**Cambridge Waste Water Treatment Plant Relocation Project**
Anglian Water Services Limited

# Environmental Statement Chapter 20: Water Resources

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## Summary

This chapter of the Environmental Statement (ES) presents the findings of the Environmental Impact Assessment (EIA) completed in relation to the potential impacts of the Proposed Development on water resources. The main water resources under consideration comprise:

- Surface water features
  - The River Cam, an Environment Agency main river and Water Framework Directive (WFD) water body, which receives the final effluent discharge from the existing Cambridge waste water treatment plant (WWTP) and would be the receptor for the final effluent discharge from the proposed WWTP.
  - Black Ditch, an ordinary watercourse which is located down-gradient of the proposed WWTP.
  - Quy Water and Bottisham Lode, also an Environment Agency main river and a combined WFD water body.
  - Surface water abstractions.
- Groundwater features
  - The West Melbury Marly Chalk Formation which comprises the uppermost bedrock formation across much of the study area and directly underlies the proposed WWTP. The Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, is classified by the Environment Agency as a Principal aquifer and a WFD groundwater body.
  - The Woburn Sands Formation (Lower Greensand) is also a Principal aquifer and a WFD groundwater body. The Lower Greensand is present across the whole of the water resources study area. However, it is overlain and confined throughout the area by Gault Formation comprising mainly clays and silts.
  - Superficial deposits, mainly associated with the River Cam and other watercourses, which include Secondary A aquifers in alluvium and river terrace deposits.
  - Groundwater abstractions.
- Flood risk
  - Changes to fluvial, surface water (pluvial) and groundwater flood risk as a result of the construction works and future operation of the proposed WWTP.

There are several nature conservation sites in the project area which are associated with, or dependent on, surface water or groundwater. These include Stow-cum-Quy Fen Site of Special Scientific Interest (SSSI), Wilbraham Fens SSSI, the River Cam County Wildlife Site (CWS) and Allicky Farm Pond CWS. Potential impacts due to the Proposed Development on water resources in nature conservation sites are discussed in this chapter. Effects on biodiversity from impacts on water resources are discussed in Chapter 8: Biodiversity (Application Document Reference 5.2.8).

## Effects during construction

Impacts to water resources during construction would be temporary. In many cases, these impacts would be mitigated by rigorous surface water and groundwater protection measures, which are standard practice in the construction industry, resulting in no significant residual effects. Exceptions would be as follows:

- Construction of a cofferdam in the River Cam to create dry conditions for the construction of the proposed treated effluent discharge outfall (the outfall) to the River Cam and riverbed scour protection. Installation and removal of the cofferdam may have a temporary effect on riverbed sediments over a reach of the river downstream of the outfall. Most of the disturbed sediment would be expected to settle out in a period of a few days. There would be a very short-term moderate adverse temporary effect, which is significant.
- The cofferdam will reduce the cross-sectional area of the river, potentially leading to increased river velocity and water levels. There would be a moderate adverse temporary effect on fluvial flood risk which is significant, while the cofferdam is in place.
- Groundwater levels may be temporarily and locally impacted by dewatering during construction of the terminal pumping station shaft. There will be a temporary moderate adverse effect on groundwater levels, which is significant.
- Dewatering is likely to be required during installation of other shallower below-ground structures. Below-ground structures exceeding 5m in depth (with a maximum depth of 8m) will cover a total area of approximately 27,000m$^2$. However, the dewatering associated with the installation of these structures will take place intermittently over an extended period during the construction programme, spreading out the impact on local groundwater levels. There will be temporary moderate adverse effect on groundwater levels, which is significant.

Dewatering for the TPS shaft and other below-ground structures is assessed as having a negligible impact on groundwater levels at water-dependent nature conservation sites. No permanent change to the integrity of the aquifer is expected as groundwater levels would recover once dewatering ceases. However, monitoring of groundwater levels around the proposed WWTP will be carried out prior to, during and following all dewatering at the proposed WWTP to assess the temporary impacts. Monitoring of water levels will also be

undertaken in Black Ditch, located down-gradient of the proposed WWTP, and in the Allicky Farm Pond CWS and Stow-cum-Quy Fen SSSI nature conservation sites in the Black Ditch catchment.

As a precaution, a no-derogation agreement will be made with the owner of a private groundwater source in the area around the proposed WWTP. The agreement will ensure that, in the unlikely event that the private supply from the groundwater source could be significantly affected as a result of construction activities, measures would be taken to maintain a supply to the property.

In addition, there is a small risk of a temporary reduction in yield from a private groundwater supply source as a result of dewatering during installation of the Waterbeach pipelines. A no-derogation agreement will also be made with the owner of this private groundwater source. It will ensure that, in the unlikely event that the private groundwater supply could be significantly affected by the dewatering, measures would also be taken to maintain a supply to the property.

Construction could increase surface water flood risk to a local residence in the vicinity of the Proposed Development by increasing surface water runoff during periods of heavy rainfall. However, an Emergency Preparedness Plan and a Construction Water Quality Management Plan will be incorporated into the CEMP. These plans will set out requirements in construction areas to prevent any significant effects on the existing flood risk in the surrounding area.

## Effects during operation

Potential impacts on water resources resulting from the operation of the Proposed Development have been considered in the EIA. Many of these were found to give rise to residual effects which were not significant. The residual effects assessed as significant, or considered initially to be of potential concern, are summarised below.

***River water quality***

The assessment considered the impact of final effluent discharge from the proposed new outfall on water quality for the River Cam during operation. It is assumed that regulatory compliance monitoring and Environment Agency assessment of permit conditions for the proposed WWTP (which would be ongoing) will ensure that the quantity of each consented determinant in the final effluent discharge will not exceed the quantity indicated by the current permit conditions for the existing Cambridge WWTP. These consented determinants comprise total phosphorus, total suspended solids (TSS), biochemical oxygen demand (BOD) and ammoniacal nitrogen. The assessment therefore assumes that environmental permitting will mitigate any risk of river water quality deterioration due to the final effluent discharge.

Permit conditions are likely to vary over time in response to changes in effluent discharge and river flow, including changes arising from population growth, water usage, climatic or environmental factors and phasing of development. The UK Centre for Hydrology & Ecology

models (UK Centre for Ecology & Hydrology, accessed April 2022) for the 2050s indicate reductions of up to 20% in low flows in the East Anglian region for most modelled scenarios. The changes indicated by these model scenarios could cause a substantial reduction in river flow available to dilute the final effluent discharge. The proposed WWTP has been designed to be flexible and to accommodate changes relating to regulatory requirements.

A comparison of the proposed consent limits, set out in the Pre-application advise, with the consent limits for the existing Cambridge WWTP was carried out. This comparison indicated that there should be a decrease in the contribution of total phosphorus and ammoniacal nitrogen to river water for all final effluent discharges from the proposed WWTP. With the transfer of waste water from the Waterbeach WRC to the proposed WWTP, there may also be a small improvement in river water quality downstream of Bottisham Lock in some periods. As a result, the overall magnitude of impact on water quality in the River Cam is assessed as minor beneficial. Combined with high sensitivity for the water body, there would be a moderate and, therefore, significant beneficial effect on the River Cam. Future benefits to river water quality would, however, also be dependent on the actual impact of climate change on low flows.

A decreased frequency of stormwater discharge to the River Cam from the proposed WWTP, as compared to the existing Cambridge WWTP, will also improve water quality in periods when these stormwater discharges currently occur. The magnitude of impact to water quality is also considered to be minor beneficial, giving rise to a moderate beneficial effect in periods of stormwater discharge to the River Cam.

***Outfall discharge – impacts of scour on the River Cam***

Modelling was undertaken to examine the impacts from the treated effluent discharge on river water conveyance within a short reach of the River Cam in the vicinity of the proposed outfall, and also from treated effluent velocities and mixing over a 1km reach of the River Cam. The objectives of modelling were to identify an outfall configuration which should minimise potential impacts to river users, the riverbed and riverbank.

There is existing sheet piling on the west riverbank, opposite the proposed outfall. Rip-rap riverbed protection and sheet piling riverbank protection will be used in the vicinity of the outfall to prevent local scour impacts. The magnitude of impact of treated effluent discharge due to scour on riverbed and riverbank sediments is considered:

- negligible under normal final effluent discharge operating conditions.
- minor adverse under abnormal operating conditions, comprising infrequent and extreme events of stormwater discharge.

