elstow Brook (US Shortstown) Water Body'. The Environment Agency Catchment Data Explorer identifies the watercourse as a heavily modified river with an objective to achieve "*Good*" status for Ecological and Biological elements by 2027 (**Ref. 12.6**).

12.5.14. A review of the most up to date (as of May 2025) Cycle 3 (2019-2022) data identifies that the current Ecological status of Elstow Brook is classified as Moderate (**Table 12-5**). The ecological classification is due to biological quality elements specifically fish (poor) and macrophytes (moderate). The Reasons for Not Achieving Good and Reasons for Deterioration are attributed to suspected agricultural and rural land management (poor soil management and land drainage) and Industry (contaminated land). There is also a confirmed land drainage activity from the agriculture arable sector impacting fish (**Ref. 12.6**).

12.5.15. Historic monitoring of the Chemical status of Elstow Brook indicates previous classification as "*Good*" across several defined substances referencing the *EU Dangerous Substances Directive* (**Ref. 12.35**). However, the current (as of May 2025) Cycle 3 (2019-2022) overall Chemical status is classified as "*Fail*" due to updated methods of chemical assessment effective from 2019. There are four groups of global pollutants – ubiquitous, persistent, bioaccumulative, toxic (uPBTs) causing failures, which is attributable to newly introduced substances, such as cypermethrin. The uPBTs that cause the significant change in chemical classification are: polybrominated diphenyl ethers (PBDEs – a group of brominated flame retardants); Mercury; certain Polycyclic aromatic hydrocarbons and Perfluorooctane sulfonate a group of per-and polyfluoroalkyl substances which is being assessed for the first time. The confirmed chemical failure at Elstow Brook is due to PBDEs from an unconfirmed source or activity (**Ref. 12.6)**.

**Table 12-5 - WFD Cycle 3 Classifications for Elstow Brook (US Shortstown) 2019-2022**

| Classification Item | 2019 | 2022 |
|---|---|---|
| Overall | Moderate | Moderate |
| Ecology | Moderate | Moderate |
| Chemical | Fail | Does not require assessment |

## GROUNDWATER

12.5.16. The information presented in this chapter is from **Appendix 11.2: Ground Investigation Technical Note (Volume 3)**.

12.5.17. Water strikes recorded within the trial pits indicated the presence of a shallow water table between 1.30m below ground level (bgl) (TP5) to 3.20m bgl (TP10) (approximately 30 to 32.5m AOD).

12.5.18. A deeper groundwater strike was also observed between 12m and 13m bgl (20.5 to 21.5m AOD), thus within the Oxford Clay Formation.

12.5.19. **Appendix 11.2: Ground Investigation Technical Note (Volume 3)** states that the Peterborough Member (Oxford Formation), Kellaways Formation and Cornbrash Formation underlie the Site and are present and confined within the study area.

### SUPERFICIAL DEPOSITS

12.5.20. The underlying geology of the Site is described in detail in **Chapter 11: Ground Conditions, Soils and Agricultural Land (Volume 1)**.

12.5.21. Superficial deposits comprising alluvium and head deposits are located within the Core Zone and the West Gateway Zone.

12.5.22. The source of local groundwater recharge to the superficial deposits is predominantly from rainfall and artificial sources (i.e. land drains/ditches and existing Site drainage infiltrating to the ground). Groundwater flow within the alluvium and head is primarily intergranular, where gravel and/or sandy strata are present.

12.5.23. The alluvium superficial deposits underlying the Site and within the study area (**Site Location Plan (Document Reference 1.6.0)**) are classified as a secondary A aquifer (**Ref. 12.3**), which is defined as being permeable layers capable of supporting water supplies at a local rather than strategic scale and, in some cases, forming an important source of base flow to rivers. However, in the case of the alluvium present, it is very thinly laterally distributed along the unnamed surface water course which runs approximately south-southwest to north-northeast across the Site and is not considered a viable groundwater resource.

12.5.24. The other type of superficial deposit present is head, which is classed as a secondary (undifferentiated) aquifer (**Ref. 12.3)**. These are aquifers for which it is not possible to attribute either category A or B to a rock type. These layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type. These are also thinly distributed across the Site and represent low-productivity aquifers.

12.5.25. Groundwater flow within the superficial deposits is therefore very limited on Site and expected to generate only local groundwater flow conditions controlled by the local surface water features.

### BEDROCK

12.5.26. The Peterborough Member is classified as an unproductive aquifer, and the Kellaways Formation (sandy member) and Cornbrash Formation that underlie the Site at depth are classified as secondary A aquifer and principal aquifer, respectively. Principal aquifers are layers of rock or drift deposits that have high intergranular and fracture permeability, meaning they usually provide a high level of water storage. They may support water supply and river base flow on a strategic scale.

## AQUIFER VULNERABILITY

12.5.27. The Groundwater Vulnerability Map (**Figure 5-4** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**) shows the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within 1km$^2$. A medium groundwater vulnerability is designated for the majority of superficial deposit aquifers at the Site. The bedrock aquifers are confined by the overlying Peterborough Member, which provides substantial protection from surface pollution sources because of its low permeability. Therefore, the principal aquifer is considered to have a low groundwater vulnerability. The Site is located within an NVZ. NVZs are areas designated as being at risk from agricultural nitrate pollution (**Ref. 12.24**). Based on groundwater abstraction occurring for temporary dewatering during the Construction Phase only, the pollution risk will not affect the Site, nor does the Site represent a risk of causing nitrate pollution.

## WATER SUPPLY

12.5.28. There is no existing potable water supply to the Site, which consists of arable lands, a former brickworks, and an abandoned clay quarry (**Chapter 1: Introduction and Site Description (Volume 1)**). Water demand from the Site arises from irrigation requirement for the arable lands.

12.5.29. The Site is situated within Anglian Water's Ruthamford South water resource zone. As for all the Anglian Water supply area, this water resource zone is located in an area classed by the Environment Agency as seriously water stressed (**Ref. 12.15**). The gap between demand and availability is expected to increase in the future resulting from changing climate and continued growth. Anglian Water proposes water transfers, reservoir storage and leak detection, with lowering water consumption as a priority for new developments. The Site will comply with Policy 50S and 52 of the Bedford BC Local Plan 2030 (**Ref. 12.30**), aiming at minimising its water use.

12.5.30. The Ruthamford South water resource zone is mainly supplied from surface water (direct abstraction on the River Ouse going to Grafham reservoir), with a small contribution from groundwater abstraction in the Woburn Sands aquifer. Anglian Water estimates that its delivery of the revised Draft WRMP 2024 will ensure the Ruthamford South water resource zone remains in balance for dry year annual average conditions and dry year critical period conditions up to 2050 (**Ref. 12.15**).

12.5.31. Anglian Water has confirmed that it will meet all requirements of a domestic nature for water supply for the Site and will work with UDX on the volume and timing of requirements so that AW can appropriately design and construct the supporting infrastructure as set out in the SoAP appended to the **Planning Statement (Document Reference 6.1.0)**.

## GROUNDWATER ABSTRACTIONS

12.5.32. The Environment Agency has confirmed that there are no licenced groundwater abstractions situated within the study area.

12.5.33. As shown in **Annex 3: Correspondence** in **Appendix 12.1: Flood Risk Assessment (Volume 3)**, Bedford BC has confirmed the presence of an unlicenced water supply (without confirming if it is surface or groundwater supply). According to information provided it is situated at Stanley Works, 3 Ampthill Road, Kempston Hardwick. Eastings and northings provided note the location of the supply as 503849, 245426, with the use being described as "*single domestic*". No further information regarding this supply was received. It is assumed that, in the absence of an aquifer at outcrop, that if this is a groundwater abstraction borehole it is most likely targeting the confined aquifers beneath the Peterborough Member (Oxford Clay Formation) non-aquifer.

## ON-SITE FLOOD RISK

12.5.34. An assessment of existing flood risk is included in **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 5; and a summary is included within this chapter. Flood modelling and maps produced by the Environment Agency and IDB contain a suitable level of detail for the purposes of producing a Site-specific FRA and Drainage Strategy and considers a cautious worst case scenario.

### Flood Risk from Rivers

12.5.35. Based on the Environment Agency Flood Map for Planning (**Ref. 12.5**), the majority of the Site is located in Flood Zone 1 (low probability). The Lake Zone has a small area to the northern periphery located in Flood Zone 2 (medium probability) and Flood Zone 3 (high probability), adjacent to the Elstow Brook and A421.

12.5.36. The Bedford Group IDB modelling shows the 100yr + 20% climate change defended Modelled Flood Extent (**Figure 12.1: Risk of Flooding from Rivers (IDB) (Volume 2)**). Flooding within the Site occurs in similar locations to that indicated by the Flood Map for Planning (**Ref. 12.5**) and Bedford BC Level 2 SFRA (**Ref. 12.18b**), with slightly larger flood extents shown in the north of the Lake Zone, and a small area of flooding identified to the north of the West Gateway Zone. The 1 in 100-year flood extents can be equated to Flood Zone 3a which is land assessed as having a 1 in 100 or greater annual probability of river flooding. As stated in **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 5 the IDB has confirmed that their flood modelling supersedes the Environment Agency information available online.

### Flood Risk from Surface Water

12.5.37. Based on the Environment Agency Surface Water Flood Map (**Ref. 12.5**) and shown in **Figure 12.2: Risk of Flooding from Surface Water (EA) (Volume 2)**, there are areas of low and medium risk in specific areas of the Site. Locations are to the north of the Lake Zone, east and southwest of the Core Zone and west of the West Gateway Zone. High risk areas follow the Elstow Brook and it's tributary in the Core Zone, as well as to the south of the East Gateway Zone.

### Flood Risk from Groundwater

12.5.38. As shown in the Groundsure Report 2022 (**Annex 7: Groundsure Report** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**), there is a low risk of groundwater flooding within approximately 50% of the Site, with the remainder of the Site at negligible risk from groundwater flooding.

### Flood Risk from Sewers

12.5.39. Anglian Water confirmed in April 2023 (**Annex 3: Correspondence of Appendix 12.1: Flood Risk Assessment (Volume 3)**) that they hold no records of sewer flooding in the vicinity of the Site that can be attributed to capacity limitations in the public sewerage system. Also shown in **Annex 3: Correspondence of Appendix 12.1: Flood Risk Assessment (Volume 3)**, Bedford BC Lead Local Flood Authority confirmed in 2023 that there have been no reported incidents of flooding in the vicinity of the Site. The probability of sewer flooding impacting the Site is negligible.

### Flood Risk from Reservoirs

12.5.40. Based on Environment Agency Risk of Flooding from Reservoirs flood maps (**Ref. 12.5**) reservoir flood risk is indicated from the Stewartby Lake located upstream of the West Gateway Zone, with flood risk extents originating from Stewartby Lake reservoir failure flowing along the Elstow Brook posing flood risk when river levels are normal and when there is no flooding from rivers to the West Gateway Zone and northern part of the Core Zone.

12.5.41. Kempston Hardwick Clay pits (north), located in the northern part of the Site, are artificial water bodies. Due to their location and depth, they are not considered to present a flood risk either on or off-Site, based on topography, water levels, and overflows into Elstow Brook.

12.5.42. As shown in Section 5 of **Appendix 12.1: Flood Risk Assessment (Volume 3)** flooding from reservoirs is extremely unlikely however based on the location of Stewartby Lake and possibility of rapid inundation, the risk of flooding from artificial sources is considered possible.

## OFF-SITE FLOOD RISK

### Historic Flood Incident - A421 Marston Moretaine

12.5.43. As described in Section 5.7 of **Appendix 12.1: Flood Risk Assessment (Volume 3)**, a flooding incident occurred in September which was due to one month's rainfall occurring in less than 48 hours, which the Lower Shelton pumping station could not cope with incoming flows. Flooding on the A421 at Marston Moretaine Interchange overpass resulted in a section of the A421 being closed for nearly three weeks, until National Highways cleared the flood water with temporary pumps. As of May 2025 National Highways are replacing the existing pumping station and relocating to higher ground to improve flood prevention. Works are scheduled to complete July 2025. Based on the location, the individual incident occurring in relation to a significant rainfall event, and pumping station failure which is remediated by National Highways, there is no association between the Site and the A421 off-site flood event.

## FUTURE BASELINE

12.5.44. Future baseline conditions refer to the description of the likely evolution of the baseline scenario without the implementation of the Proposed Development. This baseline accounts for how conditions would change if the development did not progress, and the relevant information where appropriate including justification for no change in conditions.

### Elstow Brook

12.5.45. If the development did not progress, and in line with the *Environment Agency WFD* Objectives (**Ref. 12.6**) summarised in **Table 12-6**, Elstow Brook would gain a "*Good*" status, and therefore become Highly Sensitive Receptor. This is based on Ecological targets set for 2027 achieving "*Good*" status with a "*low confidence*" based on "*disproportionately expensive and disproportionate burdens*" as the reasons. The targets for Good Chemical status are set for 2063 based on "*Natural Conditions: chemical status recovery time*" as the reason.

**Table 12-6 - Elstow Brook WFD Objectives**

| Classification Item | Year | Status | Reasons |
|---|---|---|---|
| Overall | 2063 | Good | |
| Ecology | 2027 | Good – Low confidence | Disproportionately expensive: Disproportionate burdens |
| Chemical | 2063 | Good | Natural conditions: Chemical status recovery time |

### Foul and Surface Water Sewers

12.5.46. As the Site does not currently utilise existing foul and surface water sewer systems, if the Proposed Development did not go ahead, existing foul and surface water sewers would be unaffected.

### Water Supply

12.5.47. Anglian Water identifies a deficit in the supply-demand balance for the East of England through a combination of less water supply and growing population (**Ref. 12.15**).

12.5.48. In its revised Draft WRMP 2024, Anglian Water highlights that the Ruthamford area experiences significant pressures associated with population growth, climate change and extreme drought. Deficit could be exacerbated due to potential for sustainability reduction in the Cam and Ely Ouse catchment (**Ref. 12.15**).

12.5.49. The Ruthamford South water resource zone's baseline supply demand balance 2025-2050 forecast for dry year annual average conditions shows that the zone is expected to go into deficit by 2025 (growing from a deficit of 11.8 million litres per day (MLD) in 2025 to 77.7MLD in 2050). This is mainly due to an increase in household and non-household demand. Anglian Water aims at balancing its supply and demand for this zone, as part of its final plan, through the delivery of its demand management strategy (water metering rollout, leakage reduction and water efficiency measures) and supply strategy options including adjustment to 1:200 drought, adjustment to existing potable water export, adjustment to licence cap transfer and drought permit, and delivery of a potable water transfer from Ruthamford North to Ruthamford South water resource zone (**Ref. 12.15**).

### Flood Risk

12.5.50. Flood risk would be managed based on the NPPF (**Ref. 12.32**) and Bedford Borough Local Flood Risk Management Strategy (LFRMS). The LFRMS objectives include mitigating flood risk, building resilience, promoting best land use, ensuring SUDS are used and appropriately designed, working with risk management authorities and continued awareness of sources of flooding.

12.5.51. Climate Change is predicted (**Ref. 12.23**) to increase rainfall intensity in the Upper and Bedford Ouse Management Catchment by +25% (central allowance 50th percentile) to +40% (upper end allowance 95% percentile) by the 2070s using the 1981-2000 rainfall baseline. Peak river flows are also predicted to rise by 19% (central estimate) to 58% (upper estimate) by the 2080s.

**Groundwater**

12.5.52. The future baseline is unlikely to change from that of the baseline in relation to the groundwater, largely due to most of the Site being underlain by the Oxford Formation (non-aquifer).

## SENSITIVE RECEPTORS

12.5.53. The sensitive receptors identified are summarised in **Table 12-7**:

**Table 12-7 - Identified Receptors and Importance**

| Receptor | Importance | Justification |
|---|---|---|
| Existing Watercourse – Core Zone | Medium | Local watercourse primarily draining the field, poorly maintained, cloudy stagnant water, flat gradients.<br>Will receive incoming flows from Coronation Pits in the future (25 to 50 years) once the Pits fill and the overflow is activated. |
| Elstow Brook | High | WFD monitored water body with Moderate Ecological Status.<br>Modelled peak flow of 14m$^3$/s for 1 in 100 year +20% Climate change. |
| Coronation Pits (CWS) | Medium | Former clay pit part of a restoration project for enhanced landscape, habitat and water body creation, non-statutory designation Bedford CWS. |
| Kempston Hardwick Clay Pits (north) – disused clay pits 1987 | Low | Former clays pits from Kempston Hardwick Brickworks. Previously drained in 2018. |
| Kempston Hardwick Clay pits (North) – Artificial Lake | High | Former Clay pit 1978, now an artificial lake. Receives overflows from the CWS and overflows to Elstow Brook, supporting birds and fish. |
| Kempston Hardwick Clay Pit (south) | High | Former clay pit, now part of the Bedford CWS locally significant size of water body supporting birds and fish. |
| A421 Borrow Pit | Low | Small historic borrow pit originally used for the construction of the new A421 Junction, now an artificial lake. No flood risk vulnerability or *WFD* classification. |
| Former Clay Pit 1987 (North of the Site) - Artificial Lake | Low | Former clay pit, now an artificial lake. No flood risk vulnerability or *WFD* classification. |
| Water Supply Resources | High | Anglian Water (Ruthamford South) under serious water stress reference WRMP24. |

| Receptor | Importance | Justification |
|---|---|---|
| Foul Water - Receiving Water Environment | High | Anglian Water has confirmed that upgrades to Bedford WRC will be carried out under AMP8 (2025-2030) prior to discharge of treated flows to the receiving water environment. |
| People/Property/Infrastructure affected by Surface Water Drainage Infrastructure capacity | High | Existing watercourses are unlikely to have adequate capacity for freely discharging flows from the Proposed Development, therefore on-Site flow controls and attenuation are required to manage flood risk. |
| Site Users | High | Flood Risk to Construction Site Workers. |
| Alluvium secondary A and head secondary (undifferentiated) superficial deposit aquifers | Medium | The superficial deposits, though classed as secondary aquifers (secondary A and secondary (undifferentiated), are thinly laterally distributed, and are not considered viable groundwater resources. |

12.5.54. Key sensitive receptor locations are shown on **Figure 12.3: Existing Surface Water Plan Regime (Volume 2)**.

## 12.6. ASSESSMENT OF POTENTIAL EFFECTS, MITIGATION AND RESIDUAL EFFECTS

### CONSTRUCTION PHASE

#### Embedded Mitigation

12.6.1. The assessment presented in **Table 12-8** relies on "Embedded Mitigation" which is set out in detail in the mitigation documents and sections mentioned below. No additional mitigation measures have been identified as required for the Proposed Development.

12.6.2. **Appendix 2.3: OCEMP (Volume 3)** contains the following embedded mitigation:

- Section 3.10 includes the necessary measures including good site management, pollution prevention, refuelling processes, emergency plans, stockpiling materials, control of surface water runoff volumes and rates (both temporary and permanent where applicable), inspection, operation and management of drainage systems and associated controls, storage of hazardous materials, control of waste, control sediment and dust, management of foul drainage networks where suitable, to ensure that the receiving water environment is protected from the effects of silt and sediment, pollution, accidental releases, temporary surface water runoff controls and attenuation, temporary water supplies, fittings and foul drainage systems; and
- Section 3.10 also includes measures to protect workers from potential flood risk such as developing and implementing a Flood Emergency Plan considering plant machinery, Site operatives, and evacuation where appropriate, during a flood event; and informing construction workers of Site-specific flood risks.

12.6.3. **Appendix 12.1: Flood Risk Assessment (Volume 3)** contains the following embedded mitigation:

- Section 6 Sequential and Exception Test demonstrates that the Proposed Development has been steered to areas with the lowest risk of flooding from any source. Where the Exception Test is required, it includes wider sustainability benefits and that the development will be safe for its lifetime and reduce flood risk overall;
- Section 7 Flood Risk Mitigation Measures details the measures relating to finished ground levels design preventing standing water and controlling exceedance routes directed to strategic SUDS, ensuring a viable means of access and egress by locating roads in Flood Zone 1 where possible, and if applicable raising finished road levels 600mm above modelled flood risk levels, setting finished ground levels higher than modelled surface water flood risk levels, to manage the risk of flooding including site levels, access and egress, development in Flood Zones, and future risk from existing sources; and
- Section 8 Off-Site Effects includes reference to the proposed surface WS contained in **Appendix 12.3: Drainage Strategy (Volume 3)** and demonstrates no on or off-Site flood risk as a result of the Proposed Development.

12.6.4. **Appendix 12.2: Water Strategy (Volume 3)** contains the following embedded mitigation:

- Section 4 Water Conservation Opportunities includes LEED certification, compliance with local plan requirements, reduction of water use through efficient fittings, water demand values, rainwater capture and reuse for non-domestic supply and secondary feed for WCs, treatment and distribution.

12.6.5. **Appendix 12.3: Drainage Strategy (Volume 3)** contains the following embedded mitigation:

- Section 5 Drainage Strategy details the proposed surface WS comprising of SUDS, conveyance network, flow controls, strategic attenuation, pollution prevention, rainwater harvesting, operation and maintenance schedule for SUDS components, and the foul drainage strategy.

**Potential Risks during the Construction Phase**

12.6.6. The water related risks to the environment during the Construction Phase are as follows:

- Construction works near to, or over Elstow Brook and the Clay Pits (e.g., proposed bridge which could impact hydrology through the modification of the bank, loss of vegetation, increased sedimentation, increased flood risk, erosion of non-stabilised areas);
- Proposed diversion of the existing watercourse in the Core Zone to deliver the Proposed Development which could cause an increase in sediments, change in hydrology, hydromorphology, vegetation loss, and increased flood risk;
- Increased sediment load to receiving watercourses, lakes, and clay pits from surface water runoff because of Site clearance, stripping of topsoil, and the new watercourse diversion;
- Increased risk of hydrocarbons entering the drainage system or direct accidental release to ground from construction plant activities;
- Storage of hazardous materials and increased risk of accidental leaks and release to water;
- Dust during dry periods and debris leaving the Site;
- Risk of accidental leakage from temporary foul water systems, supporting worker activity;
- Water demand from construction workers and activities;
- Foul water loading demand on the receiving public network from construction workers and welfare facilities;

- Flooding surface water runoff from Site clearance, stripping of topsoil, and over compaction of soils;
- Temporary works located in areas identified to be at fluvial and surface water flood risk; and
- Changes in groundwater quality and quantity as a result of dewatering.