Under normal operating conditions, the effect of final effluent discharge on the riverbanks and riverbed is assessed as not significant.

Recommendations from the assessment include further outfall design to be assessed by modelling to reduce potential riverbank and riverbed impacts relating to maximum stormwater discharges. Nonetheless, following implementation of best practice design, a

low residual risk of erosion to riverbanks and the riverbed may still be present in the event of an infrequent stormwater discharge, expected to occur less than once every ten years.

This concern relating to infrequent stormwater discharge and erosion risk will be further mitigated through the routine visual inspection of both riverbanks downstream of the proposed outfall following a stormwater discharge event. Maintenance or repair of eroded sections of riverbank would be undertaken if needed. As a result, there would remain, at most, a low residual scour risk, although assessed as a minor adverse impact giving rise to a moderate adverse residual effect, which is significant.

***Drainage and aquifer recharge***

A number of components of the proposed WWTP, including the TPS shaft, storm tanks, primary settlement tanks, activated sludge plant tanks, final settlement tanks and the filtration plant will be installed at depths which will be below the groundwater level in the West Melbury Marly Chalk Formation throughout the year. Foundations for many above-ground structures are also likely to penetrate well below the groundwater level.

In current conditions, land drains in the area of the proposed WWTP could intercept groundwater as it rises towards ground level in wetter winter/spring periods and direct it away to drainage ditches. However, excavation to form the base for the proposed WWTP increases the likelihood that groundwater levels could at times reach, or rise above, ground level. In addition, assuming existing land drainage within the proposed WWTP is removed during construction, the risk of regular shallow groundwater table conditions, or inundation of the area by groundwater flooding in some years, may increase significantly. Groundwater flows will also be affected locally by the presence of below-ground structures and foundations in all groundwater level conditions. As a result, the risk of groundwater flooding in some parts of the proposed WWTP in winter/spring periods could be increased further.

The possibility of groundwater flooding within the proposed WWTP will be taken into account in the detailed drainage design for the proposed WWTP. The drainage design will incorporate and develop further the proposals set out in the drainage strategy. Any emergent groundwater within the proposed WWTP will be managed by surface water drainage. This may lead to a very limited and localised loss to groundwater. However, groundwater may already currently discharge to surface water through the existing land drainage when groundwater levels are high.

Infiltration to the West Melbury Marly Chalk Formation in the area of the proposed WWTP is likely to be reduced as a result of the impermeable structures and areas of hardstanding installed as components of the WWTP. Infiltration and runoff rates may also vary locally in the vicinity of the earth banks surrounding the proposed WWTP. In addition, there could be changes to infiltration and groundwater conditions as a result of the land use (meadow) proposed in the landscape masterplan area and drainage retention features included in the drainage strategy.

It is not possible to quantify precisely the changes in infiltration and aquifer recharge which might take place. However, taking into account the relatively small area required for the proposed WWTP and the Landscape Masterplan, compared to the regional extent of the West Melbury Marly Chalk Formation, the effect on overall aquifer recharge should be localised and very limited. Changes to infiltration as a result of the landscape masterplan would also be very limited in the regional context; it would be comparable to any change occurring when land is converted from agricultural usage to meadow.

The redirection of groundwater flows and shallower groundwater levels in the area of the proposed WWTP, together with potential changes to recharge, will have a negligible impact on aquifer conditions in the West Melbury Marly Chalk Formation. As a result, the effect on the aquifer is assessed as slight adverse and not significant.

The drainage network and changes to infiltration could result in a change in contributions to base flows in local drains connected to Black Ditch. Much of the change would be a result of drainage from areas of the proposed WWTP, at risk of contamination, being redirected for treatment. These changes in infiltration and drainage may be expected to have a minor adverse impact on the overall flow regime in Black Ditch and an agricultural abstraction from Black Ditch. As a result, the effect on Black Ditch and the abstraction is also assessed as slight adverse and not significant.

***Accidental spills and leaks within the proposed WWTP***

Significant leaks from the TPS shaft or below-ground tanks at the proposed WWTP are unlikely to occur, given that best practice construction methods and operational maintenance regimes will be utilised, which include rigorous mitigation measures to prevent pollution incidents. The most likely sources of leakage are considered to be from accidental spills onto permeable ground, minor leaks from drainage systems or weeping from above-ground tanks.

Modelling of contaminant pathways indicates that the retarded travel times for most inorganic groundwater contaminants to the Black Ditch drainage network exceed 1,000 years. Some potential contaminants are modelled as reaching the drainage system in less time (480 years for ammoniacal nitrogen, 10 to 24 years for hydrocarbons). However, the assumptions used for the model are conservative. Accidental spills or leakages would be limited in volume. Fractures are unlikely to be continuous or aligned in the West Melbury Marly Chalk Formation. Furthermore, the potential for hydrocarbons to enter the water environment at the proposed WWTP would be limited as a result of embedded measures in site design, management systems and suitable operational and emergency procedures. Fuel spills would be contained on site by tank bunds or wider hardstanding. Therefore, the likelihood of hydrocarbons reaching ground into which contaminants could infiltrate would be low.

With mitigation, the impact of potential contamination from the proposed WWTP on groundwater quality in the aquifer in the West Melbury Marly Chalk Formation should be negligible. The effect on the West Melbury Marly Chalk Formation, a high sensitivity

receptor, would be slight adverse, which is not significant. The impact on Black Ditch should also be negligible. Combined with medium sensitivity, there would be a neutral effect on Black Ditch, which is not significant.

Over much of the area of the proposed WWTP, a sub-surface drainage network will be connected by buried pipeline to a pond with controlled outflow to a drain linked to Black Ditch. In the event of any contamination occurring in the area of the sub-surface drainage network, there would be a risk that the contamination could be intercepted by the drainage. Contaminants could then be transferred much more rapidly to the pond and the drain linked to Black Ditch than would occur through groundwater. However, inspection, maintenance and groundwater protection measures applied at the proposed WWTP should also reduce the potential impact on Black Ditch due to this low contamination risk to minor. The resulting effect on Black Ditch would be slight adverse, which is not significant.

***Flood risk***

Fluvial flood modelling of the River Cam water levels has been undertaken to understand to determine the impact of final effluent and stormwater discharges to the river upon flood levels . The model indicates that in a 1 in 100 year flood event, with a 20% allowance for climate change, there would be a less than 7mm increase in water levels in the River Cam, leading to a negligible change in the potential area of inundation across the floodplain. The magnitude of impact to fluvial flood risk due to final effluent and stormwater discharges from the proposed WWTP is considered negligible. The effect on potential receptors, which could include properties, dwellings and infrastructure of high sensitivity, is assessed as slight adverse and not significant.

## Effects during decommissioning

Decommissioning of the existing Cambridge WWTP involves the diversion of rising mains and gravity sewers and cessation of flow at the existing outfall. It is assumed that rigorous groundwater protection measures, which are standard practice to prevent contamination, will be implemented during the diversion works. As a result, potential impacts on water resources resulting from decommissioning activities should not give rise to any effects which are significant.

## Overall assessment

In conclusion, therefore, the following impacts have been identified for construction which could have significant, temporary adverse effects. These effects relate to:

- the increased sediment content of water in the River Cam due to impacts on the riverbed from installation and removal of the cofferdam;
- fluvial flood risk due to temporary restriction in the River Cam for the outfall construction behind a cofferdam;
- lowering of groundwater levels in the local area during dewatering for the deepest below-ground structure (the TPS shaft); and

- lowering of groundwater levels in the local area during dewatering for groundworks associated with other below-ground structures within the land required for the proposed WWTP.

During operation of the Proposed Development there would be impacts resulting from changes in final effluent and stormwater discharges which are expected to have a significant beneficial effect on water quality in the River Cam.

Recommendations from the assessment include further outfall design to reduce potential riverbank and riverbed erosion impacts, relating to maximum stormwater discharges to the River Cam. Any risk relating to infrequent stormwater discharge and erosion will be further mitigated through the routine visual inspection of both riverbanks downstream of the proposed outfall following a stormwater discharge event. Maintenance or repair of eroded sections of riverbank would be undertaken if needed. As a result, there would remain, at most, a low residual scour risk, albeit assessed as giving rise to a significant, residual adverse effect.