**Water Framework Directive Consideration**

12.6.7. The WFD applies to surface waters and groundwaters, and focuses on ensuring good qualitative and quantitative health, reducing, and removing pollution, and ensuring adequate quantity of water. The Proposed Development has been designed to comply with the objectives of WFD which is summarised below. As mentioned under Paragraph 12.2.2 of this chapter, the WFD Application will be submitted to and approved by the Environment Agency, post consent during detailed design and prior to construction.

12.6.8. As shown in Section 1 and Section 5 of **Appendix 12.3: Drainage Strategy (Volume 3)**, the detailed design of proposed works to Elstow Brook and Core Zone watercourse will be progressed by the relevant Undertaker[1] in engagement with the IDB and Environment Agency, and subject to Land Drainage Consent. The proposed road crossing located in West Gateway Zone over Elstow Brook will consist of a clear span bridge, the soffit will be set 600mm higher than the 1 in 100 year plus climate change modelled river level. The bridge abutments will be set back 10m from the top of bank with detailed design informed by riparian habitat, bank stability and ecological importance to reduce impacts. The watercourse diversion located in Core Zone will be replaced within the same Zone and the form, shape and appearance will be enhanced through meandering channel (note that top of banks remain straight) which may include alternate berms in the channel to vary flow and provide sinuosity, varied side slopes, landscaping vegetation, improved gradients, and cross-sectional shape, as shown in **Annex 2: WSP Drainage Strategy Drawing** of **Appendix 12.3: Drainage Strategy (Volume 3)**.

12.6.9. The surface water drainage proposals shown in Section 5.3 of **Appendix 12.3: Drainage Strategy (Volume 3)** will result in no change to flow dynamics in Elstow Brook, no significant loss of vegetation in the bed, no change to hydromorphology and physio-chemical quality. This will be achieved through surface water runoff quantity controlled to existing greenfield runoff rates as per Section 5.3 of **Appendix 12.3: Drainage Strategy (Volume 3)** and quality pollution prevention mitigation measures contained in Section 5.6. Catchment hydrology remains as per the existing arrangement.

12.6.10. There will be no significant impact to the biological and chemical status of Elstow Brook during the Construction and Operational Phases. This will be achieved through the design measures mentioned above and embedded mitigation included in **Appendix 2.3: OCEMP (Volume 3)** Section 3.10 (sediment loading, pollution releases, dust debris, dewatering), and **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 (SUDS Management train, flow controls, SUDS maintenance schedule). Based on the embedded mitigation included, there will be no deterioration to the *WFD* status and future objectives, and any temporary impacts will be negligible.

[1] The persons (corporate or otherwise) who are permitted to carry out the Proposed Development (including their contractors and other persons appointed by them in connection with the carrying out of the Proposed Development).

12.6.11. The effects identified as temporary construction-based activities, or permanent (e.g., removal of vegetation and habitat loss), and risks to water resources are identified below and summarised in **Table 12-8**.

12.6.12. Based on the above embedded mitigation and WFDA which will be submitted to the Environment Agency and approved during detailed design, prior to Construction, the Proposed Development complies with the objectives of The *Water Environment (Water Framework Directive) (England and Wales) Regulations 2017* (**Ref. 12.34**).

**Assessment Approach and Methodology**

12.6.13. The following sections summarise proposed works in relation to the receptor and the construction effects, along with location of effect in proximity to the receptor, temporary or permanent impact, and magnitude. Further reference is made to Embedded Mitigation mentioned in Paragraph 12.6.1 above.

**Elstow Brook and the Kempston Hardwick Clay Pit (north) - disused pit**

12.6.14. Construction works in proximity of Elstow Brook and Kempston Hardwick Clay Pit (north) disused pit, include bridge crossings, direct piped connections for proposed surface water systems, bank modifications, planting, and landscaping. These works could result in temporary or permanent loss of vegetation, habitat, increased sediment loading entering the water bodies, and temporary or permanent impacts to the bank resulting in stabilisation and reinstatement works. The works in relation to Elstow Brook are isolated and in the key areas only where necessary e.g. bridge crossing and headwalls.

12.6.15. Works in relation to the clay pit is of greater impact and part of the proposed enhancement measures from a water resources perspective; Kempston Hardwick Clay Pit will store proposed surface water runoff and rainwater harvesting volumes. Permanent Water levels could fluctuate 1m for Rainwater Harvesting and Temporary Water levels could fluctuate 2m up to the 1 in 100 year rainfall return period plus 40% climate change. Located upstream of the disused pits, is the existing artificial lake, which will be used for treatment of proposed surface water runoff only. There will be no attenuation and no fluctuating water levels in the artificial lake.

12.6.16. Details of the surface water attenuation volumes, discharge rates and typical sections are included in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5. **Appendix 2.3: OCEMP (Volume 3)** Section 3.10 and WFD Consideration section of this chapter mentioned above contains embedded mitigation to protect the receiving waterbody from construction effects.

**Watercourse Diversion - Core Zone**

12.6.17. The existing watercourse located in the Core Zone will be diverted to the eastern boundary of the Core Zone as part of the Proposed Development. This will result in loss of existing vegetation, riparian habitat, change in hydrology, and increased risk of sediment load until vegetation becomes established. The new watercourse will include enhanced cross-sectional shape, landscaping, planting, meandering channel (note that top of banks remain straight) including alternate berms in the channel to vary flow and provide sinuosity, and a gravel bed. The new watercourse feature will be protected from Site activities mentioned below (e.g., sediments, pollution, accidental releases, dust, and debris), by the Principal Contractor(s) in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10.

12.6.18. 9m byelaws remain from existing top of banks for IDB maintained watercourses on both sides and including culverts ('IDB Byelaw Zone'). The Land Drainage Consent to be approved by the IDB permits activities within this margin. Proposals in the IDB Byelaw Zone will predominantly consist of landscaped vegetation to protect riparian habitat.

**Sediment Loads**

12.6.19. Wider Site activities impacting water bodies include Site topsoil stripping, excavation, and earthworks activities (movement and storing of soils), dewatering of excavations, temporary drainage systems, and storage of materials. These works could increase the risk of sediments entering the water bodies, resulting in adverse effects on water quality, increasing turbidity, preventing natural sunlight reaching the vegetation and affecting supporting habitats.

12.6.20. The potential impacts as a result of increased sediment load through Site runoff to Elstow Brook, Kempston Hardwick Clay Pits (North) Artificial Lake, and the Core Zone watercourse, are as follows:

- Altering hydromorphological processes, by altering bedforms within watercourses/the Brook through sediment deposition altering the cross-sectional profile and variation;
- Changes to the sediment dynamics could also potentially alter prevailing erosion and deposition processes operating; and
- The potential for fine sediment accumulations could result in a change in marginal and in-channel vegetation.

12.6.21. The effects from Sediment Loads are not likely to be significant due to the embedded mitigation measures contained in **Appendix 2.3: OCEMP (Volume 3)** Section 3.10.

**Pollution**

12.6.22. Site based activities including construction plant vehicle movements (hydrocarbons), refuelling, accidental releases, and storing of hazardous materials increase the chance of pollutants being transported via uncontrolled surface water runoff to the receiving waterbodies. Dissolved pollutants and hydrocarbons can lead to reduction in oxygen, toxic conditions, metal accumulation, contamination of organism, and death of fish and other animals.

12.6.23. There is a potential risk of leaks and accidental releases of chemicals and hazardous materials (e.g., concrete mixing and wash-down of vehicles), either via filtration to the receiving groundwater or transferred via surface water runoff to the water bodies. The size of a release increases the magnitude of impact to the water body which will be temporary during the Construction Phase.

12.6.24. Generally, it is only when large quantities of hazardous substances are spilled, or the spillage is directly into the water body, that a significant risk of acute toxicity would arise in the receiving water. The effect of pollutants on water bodies is temporary and can improve through natural attenuation, dispersion, and dilution over time.

12.6.25. Any effects from accidental spillages will not be significant at the water body scale after implementation of the mitigation measures summarised in the section above of this chapter and detailed in **Appendix 2.3: OCEMP (Volume 3)** Section 3.10 of the ES.

**Dust and Debris**

12.6.26. Site topsoil stripping and large-scale removal of vegetation, along with the combination of dry weather periods, could result in dust and debris blown into nearby waterbodies. Additionally, any pollutants originating from Site activities could also be transferred further increasing contamination to water bodies. The effect of debris on water bodies is temporary and may impact the aesthetic appearance (e.g., Site materials, packaging, lightweight products) which will be removed following weather events by the Principal Contractor(s).

12.6.27. Measures are summarised in the section above of this chapter and contained within **Appendix 2.3: OCEMP (Volume 3)** Section 3.10 as embedded mitigation, therefore the effects from Dust and Debris on water bodies will likely be Not Significant.

**Leaks from Temporary Foul Sewer System**

12.6.28. During Construction, the risk of sewage leaks from temporary on-Site facilities including toilets, canteen, etc. could either filtrate to groundwater (perched) or runoff to water bodies. Contaminants include nutrients, organic matter, and suspended solids, which if transferred to the water body could result in eutrophication, smothering plants, and reduction in oxygen levels. Elstow Brook and the Lakes could be directly affected by leaks from the sewer system, however, water quality will improve over time through natural attenuation, dispersion, and dilution. **Appendix 2.3: OCEMP (Volume 3)** Section 3.10 of the ES includes measures to reduce the risk of impact to receiving water bodies from foul sewer system leaks.

**Increased Water Supply Demand and Foul Drainage**

12.6.29. During the Construction Phase, water supplies are required for Site staff, sanitary facilities, wheel washing, and concrete mixing. Used water will discharge into the receiving public foul water network. Anglian Water has confirmed that sufficient capacity is available for water supplies required during the Construction Phase. The short-term temporary effect on the water environment will likely be not significant. Anglian Water and UDX have agreed to work together to understand need, dates, and means to supply for temporary potable water as stated in the SoAP (**Appendix 4** of the **Planning Statement (Document Reference 6.1.0)**).

**Flood Risk to Site Users**

12.6.30. The northern part of Lake Zone includes existing flood risk from Elstow Brook. There is also an area of existing flood risk from Reservoirs, although the likeliness of occurrence is considered low. Where topsoil stripping, ground compaction, and modification of platform levels is undertaken, this could result in greater surface water flooding in comparison with the existing baseline. **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 7 contains the embedded mitigation measures required to reduce flood risk impact from all sources. The effect from on-Site workers and plant is likely to be small and temporary.

**Dewatering Excavations**

12.6.31. Water collected in excavations either from rainfall, surface water runoff or groundwater ingress will need to be pumped to a nearby receiving feature (e.g., ditch or settling lagoon). This water will ultimately reach Elstow Brook and may route via the watercourse in Core Zone and the clay pits in Lake Zone. The impact to water bodies includes increased risk of pollution, sedimentation clogging, and surface water volumes potentially leading to flood risk. The effects will be temporary and improve over time through natural attenuation, dispersion, and dilution.

12.6.32. Proposed connections or discharges to the receiving water body or sewer will be subject to agreement with the Environment Agency or sewerage undertaker respectively, via Environmental Permit or Section 106 Water Industry Act Agreement. Based on the embedded mitigation contained in **Appendix 2.3: OCEMP (Volume 3)** Section 3.10 of the ES, the effect on waterbodies will likely be **Not Significant**.

**Table 12-8 - Assessment of Potential Effects, Embedded Mitigation, Residual Effects and Monitoring During Construction Phase**

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| Elstow Brook | **Potential Effects** | Increased sediment loads from Site clearance, excavation, and movement of materials on Site could have a **Minor Adverse** effect on receiving water bodies impacting plant growth, negatively impacting supporting habitat. Sediment may also impact the drainage functionality (e.g., blocking and clogging the system thus increasing flood risk).<br>Increased dust and debris may also elevate the sediment load entering the watercourse resulting in a **Minor Adverse** effect.<br>Dewatering of excavations, if pumped to the Brook may also increase sediment load, resulting in a **Minor Adverse** effect.<br>Increase in peak river levels as a result of Site clearance and over compaction of soils leading to additional uncontrolled surface water runoff flows and volumes entering the watercourse further increasing flood risk through capacity restrictions and rapid uncontrolled incoming water from rainfall across the Site.<br>Increased hydrocarbons as a result of construction traffic movement and drips/releases from construction plant could result in pollution to watercourses through transfer of contaminants via surface water runoff. This would deplete oxygen levels within the Brook, increase toxicity and negatively impact supporting habitat. The effect will be **Minor Adverse**.<br>Leaks from accidental releases, storage of hazardous materials, and accidental leaks from the temporary foul drainage system, will negatively impact the Elstow Brook due to their hazardous content and increased toxicity to the water environment, resulting in a **Minor Adverse** effect. |
| | **Embedded Mitigation** | N/A - Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10, which includes reducing large site clearance excavations, management of stockpiles, effective wheel washing, temporary SUDS with sediment and pollution controls, dewatering via temporary SUDS e.g. not direct to the receptor, dust suppression, hazardous material storage in secondary containment systems and stored away from the receptor, plant machinery leak checks and remediation, refuelling over concrete bunded areas with spill kits, the necessary training of operatives for use of clean up kits. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| | **Residual Effects and Monitoring** | The sensitivity of Elstow Brook is High, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight Adverse (Not Significant)** and temporary. Elstow Brook is monitored by the IDB and maintained on an annual basis. Elstow Brook is also monitored by the Environment Agency under the RBMPs which is updated every six years. |
| Existing Watercourse Core Zone | **Potential Effects** | The existing watercourse routing through Core Zone will be diverted to the eastern boundary as part of the development proposals. This will result in the following temporary **Moderate Adverse** effects:<br>▪ Temporary loss of existing vegetation. The new watercourse location will be within the same Zone boundary, and new planting and landscaping will take time to fully establish;<br>▪ Temporary loss of existing riparian habitat. Habitat to be relocated to the newly diverted location;<br>▪ Permanent change in hydrology. The new watercourse length is increased by approximately 300m in comparison with existing. The new watercourse cross section will also be increased in width and depth to allow for future flows from the Core Zone development. Flow rates will increase from the new Core Zone development's impermeable areas;<br>▪ Increased sediment loading within the watercourse due to no established planting. New planting/landscaping will take time to fully establish and prevent sediment transfer;<br>▪ Increased risk of pollution from construction activities;<br>▪ Accidental leaks and releases; and<br>▪ Dust and debris leaving the Site. |
| | **Embedded Mitigation** | The relevant Undertaker will carry out detailed design of the diverted watercourse in engagement with the IDB (Land Drainage Consent) under the Land Drainage Act 1991 (**Ref. 12.25**).<br>The watercourse will be constructed early in the programme as stated in **Annex 3: Construction Access and Phasing** of **Appendix 2.3: OCEMP (Volume 3)** Phase 1b, to allow time for relocated planting, landscape, and habitat to establish before construction of the main development.<br>Section 5 of **Appendix 12.3: Drainage Strategy (Volume 3)** states the watercourse cross section will include an enhancement with variable, meandering routes (though top of banks remain straight) which may include alternate berms in the channel to vary flow and provide sinuosity, gravel bed for sediment control, and flat landings for safety and to support habitat.<br>**Annex 2: WSP Drainage Strategy Drawing** of **Appendix 12.3: Drainage Strategy (Volume 3)** shows IDB Byelaw Zones with landscaping either side from the top of bank of the diverted watercourse, replacing the relocated riparian habitat.<br>The Principal Contractor(s) will be responsible for developing and implementing the CEMP. **Appendix 2.3: OCEMP (Volume 3)** Section 3.10 includes suitable temporary management of surface water runoff |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| | | to prevent both on and off-Site flood risk and pollution affecting the newly diverted watercourse. |
| | **Residual Effects and Monitoring** | The sensitivity of existing Watercourse through Core Zone is Medium, and the magnitude of change, following mitigation, is Minor Adverse. The significance of effect is expected to be **Slight Adverse (Not Significant)** and temporary during the initial stages of construction. **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)** contains a SUDS monitoring regime during Construction Phase requiring regular monthly inspections and maintenance increasing to half yearly once established. |
| Coronation Pits | **Potential Effects** | The following effects could impact the Coronation Pits. The pits are located upstream of the Site and drain into the Core Zone via an overflow. The diversion of the existing watercourse within Core Zone could have an impact on the Coronation Pits if not planned appropriately, although the effects will be **Minor Adverse**, due to the receptor proximity, upstream location, and low probability of occurrence.<br>▪ Increased sediment loads from Site excavation and stripping of topsoil. Uncontrolled surface water runoff could enter the pits if the watercourse diversion is not in place located toward the southern area of the Core Zone;<br>▪ Increase in water levels in the pits if the Core Zone watercourse diversion is not in place. Site clearance and over compaction of soils could result in additional surface water runoff flows and volumes entering the pits which could increase water levels in the pits;<br>▪ Dust and debris leaving the Site could be transferred overland via strong winds in an open and exposed area;<br>▪ Dewatering of excavations if pumped to Coronation Pits further increasing sediment loading; and<br>▪ Release to water, storage of hazardous materials, and accidental leaks from the temporary foul drainage system if the pollutant pathway routes to the Coronation Pits due to their hazardous content and increased toxicity to the water environment. |
| | **Embedded Mitigation** | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10. |
| | **Residual Effects and Monitoring** | The sensitivity of Coronation Pits is Medium, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight Adverse (Not Significant)** and temporary. Visual inspection and monitoring of observed flows (if any) from Coronation Pits during Construction Phase should be undertaken on a quarterly frequency and inspection of the outlet on an annual basis, or as required following heavy storm events. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| Kempston Hardwick Clay Pits (north) – disused clay pits 1987 | **Potential Effects** | The following effects could impact Kempston Hardwick Clay Pits (north) – disused clay pits. The former clay pits are in the northeastern area of the Site and do not perform a drainage function. They were emptied in 2018 and have filled with rainwater and surface runoff since then. As shown in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5, the pits will be enhanced as strategic SUDS storing runoff volumes from both Core and Lake Zone impermeable drained areas, resulting in a significant Water improvement of an existing low-quality feature. As the receptor sensitivity is Low, the following effects are **Slight Adverse**:<br>▪ Increased sediment loads through Site clearance and topsoil stripping;<br>▪ Increased dust and debris;<br>▪ Dewatering of excavations if pumping to the Clay Pits;<br>▪ Increased hydrocarbons; and<br>▪ Leaks from hazardous releases and temporary foul drainage. |
| | **Embedded Mitigation** | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10. |
| | **Residual Effects and Monitoring** | The sensitivity of Kempston Hardwick Clay Pits (north) – disused pits is Low, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight diverse (Not Significant)** and temporary. **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)** contains a SUDS monitoring regime during Construction Phase requiring regular monthly intervention increasing to annual frequency or as required, once established. |
| Kempston Hardwick Clay pits (North) –Artificial Lake | **Potential Effects** | This former clay pit is now an artificial lake, located in the Lake Zone, that receives overflows from Kempston Hardwick Clay Pits (south) and routes to Elstow Brook. The following **Moderate Adverse** effects could impact the Lake:<br>▪ Increased sediment loads through Site clearance and topsoil stripping;<br>▪ Increased dust and debris;<br>▪ Dewatering of excavations if pumping to the Clay Pits;<br>▪ Increased hydrocarbons;<br>▪ Leaks from hazardous releases and temporary foul drainage; and<br>▪ Flood Risk through uncontrolled surface water runoff flows entering the pits. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| | **Embedded Mitigation** | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10 which includes reducing large site clearance excavations, management of stockpiles, effective wheel washing, temporary SUDS with sediment and pollution controls, dewatering via temporary SUDS e.g. not direct to the receptor, dust suppression, hazardous material storage in secondary containment systems and stored away from the receptor, plant machinery leak checks and remediation, refuelling over concrete bunded areas with spill kits, the necessary training of operatives for use of clean up kits. |
| | **Residual Effects and Monitoring** | The sensitivity of Kempston Hardwick Clay Pits (North) – Artificial Lake is High, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight Adverse (Not Significant)** and temporary. **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)** contains a SUDS monitoring regime during Construction Phase requiring regular monthly intervention increasing to annual frequency or as required, once established. |
| Kempston Hardwick Clay pit (south) CWS | **Potential Effects** | This former clay pit is now an artificial lake, located to the east of the Lake Zone outside of the Site. The pit overflows to Kempston Hardwick Clay Pits (North) – Artificial Lake, which overflows to Elstow Brook. The following **Moderate Adverse** effects could impact the Pit:<br>▪ Increased sediment loads through Site clearance and topsoil stripping – the majority of Lake Zone is at a lower ground level than the Kempston Hardwick Pits (South), therefore this risk is low;<br>▪ Increased dust and debris;<br>▪ Dewatering of excavations if pumping to the Clay Pits;<br>▪ Increased hydrocarbons;<br>▪ Leaks from hazardous releases and temporary foul drainage; and<br>▪ Flood Risk through uncontrolled surface water runoff flows entering the pits. |
| | **Embedded Mitigation** | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10 which includes reducing large site clearance excavations, management of stockpiles, effective wheel washing, temporary SUDS with sediment and pollution controls, dewatering via temporary SUDS e.g. not direct to the receptor, dust suppression, hazardous material storage in secondary containment systems and stored away from the receptor, plant machinery leak checks and remediation, refuelling over concrete bunded areas with spill kits, the necessary training of operatives for use of clean up kits. |
| | **Residual Effects and Monitoring** | The sensitivity of Kempston Hardwick Clay Pits (south) CWS is High, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight Adverse (Not Significant)** and temporary. Visual inspection and monitoring of observed flows from the Pits during Construction Phase should be undertaken on a quarterly frequency and inspection of the overflow on an annual basis, or as required following heavy storm events. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| A421 Borrow Pit – Artificial Lake<br>and<br>Former Clay Pit 1987 (North of the Site) - Artificial Lake | **Potential Effects** | The borrow pit was originally used for the construction of the new A421 Junction and is now an artificial lake, located to the north of the Site.<br>Both the former clay pit and the A421 borrow pit are understood to have no drainage link between these features and the Site.<br>The following **Minor Adverse** effects could impact the artificial lakes:<br>▪ Increased sediment loads through Site clearance and topsoil stripping;<br>▪ Increased dust and debris;<br>▪ Dewatering of excavations if pumping to the Lake; and<br>▪ Flood Risk through uncontrolled surface water runoff flows entering the pits. |
| | **Embedded Mitigation** | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10. |
| | **Residual Effects and Monitoring** | The sensitivity of A421 Borrow Pit and Former Clay Pit are Low, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Neutral (Not Significant)** and temporary. Visual inspection/observation of the Borrow Pit and Clay Pit should be undertaken during Construction Phase on a quarterly-to-half yearly basis, or as required following heavy storm events. |
| Water Supply Resources | **Potential Effects** | Increased water demand during construction for temporary Site cabins, wheel washing, staff facilities which may require significant volumes from the public water supply infrastructure result in a temporary **Moderate Adverse** effect on the water supply resources. |
| | **Embedded Mitigation** | The Principal Contractor(s) will agree with Anglian Water on the necessary connections during the Construction Phase.<br>**Appendix 2.3: OCEMP (Volume 3)** Section 3.10 also includes:<br>▪ Specification of low flow equipment;<br>▪ Education of Site workers conserving water (e.g., switching off taps, plant, and equipment when not in use);<br>▪ Wheel washing recycling systems; and<br>▪ Rainwater harvesting where appropriate (e.g., cabin roof drainage). |
| | **Residual Effects and Monitoring** | The sensitivity of Water Supply Resources is High, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight Adverse (Not Significant)** and temporary. Anglian Water undertake regular monitoring as part of their WRMP issued every five years and reviewed annually. |
| Foul Water Receiving Water Environment | **Potential Effects** | During Construction there will be increased foul water drainage demand on the Bedford WRC and existing public foul sewer network, which will discharge treated flows to the receiving water environment. This results in a temporary **Moderate Adverse** effect on the receiving water environment. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| | **Embedded Mitigation** | The Principal Contractor(s) will agree with Anglian Water on the necessary foul water connections during the Construction Phase.<br>Anglian Water has confirmed that it will provide adequate capacity via the proposed sewerage connection and is obligated to accept foul flows (**Annex 3: Correspondence** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**). The AW SoAP is included in **Appendix 4** of the **Planning Statement (Document Reference 6.1.0)**. |
| | **Residual Effects and Monitoring** | The sensitivity of Foul Water Receiving Water Environment is High, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight Adverse (Not Significant)** and temporary. Anglian Water undertake regular monitoring as part of their Drainage and Wastewater Management Plan (DWMP) issued every five years and reviewed annually. |
| People/Property/Infrastructure affected by Surface Water Drainage capacity | **Potential Effects** | The temporary **Moderate Adverse** effects of construction to people/property/infrastructure resulting from Surface Water Drainage capacity are:<br>▪ Dewatering of excavations if pumping to the ditches/watercourses; and<br>▪ Flood Risk through uncontrolled surface water runoff flows entering the network. |
| | **Embedded Mitigation** | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10.<br>**Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 includes flow controls and attenuation to prevent capacity issues within the network. As stated in **Annex 3: Construction Access and Phasing** of **Appendix 2.3: OCEMP (Volume 3)** Phase 1b, establishment during this stage of construction of on-Site flow control structures set at greenfield rates and attenuation features as shown in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5, will reduce this risk. |
| | **Residual Effects and Monitoring** | The sensitivity of People/Property/Infrastructure affected by Surface Water Drainage capacity is High, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight Adverse (Not Significant)** and temporary. |
| Site Users | **Potential Effects** | The temporary **Moderate Adverse** effects on construction Site workers include flooded excavations, surface water flooding from Site stripping and large areas of topsoil removal, and flooding from Elstow Brook. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| | **Embedded Mitigation** | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10, including a Flood Emergency Plan considering plant machinery, Site operatives, and evacuation where appropriate, during a flood event.<br>As stated in **Appendix 2.3: OCEMP (Volume 3)** Section 3.10, construction workers are informed regarding the Flood Emergency Plan during construction and specific flood risk from rivers, surface water, and ground water sources during the existing site conditions baseline included in **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 5. This information reduces the risk of impact to workers from flood risk sources by increasing knowledge and understanding of site specific characteristics which may influence construction method statements.<br>Further targeted Ground Investigation during the preconstruction detailed stages will be carried out by the relevant Undertaker(s) and include groundwater monitoring required to understand seasonal fluctuations, which may impact excavations in proximity to ground water levels as included in **Appendix 11.4: Outline Land Remediation Strategy (Volume 3)**. This will be controlled on-Site to reduce the risk of workers drowning in excavations, or plant machinery being damaged. |
| | **Residual Effects and Monitoring** | The sensitivity of Site Users is High, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight Adverse (Not Significant)** and temporary. |
| Alluvium secondary A and head secondary (undifferentiated) superficial deposit aquifers | **Potential Effects** | There is a possibility that some dewatering of excavations (such as for foundations) is required, as the proposed base elevations of the excavations are slightly below the measured groundwater level and therefore groundwater inflow could occur. This could result in a temporary minor suppression of groundwater levels within superficial deposits aquifers (due to dewatering) at and around the excavation during construction. However, inflows are expected to be limited due to the limited lateral extent of the superficial deposit aquifers and the low expected productivity of these aquifers, which results in temporary **Minor Adverse** effects. |
| | **Embedded Mitigation** | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10. |
| | **Residual Effects and Monitoring** | The alluvium secondary A and head secondary (undifferentiated) superficial deposit aquifers have a sensitivity of Medium. The magnitude of impact is expected to be Minor. The significance of effect is expected to be **Slight Adverse (Not Significant)** and temporary. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| Impacts to groundwater associated users | **Potential Effects** | Dewatering operations will potentially require temporary abstraction dewatering of the shallow superficial deposit aquifers. The unlicenced abstraction identified at Stanley Works, if this is a groundwater abstraction, is more likely to be targeting the bedrock aquifers confined beneath the Peterborough Member (Oxford Clay Formation). No impact to these bedrock aquifers is anticipated as a result of the proposed works, therefore, **Neutral (Not Significant)** impact to this (possible) unlicenced abstraction is anticipated. |
| | **Embedded Mitigation** | No Embedded Mitigation is anticipated. |
| | **Residual Effects and Monitoring** | The sensitivity of this (possible) unlicenced groundwater abstraction at Stanley Works is Medium. The magnitude of impact is Negligible. The significance of effect is expected to be **Neutral (Not Significant)** and temporary. |