# 1 Introduction

## 1.1 Purpose of this chapter

1.1.1 This chapter of the Environmental Statement (ES) presents the findings of Environmental Impact Assessment (EIA) completed in relation to the potential impacts of the Proposed Development on water resources.

1.1.2 The ES has been prepared as part of the application to the Planning Inspectorate (PINS) for development consent. This chapter considers the potential impacts to water resources due to the Proposed Development during its construction (including commissioning), operation and maintenance, and decommissioning phases.

1.1.3 This chapter (and its associated figures and appendices) is intended to be read as part of the wider ES, with particular reference to:

- Chapter 2: Project description (App Doc Ref 5.2.2);
- Chapter 8: Biodiversity (App Doc Ref 5.2.8);
- Chapter 9: Climate resilience (App Doc Ref 5.2.9);
- Chapter 11: Community (App Doc Ref 5.2.11); and
- Chapter 12: Health (App Doc Ref 5.2.12).

1.1.4 This chapter summarises information from supporting studies, technical reports and publicly available data which are included within:

- Appendix 20.9 (App Doc Ref 5.4.20.9) Hydrogeological Impact Assessment (Site selection stage);
- Appendix 20.3 (App Doc Ref 5.4.20.3) Water Framework Directive Assessment Report;
- Appendix 20.1 (App Doc Ref 5.4.20.1) Flood Risk Assessment;
- Appendix 20.4 (App Doc Ref 5.4.20.4) Dewatering/Pump Test Technical Note;
- Appendix 20.5 (App Doc Ref 5.4.20.5) Fluvial Model Report;
- Appendix 20.6 (App Doc Ref 5.4.20.6) 3D Velocity/Mixing Model Report;
- Appendix 20.7 (App Doc Ref 5.4.20.7) Outfall CFD Report;
- Appendix 20.8 (App Doc Ref 5.4.20.8) Contaminant Transport Note; and
- Appendix 20.10 (App Doc Ref 5.4.20.10) Storm Model Report.

## 1.2 Competency statement

1.2.1 Summaries of the qualifications and experience of the chapter authors are set out in Table 1-1.

**Table 1-1: Competent experts**

| Author | Qualification / Professional Membership | Years of experience | Project experience summary |
|---|---|---|---|
| [redacted] | MSc Engineering Hydrology<br>BA Natural Sciences (Geology) | 47 | Experience over the past 20 years in contributing to environmental impact assessments for groundwater and surface water resources for major infrastructure projects including wind farms and road and rail transport. Expert witness at public inquiries or prepared proof of evidence in hydrology and hydrogeology for five proposed wind farm developments.<br>Contributed to a water resources statement and hydrogeological impact assessment during site selection for the CWWTPR project. |
| [redacted] | MSc Hydrogeology<br>MEng Chemical Engineering<br>Chartered Water and Environmental Manager (MCIWEM C.WEM)<br>Chartered Environmentalist ( C.Env) | 15 (water)<br>8 (other) | Experience of groundwater impact risk assessments, environmental impact assessment for groundwater and surface water resources for major infrastructure projects including road and rail transport, Water Framework Directive assessments. |
| [redacted] | MSc Geographical Information Science<br>BSc Geography<br>MCIWEM C.WEM<br>Chartered Scientist (C.Sci)<br>CEnv | 19 | Experience across a wide range of infrastructure, water and river projects, including flood risk, hydro-morphology, water quality, river restoration. Particular experience in applying Water Framework Directive assessments and integrating with EIA process across the UK. |
| [redacted] | MSc Hydrogeology<br>MSc Geophysics<br>BSc Geology<br>MCIWEM C.WEM | 4 (water)<br>20 (other) | Analysis of groundwater risk in relation to major road and rail infrastructure projects. Assessment of groundwater turbidity and severe drought prediction for water companies. Flood risk assessments for private development and energy infrastructure. |
| [redacted] | MSc Water Resources | 14 | Experience in the assessment of environmental impacts from infrastructure development, |

| Author | Qualification / Professional Membership | Years of experience | Project experience summary |
|---|---|---|---|
| | Technology and Management<br>BSc Environmental Science<br>MCIWEM C.WEM | | including water resources and water quality analysis. Contributed to the interpretation of water quality impacts for the CWWTPR project. |
| [redacted] | MSc Soils and Environmental Pollution<br>BSc Environmental Geoscience<br>MCIWEM C.WEM | 9 | Experience of groundwater and human health qualitative and quantitative risk assessments for contamination, including site specific probabilistic modelling, baseline assessments, remediation, environmental permitting, and environmental impact assessment. |

## 1.3 Planning policy context

1.3.1 Legislation, planning policy and guidance relating to water resources, and pertinent to the Proposed Development, is listed and described in this section. Relevant European Legislation, which was implemented during the period in which UK was a member of the European Union, is set out first, followed by National Legislation. Cross-references to the European Legislation are indicated in the list for National Legislation.

1.3.2 Relevant planning policies are then indicated in a separate section followed by discussion of the influence of planning policy on EIA scope.

### National Policy Statement requirements

1.3.3 Planning policy on waste water Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to water resources, is contained in the National Policy Statement (NPS) for Waste Water (Department for Environment, Food & Rural Affairs, 2012).

1.3.4 Table 1-2 sets out how the scope proposed in this chapter complies with the NPS for Waste Water.

**Table 1-2: Scope and NPS compliance**

| NPS requirement | Compliance of ES scope with NPS requirements |
|---|---|
| Paragraph 4.2.2<br>Assess the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment. | Each characteristic is considered in this ES, with some aspects, such as potential for scour in the River Cam and flood risk, considered in detail in separate assessments and design. |
| Paragraph 4.2.3 | A separate assessment identifies impacts on the status of WFD water bodies in the study area, including the River Cam (Appendix 20.3, App Doc |

| NPS requirement | Compliance of ES scope with NPS requirements |
|---|---|
| Assess impacts of the proposed project on water bodies or protected areas under the Water Framework Directive (WFD). | Ref 5.4.20.3: Water Framework Directive Assessment Report). The assessment follows the three stage screening/scoping and detailed assessment approach outlined in the Planning Inspectorate Advice Note Eighteen: The Water Framework Directive. |
| Paragraph 4.2.4<br>Assess the potential water resources benefits that could arise from changes to effluent discharges. | This ES considers the potential beneficial impact of effluent discharge on water resources in the River Cam. |
| Paragraph 4.4.4<br>Applications for projects of 1 hectare or greater in Flood Zone 1 and all proposals for projects located in Flood Zones 2 and 3 in England should be accompanied by a flood risk assessment (FRA). | A separate FRA (Appendix 20.1, App Doc Ref 5.4.20.1: Flood Risk Assessment), summarised in this ES, assesses the risk to the Proposed Development from all sources of flooding, and considers the impact of the Proposed Development to flood risk elsewhere. |

## National planning policy

1.3.5 National planning policy of particular relevance to surface and groundwater resources is listed below:

- the National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2021), with particular reference to:
  - paragraphs 20(b), 43, 120(b), 152-173 in relation to flood risk; and
  - paragraph 174(e) regarding water pollution.

## Local planning policy

1.3.6 Local planning policy of relevance to the Proposed Development includes:

- South Cambridgeshire District Council Local Plan 2018 (South Cambridgeshire District Council, 2018) with particular reference to Policy CC/7: Water Quality, Policy CC/8: Sustainable Drainage Systems, and Policy CC/9: Managing Flood Risk; and
- Cambridge City Council Local Plan 2018 (Cambridge City Council, 2018) with particular reference to Policy 31: Integrated water management and the water cycle and Policy 32: Flood risk.

1.3.7 Cambridgeshire and Peterborough Minerals and Waste Local Plan (Cambridgeshire County Council, 2021) contains Policy 1: sustainable development and climate change, which requires all proposed developments to include measures such as managing water resources efficiently and incorporating sustainable drainage schemes to minimise flood risk. Policy 22: flood and water management, requires that there be no significant adverse impact on surface or groundwater resources, and that flood risk must be considered and mitigated.

1.3.8 South Cambridgeshire District Council and Cambridge City Council have commenced the joint preparation of both the Greater Cambridge Local Plan ('GCLP') and the North East Cambridge Area Action Plan ('NEC AAP').