## OPERATIONAL PHASE

12.6.33. The assessment in **Table 12-9** relies on Embedded Mitigation as set out in **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 7, **Appendix 12.3: Drainage Strategy** Section 5 and **Appendix 12.2: Water Strategy (Volume 3)** Section 4. The following sections contain information extracted from these appendices, which contain further detail. No additional mitigation measures have been identified as required for the Proposed Development.

### Proposed Surface Water Strategy

12.6.34. **Figure 12.4: Proposed Surface Water Strategy (Volume 2)** shows the surface WS, which details are contained in Section 5 of **Appendix 12.3: Drainage Strategy (Volume 3)**. The strategy is summarised as follows:

- Surface water runoff disposal is via discharge to watercourse due to existing Clay soils, land drainage networks and shallow ground water, leading to the understanding that soakaways are unviable. Infiltration rates will be confirmed by the relevant Undertaker via further on-Site ground investigation before construction;
- Surface water runoff rates are controlled to existing greenfield QBAR values providing betterment in comparison with the existing baseline for return periods higher than QBAR (approximately 1 in 2 year return period);
- Surface water runoff volumes are attenuated for up the 1 in 100-year return period rainfall event plus 40% climate change and stored in SUDS detention basins and wetlands;
- Pollution prevention includes the SUDS management train capturing sediments, and treating suspended solids, metals, and hydrocarbons, close to source; and
- Rainwater harvesting is also included and forms a strategic part of the WS.

12.6.35. West and East Gateway Zones include localised surface water systems with outfalls to nearby watercourses and provide independent attenuation and pollution prevention measures. The ‘Railway Quarter’ east of the Midland Main Railway Line will drain surface water as per approved planning application 23/02136/M73 to the Harrowden Green Development which is separate to the East Gateway proposed development.

12.6.36. Core Zone includes an enhanced ordinary watercourse discharging to Lake Zone, diverted during the Construction Phase and conveys unrestricted flows from the Zone, whilst allowing for upstream overflow runoff from Coronation Pit and Stewartby Residential Development. Localised on-Site treatment includes swales and underground proprietary treatment systems.

12.6.37. Lake Zone includes the strategic surface water attenuation in the form of enhanced clay pits and lakes. Surface Water from Core and Lake Zone enters the existing Kempston Hardwick Pit – Artificial Lake as a primary treatment stage, which cascades into the northern clay pits and continues routing northeast following existing topography. The existing clay pits are approximately 3m to 6m lower than the nearby outfall at Elstow Brook and therefore pumping is required.

12.6.38. A proposed pumping station is located in the northern part of the Site, and will pump flows to a proposed Water Processing and Collection Plant located to the southern part of Lake Zone. Surface water runoff will then be treated for re-use and supplied to the Core Zone for process water. In the event that the Water Processing and Collection Plant, and attenuation features are full, excess surface water will overflow into Elstow Brook at controlled QBAR greenfield runoff rates.

12.6.39. The proposed Surface WS shown in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 is driven by the maintenance of existing biodiversity and ecological enhancement. This includes protecting and improving the Riparian Zone along Elstow Brook and the diverted watercourse in the Core Zone. Ecological consideration also includes limited isolated work to Kempston Hardwick Clay Pits (North) Artificial Lake, undertaking remedial improvement (removal of silt, rubble, bricks) to the lake and disused pits, and re-profiling of existing banking with varied side slopes and flat landings. The design proposals protect existing habitat and provide a supporting environment for biodiversity and self-sustaining ecosystems.

12.6.40. Surface water drainage includes required pollution controls, removing pollutants from water before it discharges into the drainage water ponds, as stated in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5.6, which references the Ciria SUDS Manual Simple Index Approach (**Ref. 12.37**).

12.6.41. UDX will maintain all drainage within the Core and Lake Zone in accordance with **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)** – Bedford Group IDB have a duty to exercise a general supervision relating to drainage within its district. Under the Land Drainage Act 1991 (**Ref. 12.25**) there are permissive legal powers that permit the IDB to access, maintain and improve watercourses within its area.

**Flood Risk**

12.6.42. As shown in **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 5, the majority of the Site is located within low flood risk areas from all sources.

12.6.43. As shown in **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 6, and on the **Parameter Plans - Entertainment Resort Complex Land Use (Document Reference 1.10.0)**, the majority of the Site is located in Flood Zone 1 with only essential infrastructure (spine roads), more vulnerable use (mixed use/visitor accommodation) and water compatible use (landscaped space) proposed in Flood Zone 2 and 3. The Site has been arranged to prioritise development in Flood Zone 1 and as stated in **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 6.2 Sequential and Exception Test, More Vulnerable land use is permitted on Flood Zone 3, as the remaining developable area.

12.6.44. As shown in **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 6, in the Lake Zone where proposed hard paved development is located (spine road, buildings, hardstanding) proposed levels in Flood Zone 3 will be raised to 30.60m AOD rounded up which is 600mm higher than the 1 in 100 year modelled flood level plus 20% Climate Change of 29.973m AOD above modelled river levels including an allowance for climate change to ensure no on-Site flood risk. Proposed levels in the Ecological Enhancement Area adjacent to the Site boundary at the northern edge of the Lake Zone shown on **Parameter Plans - Entertainment Resort Complex Land Use (Document Reference 1.10.0)** (approximately 6.2ha) will be lowered approximately 300mm to maintain surface level flood volume capacity (Flood Zone 3) in the event that water overtops from Elstow Brook, ensuring no increase to off-Site flood risk.

12.6.45. Where isolated areas of surface water flood risk are shown, proposed finished ground levels stated in **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 7 and the surface WS as shown in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 is designed to ensure no increase to flood risk as a result of development.

12.6.46. Part of the Site is located in flood risk areas from Reservoirs. The Environment Agency advise that flooding from reservoirs is extremely unlikely (**Ref. 12.5**). An area is considered at risk if people's lives could be threatened in the event of a dam or reservoir failure. Proposed ground levels in flood zone areas where development is located, will be raised above the modelled water levels to ensure no on-Site flood risk and flow paths designed to ensure that water can continue to route safely through the Site as is the current arrangement.

**Watercourse Core Zone**

12.6.47. The watercourse in the Core Zone will be permanently diverted during the Construction Phase and during the Operational Phase will become fully established with planting, landscaping, and habitat. The watercourse will be maintained in accordance with the SUDS maintenance schedule included in **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)** to reduce the ongoing effects during the Operational Phase.

**Elstow Brook**

12.6.48. In the West Gateway Zone, the proposed bridge constructed over Elstow Brook will be operational. Subject to the details of the bridge design (e.g., height above the brook, foundations impacting the bank side slope, etc.), there could be permanent effects to a short section of the brook. This may include loss of planting, loss of riparian habitat, risk of bank collapse, and potential increase of pollution from surface water runoff. The Proposed Development includes a road crossing the brook in a parallel section limiting the extent of area affected. The detailed design of the bridge will be developed further in engagement with the IDB and Environment Agency to further reduce risks.

**Foul Water Drainage Strategy**

12.6.49. Anglian Water is obligated to accept the domestic foul flows (flows from toilets and kitchens, etc) from this development as per PPE-0200598. Wastewater streams generated by on-Site water treatment for reuse and recycling can be discharged into Anglian Water's sewer network, pending consent from them. Anglian anticipates providing connection point(s) to the foul water network and will continue to work with UDX regarding flow rates and loadings. The final point of connection location and connection strategy is awaiting further investigation and design development. Agreement between Anglian Water and UDX on these matters is set out in the SoAP (**Appendix 4** of the **Planning Statement (Document Reference 6.1.0)**). Proposed sewer connections (direct/indirect) will be subject to Section Agreements and approved by Anglian Water under the Water Industry Act 1991 (**Ref. 12.26**).

12.6.50. A Highway Service Area is proposed in the West Gateway Zone. There is a potential risk of accidental discharge of pollutants to the receiving waterbody including Organohalogen compounds, Organophosphorus compounds, Organotin compounds, Mercury, Cadmium, Cyanides, Carcinogenic substances, and Mineral oils. Sources of discharge may include leaks from under dispenser valves and couplings, pipework, tanks and fill pipes, faulty oil/separator operation.

12.6.51. In accordance with Environmental Permitting (England and Wales) Regulations 2016 (**Ref. 12.38**), to safeguard the water environment, including Elstow Brook, local watercourses and groundwater from pollutants mentioned above, the relevant Undertaker will implement the following embedded mitigation measures. These measures will be in accordance with the *Association for Petroleum & Explosives Administration Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations* (**Ref. 12.31**) and are included in WG1.1 in **Design Standards (6.3.0)** and are summarised below:

- Separate underground drainage systems with corrosion protection, discharging to the foul water network via an oil separator tank in accordance with *BS EN 858-1:2003* (**Ref. 12.39**)*;*
- The fuelling dispensing area will be covered with a roof and include a continuous spillage intercepting channel around edge;
- The Wash Bay will drain via an oil separator to the foul system;
- Impermeable areas not at risk from fuel contamination (e.g., parking areas, kiosk building roof) will drain to the surface water system via a by-pass separator;
- Isolator shut off valves will be included in the event of emergency spills, fire, vandalism, to lock the drainage system, until clean-up has been completed;
- The underground separators will be inspected and maintained in accordance with *BS EN 858-2:2003* (**Ref. 12.40**);
- All dispensers flitted with a leak proof drip tray or membrane arrangement ensuring no leaks can be diverted to the surface water system;
- Underground storage tanks to comply with PPG27 Installation, decommissioning and removal of underground storage tanks;
- A trade effluent licence will be obtained by the relevant Undertaker in agreement with Anglian Water as stated in the SoAP (**Appendix 4** of the **Planning Statement (Document Reference 6.1.0)**);
- Selection and use of an appropriate leak detection system; and
- Operation of the fuelling station will comply with all relevant permits, licences, and certification.

12.6.52. Based on the embedded mitigation mentioned above, the effects on the receiving water environment will likely be not significant.

**Water Supply Strategy**

12.6.53. Anglian Water has confirmed via Pre-Planning Assessment Report PPE-0200598 contained within **Annex 3: Correspondence** of **Appendix 12.1: Flood Risk Assessment (Volume 3)**, that a potable water supply can be provided. Anglian Water has confirmed that it will meet all requirements of a domestic nature for potable water supply as stated in the SoAP (**Appendix 4** of the **Planning Statement (Document Reference 6.1.0)**). Anglian Water has also advised that they do not provide supplies for non-domestic uses, including process water and irrigation. To mitigate this, **Appendix 12.2: Water Strategy (Volume 3)** Section 4 includes a sustainable approach to water using strategic rainwater harvesting in the Lake Zone Clay Pits, which will be stored and pumped to an on-Site process non-potable Water Processing and Collection Plant and distributed through a non-potable network to the Core Zone's park activities.

12.6.54. **Appendix 12.2: Water Strategy (Volume 3**) details design of the non-potable water system, including the capture of rainwater, the treatment and the distribution system follows the requirements specified in the British Standard BS EN 16941-1:2024 (**Ref. 12.29**). A catchment risk assessment desk study undertaken in May 2024 has identified public health risks and driven the treatment technology. This will be supported by water quality monitoring and subject to the Water Industry Act 1991 (**Ref. 12.26**), Water Supply (Water Fittings) Regulations 1999 (**Ref. 12.27**) and Private Water Supplies Regulations 2016 (**Ref. 12.28**). For rainwater harvesting purposes to support process water, the Clay Pits in Lake Zone receives maximum runoff from Core and Lake Zone, Manor Road, Kempston Hardwick South (CWS), Coronation Business Park, Coronation Pits (25 to 50 years' time), Stewartby Residential Site only.

12.6.55. The impacts to the Water environment from the Proposed Development during Operational Phase are summarised in **Table 12-9**.

**Table 12-9 - Assessment of Potential Effects, Embedded Mitigation, Residual Effects and Monitoring During Operational Phase**

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| Elstow Brook | **Potential Effects** | The potential **Moderate Adverse** effects resulting from a Bridge over Elstow Brook in an isolated section at the West Gateway Zone is as follows:<br>▪ Temporary/permanent loss of riparian habitat;<br>▪ Temporary/permanent loss of vegetation;<br>▪ Risk of bank collapse; and<br>▪ Risk of pollution from surface water runoff. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| | **Embedded Mitigation** | The relevant Undertaker will progress the detailed design of the bridge crossing during engagement with IDB (Land Drainage Consent) and Environment Agency (WFD). Detailed design and engagement with the relevant authority will reduce risk of fluvial flooding from bridge crossing levels control, pollution prevention to Elstow Brook and bridge abutments set back to prevent bank collapse.<br>Development proposals located alongside the Elstow Brook to allow for a 10m landscaped buffer to reduce permanent loss of landscape vegetation and riparian habitat.<br>**Appendix 12.3: Drainage Strategy (Volume 3)** Section 5.6 includes pollution prevention methods to reduce risk to Elstow Brook. |
| | **Residual Effects and Monitoring** | The sensitivity of Elstow Brook is High, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight Adverse (Not Significant)**. Elstow Brook is monitored by the IDB and maintained on an annual basis. Elstow Brook is also monitored by the Environment Agency under the RBMPs which is updated every six years. |
| Watercourse Core Zone | **Potential Effects** | The watercourse will be constructed early in the programme as stated in **Annex 3: Construction Access and Phasing** of **Appendix 2.3: OCEMP (Volume 3)** Phase 1b, to allow time for relocated planting, landscape, and habitat to establish before construction of the main development. During the Operational Phase, the watercourse will be maintained by the Relevant Stakeholder in accordance with **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)**.<br>The diverted watercourse will be fully established by the Operational Phase. Enhancement to vegetation, landscape, habitat as shown in **Appendix 6.4: Outline Habitat Creation and Enhancement Plan (Volume 3)** will result in beneficial effects.<br>The increased capacity cross section of the watercourse will convey Core Zone development flows from the Site reducing on and off-Site flood risk.<br>There is a **Moderate Beneficial (Significant)** effect. |
| | **Embedded Mitigation** | Included in embedded mitigation as stated in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 and **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)**, which contains a SUDS monitoring regime during the Operational Phase ranging across monthly, quarterly, annually and every five years frequency, or as required for the individual component and after heavy storm events. |
| | **Residual Effects and Monitoring** | The sensitivity of Watercourse Core Zone is Medium, and the magnitude of change, following mitigation, is Moderate Beneficial. The significance of effect is expected to be **Moderate Beneficial (Significant)**. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| Coronation Pits | **Potential Effects** | The potential effects on the Coronation Pits are limited during the Operational Phase as the receptor is upstream of Core Zone and does not receive any surface water runoff volumes or flow rates from the Site.<br>The diverted watercourse will be fully established and able to convey flows from Coronation Pits.<br>The relevant Undertaker will maintain the surface water system in accordance with maintenance schedule contained in the DS. |
| | **Embedded Mitigation** | NA – No Embedded Mitigation required during Operational Phase. |
| | **Residual Effects and Monitoring** | The sensitivity of Coronation Pits is Medium, and the magnitude of change, following mitigation, is No Change. The significance of effect is expected to be **Neutral**. Monitoring of flows from Coronation Pits should be undertaken on a quarterly frequency and inspection of the outlet on an annual basis, or as required following heavy storm events. |
| Kempston Hardwick Clay Pits (North) – disused clay pits 1987 | **Potential Effects** | **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 shows that the Kempston Hardwick Pits (North) will be restored and enhanced as a strategic SUDS feature storing runoff volumes from both Core and Lake Zone impermeable drained areas, and strategically harvesting rainwater volumes, resulting in a **Major Beneficial** improvement of an existing low-quality feature, from a water resources perspective.<br>The potential **Minor Adverse** effects on the Kempston Hardwick Clay Pits (North) – disused pits are:<br>▪ Pollution from surface water runoff;<br>▪ Pollution from accidental foul water leaks; and<br>▪ Pumping large quantities of stored surface water volumes from the Pits to Core Zone for process water supply demand. This could rapidly lower water levels in the pit only during seasonally dry periods affecting habitat and landscape. |
| | **Embedded Mitigation** | **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 includes pollution prevention methods from surface water runoff and **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)** contains the SUDS Maintenance Schedule ensuring optimum operation of the feature and upstream contributing systems.<br>The foul water system will be designed and constructed to British Standards and the strategy is shown in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5.7. Appendix 12.2: Water Strategy (Volume 3) Section 4 contains embedded mitigation to manage strategic water re-use, which includes monitoring of water levels during seasonal changes through winter and summer months when rainfall and demand may fluctuate, a minimum maintained water level of 20.50m AOD to support aquatic life, and a drought plan if water levels fall below the minimum level, deployed sequentially e.g. water conservation and reduction of irrigation use (before levels drop below minimum), and non-domestic water use suspension if required. The above will mitigate potential pollution related effects on the Kempston Hardwick Clay Pits (North) – disused clay pits 1987 and Artificial Lake. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| | | **Appendix 12.2: Water Strategy (Volume 3)** Section 4 contains embedded mitigation to manage strategic water re-use, which includes monitoring of water levels during seasonal changes through winter and summer months when rainfall and demand may fluctuate, a minimum maintained water level of 20.50m AOD to support aquatic life, and a drought plan if water levels fall below the minimum level, deployed sequentially e.g. water conservation and reduction of irrigation use (before levels drop below minimum), and non-domestic water use suspension if required. |
| | **Residual Effects and Monitoring** | The sensitivity of Kempston Hardwick Clay Pits (North) – disused clay pits is Low, and the magnitude of change, following mitigation, is Major Beneficial. The significance of effect is expected to be **Moderate Beneficial (Significant)**. **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)** contains a SUDS monitoring regime during Operational Phase ranging across monthly, quarterly, annually and every five years frequency, or as required after heavy storm events. |
| Kempston Hardwick Clay pits (North) – Artificial Lake | **Potential Effects** | The following potential **Minor Adverse** effects which could impact the Lake are:<br>▪ Pollution from surface water runoff from off-Site sources; and<br>▪ Pollution from accidental foul water leaks. |
| | **Embedded Mitigation** | **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5.6 includes pollution prevention methods from surface water runoff. The foul water system will be design and constructed to British Standards. |
| | **Residual Effects and Monitoring** | The sensitivity of Kempston Hardwick Clay Pits (North) – Artificial Lake is High, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight Adverse (Not Significant)**. **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)** contains a SUDS monitoring regime during Operational Phase ranging across monthly, quarterly, annually and every five years frequency, or as required after heavy storm events. |
| Kempston Hardwick Clay pits (South) | **Potential Effects** | The potential effects on Kempston Hardwick Clay Pits (South) are limited during the Operational Phase as the receptor is upstream of Lake Zone and does not receive any surface water runoff volumes or flow rates from the Site. The Site is downstream of the existing former clay pits and the proposed drainage scheme continues to outfall to Elstow Brook as per the existing regime. |
| | **Embedded Mitigation** | There are no notable effects on the existing pits during Operational Phase. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| | **Residual Effects and Monitoring** | The sensitivity of Kempston Hardwick Clay Pits (South) – CWS is High, and the magnitude of change, following mitigation, is No Change. The significance of effect is expected to be **Neutral (Not Significant)**. Monitoring of flows from the Pits should be undertaken on a quarterly frequency and inspection of the overflow outlet on an annual basis, or as required following heavy storm events. |
| A421 Borrow Pit – Artificial Lake<br>and<br>Former Clay Pit 1987 (North of the Site) - Artificial Lake | **Potential Effects** | The former clay pit and the A421 borrow pit are understood to have no drainage link between these features and the Site.<br>A potential risk of pollution from surface water runoff exceedance flows during a flood event, routing from the Site to the downstream receptors. There is a **Minor Adverse (Not significant)** effect. |
| | **Embedded Mitigation** | **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 7 considers no on or-off-Site flood risk as a result of development. |
| | **Residual Effects and Monitoring** | The sensitivity of A421 Borrow Pit and Former Clay Pit is Low, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Neutral (Not Significant)**. Visual inspection/monitoring of the Borrow Pit and Clay Pit should be undertaken on an annual basis or as required following heavy storm events. |
| Water Supply Resources | **Potential Effects** | The potential effects will be limited as Anglian Water has confirmed that a domestic supply will be provided as shown in **Appendix 12.2: Water Strategy (Volume 3)** Section 3. The AW SoAP is appended to the **Planning Statement (Document Reference 6.1.0)**.<br>**Appendix 12.2: Water Strategy (Volume 3)** Section 4 includes sustainable solutions for process water supply including strategic rainwater harvesting. |
| | **Embedded Mitigation** | Effects mitigated through primary measures with Anglian Water and in **Appendix 12.2: Water Strategy (Volume 3)** Section 4. |
| | **Residual Effects and Monitoring** | The sensitivity of Water Supply Resources is High, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight (Not Significant)**. Anglian Water undertake regular monitoring as part of their WRMP issued every five years and reviewed annually. |
| Foul Water Infrastructure Receiving Water Environment | **Potential Effects** | The **Minor Adverse** potential effects are limited as Anglian Water has confirmed that the installation of foul water drainage connections and any upgrades deemed necessary by Anglian Water to existing Anglian Water infrastructure (such as, for example, the Bedford WRC) can be delivered by Anglian Water using Anglian Water's statutory powers and permitted development rights or, where applicable, another regulated provider's statutory power, to the extent permitted development rights are not available planning permission will be sought as set out in the SoAP. . The AW SoAP is appended to the **Planning Statement (Document Reference 6.1.0)**. |