1.3.9 The GCLP is intended to replace both the adopted Cambridge City and South Cambridgeshire Local Plans 2018 and cover the period to 2041. In November/December 2021 public consultation was held on the Greater Cambridge Local Plan - First Proposals ('GCLP') (Regulation 18: Preferred Options) including the Greater Cambridge Local Plan: First Proposals - Sustainability Appraisal (October 2021). Accompanying these documents, the councils published a number of supporting documents which are referenced below where they provide relevant background.

1.3.10 Following consultation in July 2020 on Cambridge City and South Cambridgeshire Councils joint Draft Regulation 18 NEC AAP, the Councils have now completed the preparation of their Reg.19 Submission version of the NEC AAP which went through respective District and City Council Committee cycles between 30 November 2021 and 11 January 2022. The Reg.19 version of the AAP has now been approved for consultation but shelved pending the outcome of the Development Consent Order(DCO).

1.3.11 The Greater Cambridge Strategic Flood Risk Assessment (Stantec on behalf of Greater Cambridge Shared Planning, 2021) provides an assessment of the extent and nature of the risk of flooding and its implications for land use planning.

1.3.12 As lead local flood authority, Cambridgeshire County Council is responsible for implementation of the Flood and Water Management Act (UK Government, 2010). Cambridgeshire's Local Flood Risk Management Strategy (2021-2027) (Cambridgeshire County Council, 2022) details management of flood risk from surface water and groundwater sources.

## 1.4 Legislation

### European Legislation

1.4.1 The Floods Directive 2007/60/EC (European Commission, 2007) requires Member States to assess all watercourses for risk from flooding, to map the flood extent and assets and humans at risk in these areas, and to take adequate and coordinated measures to reduce this flood risk. The Directive requires that flood risk management plans are prepared, implemented and reviewed every six years for each river basin district, in coordination with River Basin Management Plans (RBMP) prepared under the WFD.

1.4.2 The Priority Substances Directive 2013/39/EU (European Commission, 2013) amends WFD 2000/60/EC and the Directive on Environmental Quality Standards (Directive 2008/105/EC) by updating the list of priority substances that would apply to WFD assessment.

1.4.3 The Urban Waste Water Treatment Directive 91/271/ (European Commission, 1991) (as amended) (UWWTD (consolidated)) concerns the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors. The objective of the Directive is to protect the environment from the adverse effects of these waste water discharges.

### National Legislation

1.4.4 The Environmental Protection Act 1990 (UK Government, 1990) makes provision to control pollution arising from industrial and other processes for waste management.

1.4.5 The Water Industry Act 1991 (UK Government, 1991) relates to water supply and the provision of waste water services in England and Wales.

1.4.6 The Land Drainage Act 1991 (UK Government, 1991) (as amended) assigns functions to internal drainage boards (IDBs) and local authorities to manage watercourses and provide consenting powers for proposed works to watercourses associated with development.

1.4.7 The Environment Act 1995 (UK Government, 1995) sets standards for environmental management and includes legislation for the establishment of the Environment Agency.

1.4.8 The Environment Bill 2020 (UK Government, 2021) sets standards for environmental targets and includes policy papers on monitoring of storm overflows (Department for Environment, Food & Rural Affairs, 2021).

1.4.9 The Water Resources Act (England and Wales) 1991 (UK Government, 1991) (Amended 2009) (WRA) sets out the responsibilities of the Environment Agency (and, prior to 1995, the National Rivers Authority) in relation to water pollution, resource management, flood defence, fisheries, and navigation.

1.4.10 The Water Act 2003 (UK Government, 2003) amends the Water Resources Act 1991 and the Water Industry Act 1991, increasing environmental protection and ensuring sustainable use of water resources.

1.4.11 The Flood and Water Management Act 2010 (UK Government, 2010) includes provisions concerning the management of risks in connection with flooding and coastal erosion.

1.4.12 The Water Framework Directive (Standards and Classification) Directions England and Wales) 2015 (UK Government, 2015) presents the environmental standards to be used in the second cycle of the Water Framework Directive (2000/60/EC) (European Commission, 2000) river basin management planning process. The environmental standards help assess risks to the ecological quality of the water environment.

1.4.13 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (UK Government, 2017) transposes the WFD from European legislation. The WFD is delivered in England and Wales through a framework of

RBMP. England and Wales are divided into 11 River Basin Districts (RBD), each consisting of smaller management units known as water bodies. These water bodies include all river, lake, groundwater, coastal, and transitional water features located within the RBD.

1.4.14 The Water Resources (Abstraction and Impounding) Regulations SI 2006/64 (UK Government, 2006) contain provisions relating to the licensing of abstraction and impounding of water in England and Wales.

1.4.15 The Flood Risk Regulations 2009 (UK Government, 2009) transpose the EC Floods Directive 2007/60/EC (European Commission, 2007) on the assessment and management of flood risk into domestic law in England and Wales. The regulations designate a Local Lead Flood Authority (LLFA) and impose duties to prepare documents including:

- preliminary flood risk assessment;
- flood hazard and flood risk maps; and
- flood risk management plans.

1.4.16 The Private Water Supplies (England) Regulations 2016 (UK Government, 2016) set out the framework for drinking water quality in England in respect of supplies of water intended for human consumption and not provided directly by a water undertaker or licensed water supplier. Private supplies to single households are exempt from monitoring and risk assessment unless requested by the owner or occupier. Local authorities enforce the legislation.

1.4.17 The Environmental Permitting (England and Wales) (Amendment) (No. 2) Regulations 2016 (UK Government, 2016) amend the Environmental Permitting (England and Wales) Regulations 2010. They extend the requirement for an environmental permit to flood risk activities, in addition to polluting activities included under the previous regulations.

## 1.5 Consultation

### Scoping

1.5.1 Table 1-3 provides a summary of key points raised during scoping. For definitions of Core, Waterbeach and Transfers zones, refer to the Glossary (App Doc Ref 1.4).

**Table 1-3: Key points raised during scoping**

| ID | Consultee | Points raised | Response |
|---|---|---|---|
| 3.16.1 | PINS | Potential impacts of deep foundations on the Lower Greensand aquifer in the Waterbeach Zone. | There are no proposed deep foundations within the Waterbeach Zone. However, the Lower Greensand is assessed in relation to deep foundations and shafts in Section 4.1 (Construction phase). |
| 3.16.2 | PINS | Potential dewatering impacts on superficial deposits during trench excavation for pipelines in Core Zone. | There are no superficial deposits shown on British Geological Survey (BGS) mapping within the land required for the proposed WWTP and landscape masterplan. Therefore, pipeline trenches in this area are not expected to impact superficial deposits. |
| 3.16.3 | PINS | Planning Inspectorate agrees that consideration of release of sediment during construction of the outfall, relates only to the Transfers Zone. | Construction impacts relating to the proposed treated effluent discharge outfall to the River Cam (the outfall) are considered in Section 4.1 (Construction phase). |
| 3.16.4 | PINS | Planning Inspectorate agrees that discharge of final effluent used for testing of Waterbeach transfer pipeline can be scoped out of the assessment for the Core Zone. The CEMP includes watercourse protection measures, and appropriate approvals would be in place before discharge. | Wet testing of pipelines is considered within this ES for Transfer and Waterbeach Zones in Section 4.1 (Construction phase). |
| 3.16.5 | PINS | Potential impact on discharge of silt laden water to Stow-cum-Quy Fen SSSI in relation to Transfers and Waterbeach Zones. | The potential impact on drainage channels crossed by the Waterbeach transfer pipeline, which are located close to Stow-cum-Quy Fen SSSI further downstream, is considered in Section 4.1 (Construction phase). The Transfer Zone (final effluent and storm pipeline and tunnel alignment) is outside the catchment for the Black Ditch/SSSI and is not included in this assessment. |