| Sensitive Receptor | Potential Effects/Embedded Mitigation/Residual Effects and Monitoring | |
|---|---|---|
| | **Embedded Mitigation** | Embedded Mitigation in the form of agreed foul water drainage connections and upgrades agreed in consultation with Anglian Water. |
| | **Residual Effects and Monitoring** | The sensitivity of Foul Water Infrastructure Receiving Water Environment is High, and the magnitude of change, following mitigation, is Negligible. The significance of effect is expected to be **Slight (Not Significant)**. Anglian Water undertake monitoring as part of their DWMP every five years. |
| People/Property /Infrastructure affected by Surface Water Drainage Infrastructure capacity | **Potential Effects** | The potential effects which could impact the people/property/infrastructure from surface water capacity Flood Risk is limited as the measures contained in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 results in no on or off-Site flood risk as a result of the Proposed Development.<br>The relevant Undertaker will maintain the surface water system in accordance with the maintenance schedule contained within **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)**. |
| | **Embedded Mitigation** | **Appendix 12.1: Flood Risk Assessment (Volume 3)** Section 8 concludes no on-and-off-Site flood risk as a result of the development surface WS contained in **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5. |
| | **Residual Effects and Monitoring** | The sensitivity of Surface Water Drainage Infrastructure is High, and the magnitude of change, following mitigation, is No Change. The significance of effect is expected to be **Neutral**. **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)** contains a SUDS monitoring regime during Operational Phase ranging across monthly, quarterly, annually and every five years frequency, or as required after heavy storm events. |
| Site Users | **Potential Effects** | The effects on future Site Users are limited during Operational Phase in relation to flood risk from surface water and rivers based on **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 and **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)**. |
| | **Embedded Mitigation** | Embedded Mitigation included as shown in **Appendix 12.1: Flood Risk Assessment** Section 8 and **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 and **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)**. |
| | **Residual Effects and Monitoring** | The sensitivity of Site Users is High, and the magnitude of change, following mitigation, is No Change. The significance of effect is expected to be **Neutral**. Elstow Brook is monitored by the IDB and maintained on an annual basis. **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)** contains a SUDS monitoring regime during Operational Phase. |

### CUMULATIVE EFFECTS

12.6.56. As referred to in **Chapter 3: Approach to EIA (Volume 1)**, the cumulative assessment for Water Resources is set out in **Chapter 18: Cumulative Effects (Volume 1)**.

## 12.7. DIFFICULTIES AND UNCERTAINTIES

12.7.1. Based on the assumptions summarised under Section 12.2 of this chapter and the embedded mitigation contained in **Appendix 12.1: Flood Risk Assessment (Volume 3)**, **Appendix 12.2: Water Strategy (Volume 3)** and **Appendix 12.3: Drainage Strategy (Volume 3)**, there are no significant difficulties or uncertainties in relation to Water Resources.

## 12.8. SUMMARY OF LIKELY SIGNIFICANT EFFECTS AND PROPOSED MITIGATION

12.8.1. **Table 12-10** below presents a summary of the likely significant effects relating to Water Resources as a result of the Proposed Development, and the mitigation measures proposed to avoid, prevent, reduce or, if possible and required, offset any identified significant adverse effects. The table summarises those effects that were identified within the assessment as likely to be significant prior to the consideration of mitigation. Significant effects are identified as **major or moderate**. Effects that are identified as **negligible or minor** are not considered to be significant, and therefore, are not listed in the summary table below.

**Table 12-10 - Summary of Likely Significant Construction and Operational Effects on Water Resources with Proposed Mitigation**

Key to table:
**P/T = Permanent or Temporary, D/I = Direct or Indirect, ST/MT/LT = Short Term, Medium Term or Long Term, N/A = Not Applicable**

| Receptor - Sensitivity | Description of Effect | Classification of Effect | Embedded Mitigation | Classification of Residual Effect | Significant/Not Significant |
|---|---|---|---|---|---|
| **Construction Phase** | | | | | |
| Existing Watercourse Core Zone - **Medium** | Temporary loss of existing vegetation.<br>Temporary loss of existing riparian habitat.<br>Permanent change in hydrology.<br>Increased sediment loading.<br>Increased risk of pollution from construction.<br>Accidental leaks and releases.<br>Dust and debris leaving the Site. | **Moderate Adverse**<br>T/D/MT | **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 includes watercourse diversion/enhancement.<br>Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10. | **Minor Adverse**<br>T/D/MT | **Not Significant** |

| Receptor - Sensitivity | Description of Effect | Classification of Effect | Embedded Mitigation | Classification of Residual Effect | Significant/Not Significant |
|---|---|---|---|---|---|
| Kempston Hardwick Clay pits (North) –Artificial Lake – **High** | Increased sediment loads.<br>Increased dust and debris.<br>Dewatering of excavations.<br>Increased hydrocarbons pollution.<br>Leaks from accidental releases.<br>Leaks from temporary foul drainage system.<br>Flood risk from surface water runoff. | **Moderate Adverse**<br>T/D/MT | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10. | **Minor Adverse**<br>T/D/MT | **Not Significant** |
| Kempston Hardwick Clay pits (South) CWS – **High** | Increased sediment loads.<br>Increased dust and debris.<br>Dewatering of excavations.<br>Increased hydrocarbons pollution.<br>Leaks from accidental releases.<br>Leaks from temporary foul drainage system.<br>Flood risk from surface water runoff. | **Moderate Adverse**<br>T/I/MT | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10. | **Minor Adverse**<br>T/I/MT | **Not Significant** |

| Receptor - Sensitivity | Description of Effect | Classification of Effect | Embedded Mitigation | Classification of Residual Effect | Significant/Not Significant |
|---|---|---|---|---|---|
| Water Supply Resources - **High** | Increased Water Demand on supply resources. | **Moderate Adverse** T/D/MT | Principal Contractor(s) to secure supply from Anglian Water. Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10. | **Minor Adverse** T/D/MT | **Not Significant** |
| Foul Water Receiving Water Environment – **High** | Increased foul load on receiving water environment. | **Moderate Adverse** T/D/MT | Principal Contractor(s) to agree with Anglian Water. **Annex 3: Correspondence** of **Appendix 12.1: Flood Risk Assessment (Volume 3)** shows Anglian Water are obligated to accept foul flows and Anglian Water SoAP records commitment (**Appendix 4 of the Planning Statement (Document Reference 6.1.0)** . | **Minor Adverse** T/D/MT | **Not Significant** |
| People/Property/Infrastructure affected by Surface Water Drainage capacity – **High** | Dewatering of excavations if pumping to the ditches/watercourses. Flood Risk through uncontrolled surface water runoff flows entering the network. | **Moderate Adverse** T/D/MT | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10. | **Minor Adverse** T/D/MT | **Not Significant** |