| ID | Consultee | Points raised | Response |
|---|---|---|---|
| 3.16.6 | PINS | Impact on land drainage and backfill materials within Core Zone to be considered. | Information on backfill materials and measures to prevent trenches acting as land drains is considered in Section 4.1 (Construction phase). |
| 3.16.7 | PINS | Potential leakage impact from pipelines in the Core Zone. | Consideration is given in Section 4.1 (Construction phase) to commissioning, construction and materials of pipelines to prevent leakage. This is applicable to the entire Scheme Order Limits. |
| 3.16.8 | PINS | Potential inflow of groundwater to shafts, or outflow of wastewater to Chalk aquifer, in Core or Waterbeach Zones. | There are no shafts in the Waterbeach Zone. The potential for leakage to and from shafts is considered in Section 4.1 (Construction phase). |
| 3.16.9 | PINS | Planning Inspectorate agrees that the effect of accidental spills contaminating the chalk aquifer relates only to the Core Zone. | The impact of accidental spills and leakages within the land required for the proposed WWTP and landscape masterplan is considered in Section 4.2 (Operation phase). |
| 3.16.10 | PINS | Planning Inspectorate agrees that the effects on river flows due to tunnel and pipeline watercourse crossings can be scoped out of the Core Zone. | Effects on river flows from tunnel and pipeline watercourse crossings within land required for the Waterbeach pipeline, transfer tunnel and treated effluent pipelines is considered in Section 4.1 (Construction phase). |
| 3.16.11 | PINS | Planning Inspectorate agrees that effects on water quality and WFD status from increased effluent and stormwater discharges relates only to the Transfers zone, referring to WFD (England and Wales) Regulations 2017 (UK Government, 2017). | Water quality impacts from increased final treated effluent and stormwater discharges are assessed in Section 4.2 (Operation phase). The WFD status is considered in a separate WFD assessment (Appendix 20.3 App Doc Ref 5.4.20.3: Water Framework Directive Assessment Report). |
| 3.16.12 | PINS | Planning Inspectorate agrees that the impact of riverbed scour relates only to operational discharges within the Transfers Zone. | Rip-rap will be placed on the riverbed to prevent riverbed scour. 3D hydrodynamic modelling of the outfall and River Cam informed detailed design of the outfall to ensure dissipation of flow energy, reducing likelihood of scour. See Appendix 20.6 (App Doc Ref 5.4.20.6) 3D Velocity/mixing model and Appendix 20.7 (App Doc Ref 5.4.20.7) Outfall CFD Report. This chapter considers scour impacts at the outfall in both Section 4.1 (Construction phase) and Section 4.2 (Operation phase). |

| ID | Consultee | Points raised | Response |
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| 3.16.13 | PINS | Groundwater (Core Zone) and surface water abstractions (Core and Waterbeach Zones) require further assessment (not to be scoped out). | The impact of dewatering during construction within all zones is considered for groundwater sources in Section 4.1 (Construction phase).<br>The impact on surface water abstractions, and also drains and ditches managed by IDB, is also considered for all zones in Section 4.1 (Construction phase). |
| 3.16.14 | PINS | Planning inspectorate agrees that impact of surface water abstraction from Bannold Drove Ditch (referred to in this document as Bannold Drove Drain) relates only to the Waterbeach Zone. | Assessment of Bannold Drove Drain is considered within Chapter 22: Cumulative Effects Assessment (App Doc Ref 5.2.22). |
| 3.16.15 | PINS | Planning Inspectorate agrees that the impact of deep foundations on groundwater flows relates only to the Core Zone. | The impact of deep foundations on groundwater flows in the Core Zone is considered in Section 4.2 (Operation phase). |
| 3.16.16 | PINS | Flood risk should be considered for all zones. A standalone FRA will be appended to the EA and cross-reference should be made to this. | A separate FRA, Appendix 20.1 (App Doc Ref 5.4.20.1) Flood Risk Assessment) considers flood risk to and from the Proposed Development across all zones. |
| 3.16.17 | PINS | Impact on groundwater flow due to construction of shaft must be considered (not to be scoped out). | Appendix 20.4 (App Doc Ref 5.4.20.4) Dewatering/Pump Test Technical Note considers the impact on groundwater levels in the Grey Chalk with respect to dewatering during construction of the terminal pumping station shaft. The assessment is provided in Section 4.1 (Construction phase). |
| 3.16.18 | PINS | Temporary reduction in groundwater levels at Stow-cum-Quy Fen SSSI during construction of shaft to be considered (not to be scoped out). | The pumping test and dewatering technical note Appendix 20.4 (App Doc Ref 5.4.20.4: Dewatering/Pump Test Technical Note) considers the extent of impact on groundwater levels in the Grey Chalk with respect to dewatering during construction of the terminal pumping station shaft. The assessment is discussed in Section 4.1 (Construction phase). |
| 3.16.19 | PINS | River Cam reduction in flow in the reach between the existing outfall and proposed outfall to be considered (not to be scoped out). | Consideration of the reduction in flow and the spatial extent of the River Cam potentially impacted is discussed in Section 4.3 (Decommissioning). |

| ID | Consultee | Points raised | Response |
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| 3.16.20 | PINS | Separate assessments of water quality impacts to the River Cam, should be referenced, and should also cross-reference other chapters e.g. Biodiversity.<br><br>The ES should consider ceasing discharges from existing outfalls and changes occurring due to new outfall location.<br><br>The ES should consider temporary changes during commissioning of new WWTP and decommissioning of old WWTP. | The WFD assessment, Appendix 20.3, (App Doc Ref 5.4.20.3: Water Framework Directive Assessment Report) considers water quality impacts to the River Cam water body. Cross referencing of other chapters is included where appropriate.<br><br>Section 4.1 (Construction phase) includes assessments related to testing and commissioning. Decommissioning assessments are provided in Section 4.3 (Decommissioning). |
| 3.16.21 | PINS | Effects from construction pollutants should be considered for the following sites, which were considered in Biodiversity Scoping report;<br><br>• Wicken Fen SSSI, National Nature Reserve and Ramsar;<br>• Fenland Special Area of Conservation (SAC);<br>• Wilbraham Fens SSSI;<br>• Cam Washes SSSI;<br>• Upware North Pit SSSI;<br>• River Cam County Wildlife Site (CWS);<br>• Clayhithe Pollard Willows CWS.<br><br>The Inspectorate considers that as all of these designated sites are downstream of the proposed new effluent outfall, and as there is insufficient evidence at this stage from the Applicant's separate water quality assessment to determine the changes in discharges resulting from the new WWTP, that all sites should be scoped into the assessment across all three zones of the Proposed Development, where significant effects are likely to occur. | Wicken Fen, Fenland SAC, Cam Washes, Upware North Pit and Clayhithe Pollard Willows CWS are all a substantial distance downstream of the proposed outfall on the River Cam and are not anticipated to be affected by construction.<br><br>The environmental permitting framework will ensure that the effluent load being discharged to the River Cam from the proposed WWTP would never exceed the effluent load under currently consented limits for the existing Cambridge WWTP, which is discussed in Section 4.2 (Operation phase).<br><br>There will also be a reduction in stormwater discharges from the proposed WWTP, as discussed in Section 4.2 (Operation phase). Therefore, there would be no additional water quality impacts on these sites once the proposed WWTP is operational.<br><br>The proposed outfall is located in the River Cam CWS. The effects on the River Cam in the vicinity of the outfall are considered in Section 4.2 (Operation phase).<br><br>The negligible impact at Wilbraham Fens SSSI of dewatering during shaft construction at the proposed WWTP is discussed in Section 4.1 (Construction phase). The SSSI is up-gradient of the proposed WWTP and therefore, there would be no impact on water resources at the SSSI during operation. |

| ID | Consultee | Points raised | Response |
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| n/a | Greater Cambridge Shared Planning | Indicate groundwater levels within context of ground conditions and hydrological studies. | The range in groundwater levels is referred to in Section 3.1 (Current baseline). |
| n/a | Greater Cambridge Shared Planning | Welcome the consideration given to surface water, ground water and designated nature conservation sites including potential contamination impacts and mitigations. | Impacts to surface water, groundwater and nature conservation sites and associated mitigation measures are considered in Section 2.8 (Mitigation measures adopted as part of the Proposed Development), Section 4.1 (Construction phase), Section 4.2 (Operation phase) or Section 4.3 (Decommissioning). |
| n/a | Greater Cambridge Shared Planning | Consideration of water resource availability through water re-use to be considered to relieve pressure on chalk aquifer. Create awareness on water issues through for example appropriate use of the discovery centre. | The Network Drainage Strategy report, Appendix 20.12 (App Doc Ref 5.4.20.12 Drainage Strategy) considers water reuse.<br>Chapter 11: Community (App Doc Ref 5.2.11) considers the discovery centre content for the community. |
| n/a | Cambridgeshire County Council | As Lead Local Flood Authority, requires Flood Risk Assessment and Surface Water Drainage Strategy. Also required details of ground investigations and groundwater dewatering strategy. | A separate FRA (Appendix 20.1, App Doc Ref 5.4.20.1 Flood Risk Assessment) accompanies the application.<br>A separate Drainage Strategy report (Appendix 20.12, App Doc Ref 5.4.20.12 Drainage Strategy) also accompanies the application, and considers surface water drainage from hard surfaces.<br>Ground investigations were carried out at the proposed WWTP site in 2021. Estimations of dewatering rates and potential temporary impacts on groundwater levels are considered in Section 4.1 (Construction phase). |
| n/a | Cambridgeshire County Council | Surface water drainage strategy to meet requirements of local planning policies and consider recommendations of the Strategic Flood Risk Assessment and Surface Water Management Plan. | A separate Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12 Drainage Strategy) considers surface water drainage from hard surfaces, with reference to relevant guidance documents. |
| n/a | Cambridgeshire County Council | Infiltration rates should be calculated in accordance with BRE 365. If infiltration is unlikely to be effective, then discharge to a watercourse or sewer may be considered. | Infiltration testing has been undertaken as part of ground investigation works. A separate Drainage Strategy report (Appendix 20.12, App Doc Ref 5.4.20.12 Drainage Strategy) considers infiltration potential. |

| ID | Consultee | Points raised | Response |
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| n/a | Cambridgeshire County Council | As Lead Local Flood Authority, consent is required for constructions and alterations within an ordinary watercourse. The LLFA does not regulate ordinary watercourse in Internal Drainage Board areas. | Alterations to watercourses during construction are noted in Section 4.1 (Construction phase).<br>Relevant consents would be obtained, and this is a requirement of the Code of Construction Practice (CoCP) Part A (Appendix 2.1, App Doc Ref 5.4.2.1). |
| n/a | Cambridgeshire County Council | Waterbeach Level and Swaffham Internal Drainage Board (IDB) to be consulted regarding construction and alterations within watercourses in IDB districts. | Consultation with the IDB have been iterative and have informed alterations to watercourses, which are described in more detail in Section 4.1 (Construction phase). |
| n/a | Cambridgeshire County Council | Pollution risk during construction phase to be considered and mitigated. Consideration given to dry watercourses which may flow during heavy rainfall. | Pollution risks to watercourses during the construction phase are considered in Section 4.1 (Construction phase). |
| n/a | Environment Agency | Agrees that the proposed assessment methodology is acceptable. Expects separate studies on final effluent, stormwater discharge, flood risk, water quality and hydro-morphology of the River Cam. WFD assessment methodology to be agreed via consultation. | Separate studies relating to stormwater discharge (Appendix 20.10, App Doc Ref 5.4.20.10 Storm Model Report), flood risk (Appendix 20.1, App Doc Ref 5.4.20.01 Flood Risk Assessment) and Water Framework Directive hydro-morphology of the River Cam (Appendix 20.3, App Doc Ref 5.4.20.3 WFD Assessment Report) inform the assessment of water resources in this chapter. Commitments on final effluent quality are referred to in Section 4.2 (Operation phase).<br>The WFD screening assessment methodology has been agreed with the Environment Agency (Appendix 20.3, App Doc Ref 5.4.20.3 WFD Assessment Report). |
| n/a | Environment Agency | IDB to be consulted regarding reduced flows to Bannold Drove Drain. EA to be consulted on changes resulting in increased discharge to Bannold Drove Drain. | Reduced flows to Bannold Drove Drain would result from decommissioning the Waterbeach WRC. This activity is part of the proposals brought forward by a third party. The IDB has been consulted regarding Bannold Drove Drain. Assessment of Bannold Drove Drain is considered within Chapter 23: Cumulative Effects Assessment. |
| n/a | Fen Ditton Parish Council | Recreational river use to be considered in relation to stormwater overflows. | The potential impact on recreational uses of the river are considered in Chapter 11: Community (App Doc Ref 5.2.11). This has been informed by |

| ID | Consultee | Points raised | Response |
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| | | | key outputs associated with stormwater discharges, which are considered in Section 4.2 (Operation phase). |
| n/a | Fen Ditton Parish Council | Query about clause 21.1.9; items scoped out "after consultation with the relevant statutory consultee", and whether this implied that scoping occurred outside the report.<br><br>Follow up query on sources of information for Clause 21.8.2. | The text in Clause 21.1.9 is an introduction to the scoping tables in Section 21.8 of the scoping report. No assessment was undertaken outside the current report.<br><br>Clause 21.8.2; Impact on groundwater at SSSI and CWS is included in the pumping test analysis and shaft dewatering assessment (Appendix 20.4, App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note), and is referred to in this chapter. |
| n/a | Fen Ditton Parish Council | Impact of system failure (spills) and surface water runoff on Black Ditch and Stow-cum-Quy Fen SSSI, noting that Black Ditch can connect at its southern end to Quy Water/Bottisham Lode. | A separate Drainage Strategy report (Appendix 20.12, App Doc Ref 5.4.20.12 Drainage Strategy) considers surface water runoff from hard surfaces.<br><br>Black Ditch connectivity with ponds and Stow-cum-Quy Fen SSSI is considered in Section 3.1 (Current baseline).<br><br>Consideration of system failure (spills) to groundwater and Black Ditch receptor is provided by a contaminant transport model (Appendix 20.8, App Doc Ref 5.4.20.8 Contaminant Transport Note), which is referenced in Section 4.2 (Operation phase). |
| n/a | Fen Ditton Parish Council | Recommends a Combined Sewer Overflow (CSO) or emergency escape at Waterbeach to prevent pumping station transfer to proposed WWTP and resulting pollution potential, in the event of system failure at the receiving end. | The new Waterbeach pumping station is outside the scope of this DCO application and has not been considered within this ES. The final location will be agreed following further discussion with the Waterbeach developer, Waterbeach Development Company. Waterbeach Development Company will obtain the necessary planning consents for the pumping station although it will be constructed by Anglian Water Services. Construction of the pumping station is expected to take place at the same time as the pipeline is laid. |
| n/a | Fen Ditton Parish Council | Recommendation to consult with six known owners of Protected Rights and also Horningsea PC and Save Honey Hill Community Group. | Water features survey has been carried out and included more sites identified since the scoping report (Appendix 4.2 App Doc Ref 5.4.4.2). Anglian Water Services has engaged with Horningsea PC and Save Honey |

| ID | Consultee | Points raised | Response |
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| | | | Hill Community Group, providing a forum for discussion of any water resources concerns. |
| n/a | Fen Ditton Parish Council | Consider impacts to downstream groundwater receptors such as Black Ditch in the event of pipeline leakage.<br><br>Concern for piped land drains crossing pressurized, effluent pipelines. | Contaminant transport modelling has been undertaken to assess impacts of leaks/spills from the proposed WWTP to Black Ditch (Appendix 20.8, App Doc Ref 5.4.20.8 Contaminant Transport Note) and is referenced in Section 4.2 (Operation phase).<br><br>Pressurised Waterbeach pipeline and land drains are discussed in Section 4.1 (Construction phase). Waterbeach pipeline leakage is considered in Section 4.2 (Operation phase). |
| n/a | Fen Ditton Parish Council | Consider impact of pipelines passing through made ground including historic Marl pits and Coprolite workings. | Details of pipeline construction are provided in Chapter 2: Project description (App Doc Ref 5.2.2). Leakage from pipelines is considered in Section 4.1 (Construction phase) and in Section 4.2 (Operation phase). |
| n/a | Fen Ditton Parish Council | Consider water quality impact to River Cam Washlands SSSI in relation to CSO and outfall. | Water quality impacts are addressed in Section 4.2 (Operation phase) and also in Water Framework Directive assessment (Appendix 20.3, App Doc Ref 5.4.20.3 WFD Assessment Report).<br><br>Fewer Combined Sewer Overflow (CSO) spills should occur in the future and, as a result, there should less of an impact from spills on River Cam water quality. |
| n/a | Fen Ditton Parish Council | Consider climate change impacts on water quality when outfall discharge is to River Cam drought/low flow conditions. Consider changing treatment requirements in response to climate change. | Reduction in River Cam flows due to climate change is considered in Section 3.2 (Future baselinee). Low flows in the River Cam are also considered in Chapter 9: Climate Resilience. |
| n/a | Fen Ditton Parish Council | Reconsider all potential receptors in view of climate change water quality impacts due to River Cam drought/low flow conditions. | Reduction in River Cam flows due to climate change is considered in Section 3.2 (Future baselinee), which also considers future Environment Agency environmental permitting conditions for water quality. Climate change, including low flows in the River Cam is also considered in Chapter 9: Climate Resilience. The Flood Risk Assessment (Appendix 20.1, App Doc Ref 5.4.20.1 Flood Risk Assessment) further considers the impact of climate change on flood risk. |