| Receptor - Sensitivity | Description of Effect | Classification of Effect | Embedded Mitigation | Classification of Residual Effect | Significant/Not Significant |
|---|---|---|---|---|---|
| Site Users - **High** | Flooded excavations.<br>Surface water flooding from Site stripping and topsoil removal.<br>Flood risk from rivers. | **Moderate Adverse**<br>T/D/MT | Embedded mitigation to be implemented in accordance with **Appendix 2.3: OCEMP (Volume 3)** Section 3.10 including a Flood Emergency Plan. | **Minor Adverse**<br>T/D/MT | **Not Significant** |
| **Operational Phase** | | | | | |
| Elstow Brook - **High** | At Bridge Crossings:<br>▪ Loss of riparian habitat.<br>▪ Loss of vegetation.<br>▪ Risk of bank collapse.<br>▪ Risk of pollution from runoff. | **Moderate Adverse**<br>P/D/LT | Relevant Undertaker progresses detailed design of bridge crossing in engagement with IDB (Land Drainage Consent) and Environment Agency (*WFD*).<br>Allow for 10m landscaped buffer alongside the Elstow Brook.<br>**Appendix 12.3: Drainage Strategy (Volume 3)** Section 5 includes pollution prevention methods, SUDS treatment train. | **Minor Adverse**<br>P/D/LT | **Not Significant** |

| Receptor - Sensitivity | Description of Effect | Classification of Effect | Embedded Mitigation | Classification of Residual Effect | Significant/Not Significant |
|---|---|---|---|---|---|
| Watercourse Core Zone - **Medium** | Enhancement to vegetation, landscape, and habitat.<br><br>Increased capacity cross section. Convey Core Zone development flows reducing on and off-Site flood risk. | **Moderate Beneficial** P/D/LT | **Annex 3: WSP SUDS Maintenance Schedule** of **Appendix 12.3: Drainage Strategy (Volume 3)** contains Maintenance Schedule for Watercourse. | **Moderate Beneficial** P/D/LT | **Significant** |
| Kempston Hardwick Clay Pits (North) – disused clay pits 1987 - **Low** | Primary beneficial effects are enhanced strategic SUDS feature, and strategic rainwater harvesting wetland, resulting in a **Major Beneficial** improvement from a Water perspective. | **Major Beneficial** P/D/LT | Embedded mitigation **Appendix 12.3: Drainage Strategy (Volume 3)** Section 5.<br>**Appendix 12.2: Water Strategy (Volume 3)** Section 4 includes sustainable water solutions. | **Moderate Beneficial** P/D/LT | **Significant** |

## 12.9. REFERENCES


- **Ref. 12.1:** Ordnance Survey (2024) *Detailed maps & routes to explore across the UK | OS Maps*. Available at: https://explore.osmaps.com/?lat=51.776100&lon=-1.894300&zoom=7.0000&style=Standard&type=2d [Accessed: 21 May 2025].
- **Ref. 12.2:** Department for Environment Food and Rural Affairs (2023) LIDAR Composite Digital Terrain Model (DTM) 10m. Available at: https://environment.data.gov.uk/defra/ce8fe7e7-bed0-4889-8825-19b042e128d2/details [Accessed: 21 May 2025].
- **Ref. 12.3:** Department for Environment, Food and Rural Affairs and Natural England (n.d.) *Multi-Agency Geographic Information for the Countryside (MAGIC) Map*. Available at: https://magic.defra.gov.uk/ [Accessed: 21 May 2025].
- **Ref. 12.4:** British Geological Survey (2023) *BGS Geology Viewer*. Available at: https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/ [Accessed: 21 May 2025].
- **Ref. 12.5:** Environment Agency (2019) *Flood map for planning.* Available at: https://flood-map-for-planning.service.gov.uk/ [Accessed: 21 May 2025].
- **Ref. 12.6:** Environment Agency (2023) *Environment Agency - Catchment Data Explorer.* Available at: https://environment.data.gov.uk/catchment-planning/ [Accessed: 21 May 2025].
- **Ref. 12.7:** British Geological Survey (2020) *GeoIndex - British Geological Survey*. Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.111728388.1017569236.1657265631-1497676150.1657265631 [Accessed: 21 May 2025].
- **Ref. 12.8:** Not in use
- **Ref. 12.9:** Not in use
- **Ref. 12.10:** Buro Happold Limited (2018) Bedford Business Park at Land South of Bedford, Environmental Statement Volume 1: Main Report, pp.90–110. Available at: https://edrms.bedford.gov.uk/OpenDocument.aspx?id=GMB1%2fm3DoPdP%2b2xb1bNfXA%3d%3d&name=18+02940+EIA+V21+-+ENVIRONMENTAL++STATEMENT+VOL+1.pdf [Accessed: 21 May 2025].
- **Ref. 12.11:** Not in use
- **Ref. 12.12:** Not in use
- **Ref. 12.13:** Bedford Group of Internal Drainage Boards (2024) *Board Area Map. Available at: https://www.idbs.org.uk/about-us/boards-drainage-district/* [Accessed: 21 May 2025].
- **Ref. 12.14:** Anglian Water (2019) *Water Resources Management Plan 2019*. Available at: https://www.anglianwater.co.uk/siteassets/household/about-us/wrmp-report-2019.pdf [Accessed: 21 May 2025].
- **Ref. 12.15:** Anglian Water (2024) *Revised Draft WRMP24, Our Water Resources Management Plan 2024*. Available at: https://www.anglianwater.co.uk/siteassets/household/about-us/wrmp/revised-draft-wrmp24-main-report-v2.pdf [Accessed: 21 May 2025].
- **Ref. 12.16:** Not in use
- **Ref. 12.17:** Environment Agency and Department for Environment, Food and Rural Affairs (2021) *Water Stressed Areas - Final Classification*. Available at: https://www.gov.uk/government/publications/water-stressed-areas-2021-classification [Accessed: 21 May 2025].

- **Ref. 12.18a:** JBA Consulting (2020) *Bedford Borough Council Level 1 Strategic Flood Risk Assessment*. Available at: https://edrms.bedford.gov.uk/OpenDocument.aspx?id=li3cQOt63E3W8gIO2AEmuQ%3d%3d&name=BBC%20Strategic%20Flood%20Risk%20Assessment%20Level%201%20Nov%202020.pdf [Accessed: 21 May 2025].
- **Ref. 12:18b**: JBA Consulting (2022) *Bedford Borough Council Level 2 Strategic Flood Risk Assessment*. Available at: https://www.bedford.gov.uk/media/5087/download?inline [Accessed: 21 May 2025].
- **Ref. 12.19:** Caulmert Limited (2011) *Supporting Planning Statement Coronation Pit August 2011.* Available at: https://edrms.bedford.gov.uk/SearchResults.aspx?appNumber=11/01356/S73WM [Accessed: 21 May 2025].
- **Ref. 12.20:** Caulmert Limited (2011) *Revised Restoration Scheme Coronation Pit August 2011.* Available at: https://edrms.bedford.gov.uk/SearchResults.aspx?appNumber=11/01356/S73WM [Accessed: 21 May 2025].
- **Ref. 12.21:** Reed, H. (2002) *The Surface Waters Plan – Bedfordshire and River Ivel Internal Drainage Board and The Forest of Marston Vale*. Available at: https://www.idbs.org.uk/wp-content/uploads/2024/04/the-surface-waters-plan-appendices-compressed.pdf [Accessed: 21 May 2025].
- **Ref. 12.22:** Scott Wilson (2008) *Environmental Statement Volume 2 The Development of Borrow Pits at Whitbred Land Kempston – BP3, Rev 2, 15 September 2009*. Available at: https://edrms.bedford.gov.uk/SearchResults.aspx?appNumber=11/01356/S73WM [Accessed: 21 May 2025].
- **Ref. 12.23:** Environment Agency (2022) *Flood risk assessments: climate change allowances*. Available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances [Accessed: 21 May 2025].
- **Ref. 12.24:** Department for Environment, Food and Rural Affairs and Environment Agency (2025) *Nitrate vulnerable zones*. Available at https://www.gov.uk/government/collections/nitrate-vulnerable-zones [Accessed: 21 May 2025].
- **Ref. 12.25:** HM Government (1991) *Land Drainage Act 1991*. Available at https://www.legislation.gov.uk/ukpga/1991/59/contents [Accessed: 21 May 2025].
- **Ref. 12.26:** HM Government (1991) *Water Industry Act 1991*. Available at: https://www.legislation.gov.uk/ukpga/1991/56/contents [Accessed: 21 May 2025].
- **Ref. 12.27:** HM Government (1999) *The Water Supply (Water Fittings) Regulations 1999*. Available at: https://www.legislation.gov.uk/uksi/1999/1148/contents/made [Accessed: 21 May 2025].
- **Ref. 12.28:** HM Government (2016) *The Private Water Supplies (England) Regulations 2016*. Available at: https://www.legislation.gov.uk/uksi/2016/618/contents [Accessed: 21 May 2025].
- **Ref. 12.29:** British Standards Institution (2024) *BS EN 16941-1:2024 – On-site non-potable water systems - Systems for the use of rainwater*.
- **Ref. 12.30:** Bedford Borough Council (2020) *Local Plan 2030*. Available at: https://www.bedford.gov.uk/media/4011/download?inline [Accessed: 21 May 2025].
- **Ref. 12.31:** Association for Petroleum and Explosives Administration and Energy Institute (2018) *Design, construction, modification, maintenance and decommissioning of filling stations (4th edn)*. London: Association for Petroleum and Explosives Administration and Energy Institute.

- **Ref. 12.32:** Ministry of Housing, Communities and Local Government (2024) *National Planning Policy Framework*. Available at: https://assets.publishing.service.gov.uk/media/67aafe8f3b41f783cca46251/NPPF_December_2024.pdf [Accessed: 21 May 2025].
- **Ref. 12.33:** Standards for Highways (2020) *Design Manual for Roads and Bridges: LA 113 - Road drainage and the water environment*. Available at: https://www.standardsforhighways.co.uk/search/d6388f5f-2694-4986-ac46-b17b62c21727 [Accessed: 21 May 2025].
- **Ref. 12.34:** HM Government (2017) *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017*. Available at: https://www.legislation.gov.uk/uksi/2017/407/contents [Accessed: 21 May 2025].
- **Ref. 12.35:** Council of the European Union (1967) *Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances*. Available at: https://eur-lex.europa.eu/eli/dir/1967/548/oj/eng [Accessed: 21 May 2025].
- **Ref. 12.36:** Not in use
- **Ref. 12.37:** Construction Industry Research and Information Association (2015) The SuDS Manual (C753).
- **Ref. 12.38:** HM Government (2016) *The Environmental Permitting (England and Wales) Regulations 2016*. Available at: https://www.legislation.gov.uk/uksi/2016/1154/contents [Accessed: 21 May 2025].
- **Ref. 12.39:** British Standards Institution (2002) *BS EN 858-1:2002 – Separator systems for light liquids (e.g. oil and petrol) - Principles of product design, performance and testing, marking and quality control*.
- **Ref. 12.40:** British Standards Institution (2003) *BS EN 858-2:2003 – Separator systems for light liquids (e.g. oil and petrol) - Selection of nominal size, installation, operation and maintenance*.

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