| ID | Consultee | Points raised | Response |
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| n/a | Fen Ditton Parish Council | Seeks confirmation that ground investigation works have penetrated the Woburn Sands Formation. Include in the EIA on-site evidence of the depth and piezometry of the Woburn Sands Formation. | Depth of Ground Investigation boreholes drilled into the Woburn Sands Formation (Lower Greensand) at the proposed WWTP indicate that deep foundation works, shafts and tunnels would not penetrate the Woburn Sands Formation. Long term piezometry records available from Environment Agency monitoring at borehole locations in the area around the proposed WWTP are referred to in Section 3.1 (Current baseline). |
| n/a | Fen Ditton Parish Council | Requests inclusion of details of A14 Borrow Pits to inform EIA. | Information on soil conditions for design is provided by site-specific ground investigation data. Borehole logs for the A14 were used when preparing the hydrogeological impact assessment (HIA) (Appendix 20.9, App Doc Ref 5.4.20.9 Hydrogeological impact assessment (Site selection stage)). |
| n/a | Public Health England | Consider water quality impacts, including abstractions for drinking water, on human health and recreation. | There are no public water supply groundwater sources that could be affected by the Proposed Development. Private groundwater supplies are discussed in Section 2.5 (Baseline study) and Section 4.1 (Construction phase).<br>Wider issues relating to water quality and human health/recreation are considered in Chapter 11: Community and Chapter 12: Health (Application Document 5.2.11 and 5.2.12). |

## Technical Working Groups

1.5.2 Table 1-4 provides a summary of key points raised during engagement with Technical Working Groups (TWG).

**Table 1-4: Key points raised during engagement with TWG**

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| 17 May 2021 | Cambridge Past Present and Future | Water quality issues. | Water quality is discussed in Section 4.2 (Operation phase). |
| 27 January 2022 | Cam Conservators | Outfall scour protection. | Hydrodynamic modelling of the outfall and River Cam informed detailed design of the outfall (including rip rap) to ensure dissipation of |

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| | | | flow energy, reducing likelihood of scour. See Appendix 20.6 (App Doc Ref 5.4.20.6) 3D Velocity/mixing model and Appendix 20.7 (App Doc Ref 5.4.20.7) Outfall CFD Report. This chapter considers scour impacts at the outfall in both Section 4.1 (Construction phase) and Section 4.2 (Operation phase). |
| 23 July 2021 | Cam Conservators | Advice from Cam Conservators to ensure good weed control at outfall. | The design of the outfall is such that weed growth is not anticipated. In the unlikely event that weed growth might become an operational issue, this would be managed as needed, and related in-river activities would be coordinated through consultation with the Conservancy. |
| 02 September 2021 | Defra | Stormwater discharge approaches. | Storm modelling has been undertaken in Appendix 20.10 (App Doc Ref 5.4.20.10) Storm Model Report. Storm overflow discussed in Section 4.2 (Operation phase) of this chapter. |
| 6 June 2022 | Environment Agency | Stormwater management. | |
| 28 August 2021 | Environment Agency | Pre scoping meetings. | No specific actions raised for water resources. |
| 15 December 2020 | Greater Cambridgeshire Partnership | Waterbeach pipeline. | Construction impacts associated with the Waterbeach pipeline are discussed in Section 4.1 (Construction phase) of this chapter. |
| 16 March 2022 | Ofwat | Presentation of approach. | No specific actions raised for water resources. |

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| 07 January 2020 to present | Parish Councils who had comments on water were:<br>• Waterbeach<br>• Histon and Impington<br>• Landbeach Parish<br>• Milton<br>• Stow-cum-Quy<br>• Great Wilbraham<br>• Little Wilbraham and Six Mile Bottom<br>• Horningsea<br>• Fen Ditton | Impacts of flooding or overflow on SSSI.<br>Groundwater impacts.<br>Stormwater management (spills).<br>Pipeline river crossings. | Impacts to SSSI and groundwater are considered in Section 4.1 (Construction phase).<br>Stormwater management and its impacts are considered in Section 4.1 (Construction phase) and Section 4.2 (Operation phase).<br>Pipeline river crossings are considered in Section 4.1 (Construction phase). |
| 14 June 2021 | South Cambridgeshire District Council | Updates of approach. | No specific actions raised for water resources. |
| 14 October 2021 | TWG (Environment Agency, Swaffham IDB, Cam Valley Forum) | 20% climate change allowance query.<br>Stormwater discharge impact on water quality. | Fluvial flood modelling Appendix 20.5 (App Doc Ref 5.4.20.5 Fluvial Model Report), based on the River Cam urban model, incorporates a blanket allowance of 20% for climate change. The River Cam Urban model is being updated by the Environment Agency at the time of preparation of this assessment.<br>The blanket 20% climate change allowance may be considered conservative with respect to current climate change allowances, as discussed in the FRA Appendix 20.1 (App Doc Ref 5.4.20.1 Flood Risk Assessment), which is referenced in Section 4.2 (Operation phase).<br>Storm modelling has been undertaken in Appendix 20.10 (App Doc Ref 5.4.20.10) Storm Model Report. Storm overflow is discussed in Section 4.2 (Operation phase). |

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| 10 June2021 | TWG Environment Agency | Future environmental permit limits for water discharge activities.<br><br>Flood risk.<br><br>Advice provided on use of existing River Cam model. | Discharge consent limits are discussed in Section 4.2 (Operation phase). Discharge consent conditions for the proposed WWTP will be based on Environment Agency water quality modelling.<br><br>The Environment Agency advised that the River Cam Urban model (Halcrow, 2012) is being updated to include current climate change allowances. Updates have not been finalised and therefore the 2012 model provided the best available modelled data for Appendix 20.5 (App Doc Ref 5.4.20.5) Fluvial Model Report and Appendix 20.1 (App Doc Ref 5.4.20.1) Flood Risk Assessment. |
| 18 March 2021 | TWG Environment Agency | River Cam water quality (project overview and discussion of initial expectations on effluent discharge limits). | Pre-application quality limits are discussed in Section 4.2 (Operation phase). |
| 19 August 2021 | TWG Natural England | Pre scoping meetings. | No specific actions raised for water resources. |
| | TWG Natural England | River Cam water quality (project overview and discussion of initial expectations on effluent discharge limits). | This ES chapter considers discharge consents for the existing Cambridge WWTP and considers the proposed (indicative) consents in Section 4.2 (Operation phase). |
| 11 February 2022 | Waterbeach Level Internal Drainage Board | Discussion of IDB managed flow in Bannold Drove Drain and wider catchment. IDB indicates that in dry periods, when river water is used to supplement flows in the catchment, the river water does not extend to the reach north of the outfall at Bannold Drove Drain. | Assessment of Bannold Drove Drain is considered within Chapter 23: Cumulative Effects Assessment. |

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| 21 September 2021 | Waterbeach Level and Swaffham IDB | Advice provided that water within Bannold Drove Drain is used for agriculture downstream. | |
| 15 November 2021 | Wildlife Trust | Water quality impact to Quy Fen. | Water quality impacts to nature conservation sites are discussed in Section 4.1 (Construction phase). Quy Fen SSSI assessed in Chapter 8:Biodiversity. |

## Statutory s42 consultation

1.5.3 Table 1-5 provides a summary of key points raised during statutory s42 consultation.

**Table 1-5: Key points raised during statutory s42 consultation**

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| 27 April 2022 | Environment Agency | Reduced flow in Bannold Drove Drain could negatively impact water quality and ecology and it's important that a water level is maintained. | Assessment of Bannold Drove Drain is considered within Chapter 22: Cumulative Effects Assessment (App Doc Ref 5.2.22). |
| 27 April 2022 | Environment Agency | Concerns for the potential transmission of pollutants within principal and secondary aquifers in relation to underground pipelines. Appropriate engineering standards, risk assessment, design method statement and effective management systems required. | Information on materials, engineering standards and testing is provided in Chapter 2: Project description. Overall, environmental risks are also discussed in Section 4.1 (Construction phase) and Section 4.2 (Operation phase). Any detailed risk assessments, design method statements and details of effective management systems will be provided prior to the start of construction. |
| 27 April 2022 | Environment Agency | It is unclear what magnitude of pollutant release could be detected the Waterbeach pipeline by monitoring or whether the location of a leak could be identified.<br>It should be demonstrated that design proposals for the Waterbeach, final effluent and storm water | |

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| | | pipelines would provide sufficient mitigation of risks. | |
| 27 April 2022 | Environment Agency | All private groundwater abstractions to be identified in the vicinity of the Proposed Development. Need to take account of SPZs relating to private abstractions. | Results of surveys of private abstractions are discussed in Section 3.1 (Current baseline). The assessment of potential impacts is included in Section 4.1 (Construction phase). |
| 27 April 2022 | Environment Agency | Contaminant transport modelling for the Grey Chalk to be revisited using site-specific data obtained from pumping tests.<br><br>Contaminant transport modelling for the superficial deposits will also have to be undertaken. | Appendix 20.4 (App Doc Ref 5.4.20.4) Dewatering/Pump Test Technical Note has been forwarded to the Environment Agency, together with a report on the contaminant transport modelling for the Grey Chalk Appendix 20.8 (App Doc Ref 5.4.20.8) Contaminant Transport Note. Revised results from the modelling are discussed in Section 4.2 (Operation phase).<br><br>Superficial deposits are present along pipeline routes and not at the proposed WWTP. Concerns for pipeline leakage and resulting contamination of groundwater will be addressed by reference to the pipeline materials, engineering standards and testing and monitoring methods applied, as outlined in Chapter 2: Project description, rather than by any modelling which would have very limited value in assessing the possible impacts. |
| 27 April 2022 | Environment Agency | The numerical calculations for assessments of impacts of dewatering on groundwater flows and levels will have to be revisited using site-specific data from the pumping tests, taking into account also the finalised construction methods.<br><br>Further assessment of the potential impacts due to dewatering of superficial deposits during excavation of pipeline trenches will also have to be undertaken. | A separate technical note on test pumping Appendix 20.4 (App Doc Ref 5.4.20.4) Dewatering/Pump Test Technical Note has been forwarded to the Environment Agency. It includes an assessment of potential rates of dewatering during construction of the TPS shaft and the extent of resulting drawdown. Assessments of dewatering for pipeline installations is included in the HIA, Appendix 20.9 (App Doc Ref 5.4.20.9 Hydrogeological impact assessment (Site selection stage)). The results are referenced in Section 4.1 (Construction phase) and have been updated for the West Melbury Marly Chalk Formation using aquifer properties data obtained from the test pumping. As there are no significant receptors (for example, private groundwater abstractions or nature conservation sites) in close proximity to the pipelines, and |

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| | | | there is limited additional groundwater information now available, the original calculations have not been updated for the superficial deposits. |
| 27 April 2022 | Environment Agency | Concern about using treated effluent in pressure testing the Waterbeach waste water transfer pipeline. Any flaws in the integrity of the pipeline containment could lead to releases of waste water to the environment. | Best practice is to use clean water for all pipeline pressure testing. This practice will be adopted for the Waterbeach waste water transfer pipeline and is referred to in Chapter 2: Project Description (App Doc Ref 5.2.2). |
| 4 May 2022 | South Cambridgeshire District Council | Provide evidence for minor impact to groundwater levels during dewatering. | Quantitative groundwater level impacts are assessed in Appendix 20.4 (App Doc Ref 5.4.20.4) Dewatering/Pump Test Technical Note and are referenced in Section 3.1 (Current baseline). |
| 4 May 2022 | South Cambridgeshire District Council | Impact to ponds during dewatering. | Water resources surveys identified hydrological receptors which might be affected by the Proposed Development. These are referenced in Section 3.1 (Current baseline). Dewatering impacts to receptors are considered in Section 4.1 (Construction phase). |
| 4 May 2020 | Cambridge City Council | Notes potential improvement in water quality and flows in River Cam. | No response required. |
| April 2022 | Cambridgeshire County Council | How will water quality impacts affect River Cam County Wildlife Site, including knock-on effects on downstream conservation sites such as Ouse Washes SSSI / Ramsar / SAC / SPA. | Section 3.1 (Current baseline) considers Environment Agency discharge consent conditions for the existing Cambridge WWTP. Section 4.2 (Operation phase) compares the proposed (indicative) consent conditions with the existing consent conditions and provides an assessment of the impacts on water quality in the River Cam as a result of the proposed changes in consent conditions.<br><br>Water quality impacts to nature conservation sites are further considered in Chapter 8: Biodiversity (App Doc Ref 5.2.8). |
| April 2022 | Cambridgeshire County Council | Any works to watercourses will require ordinary watercourse consent from the LLFA or from the | Engagement between Anglian Water and the relevant watercourse authorities is ongoing. |

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| | | Internal Drainage Board (IDB) if within an IDB catchment. | |
| April 2022 | Cambridgeshire County Council | Drainage infrastructure must manage greater intensity rainfall events.<br><br>Expectation that surface water drainage strategy for hardstanding areas will include SuDS and will restrict discharged runoff to greenfield rates and include suitable treatment to protect receptors from contaminants. | The Drainage Strategy Appendix 20.12 (App Doc Ref 5.4.20.12 ) outlines the management of runoff from hardstanding areas and includes climate change allowance for peak rainfall intensity. Contaminated runoff will be isolated and returned to the treatment process. |
| April 2022 | Cambridgeshire County Council | Welcomes the proposed construction flood risk management plan. | Construction flood risk is considered in the Emergency Preparedness Plan and the Construction Water Quality Management Plan which are required by the CoCP (Appendix 2.1, App Doc Ref 5.4.2.1). |
| April 2022 | Cambridgeshire County Council | Impact to water quality during construction of new outfall and effect on aquatic species | Impacts on water quality associated with construction of the outfall are considered in Section 4.1 (Construction phase). Associated impacts on aquatic species are considered in Chapter 8: Biodiversity. |
| 25 April 2022 | National Trust | Welcomes assessment of hydrology/water quality impacts to Wicken Fen Ramsar and Fenland SAC, alone and in combination | Section 3.1 (Current baseline) considers Environment Agency discharge consents for the existing Cambridge WWTP. Section 4.2 (Operation phase) compares the proposed (indicative) consent conditions with the existing consent conditions and provides an assessment of the impacts on water quality in the River Cam as a result of the proposed changes in consent conditions.<br><br>Water quality impacts to nature conservation sites are further considered in Chapter 8: Biodiversity. |

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| 25 April 2022 | National Trust | Queries whether Anglesey Abbey CWS should have been scoped out of this assessment, with concerns regarding potential groundwater and surface water connectivity between the Proposed Development and the CWS. | The study area considered for the water resources assessment extends east as far as Quy Water. Anglesey Abbey CWS is located on the eastern bank of Quy Water and is just outside the study area. As discussed in Section 3.1 (Current baseline), the most southerly part of the landscape masterplan area may drain towards Quy Water. However, in Section 4.1 (Construction phase) and Section 4.2 (Operation phase), no significant surface water or groundwater impacts have been identified for Quy Water as a result of the Proposed Development, and therefore Anglesey Abbey CWS remains scoped out. |
| 25 April 2022 | National Trust | Concerns about aquifer properties based on a rising head test in a single borehole. Possibility that West Melbury Marly Chalk Formation permeability may be higher than anticipated due to fracture flow, with implications for dewatering and contaminant transport. | Results from pumping tests conducted at the proposed WWTP in 2021 (Appendix 20.4, App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note) have led to revised, higher estimates of permeability for the West Melbury Marly Chalk Formations than indicated from testing at the single borehole (in 2020). Dewatering rates have been revised as a result, and temporary groundwater level impacts on hydrological receptors are assessed in Section 4.1 (Construction phase). The revised permeabilities range has been used for contaminant transport modelling (App Doc Ref 5.4.20.8 Contaminant Transport Note). The results of this modelling are also referred to in the assessment in Section 4.2 (Operation phase). |
| 27 April 2022 | Natural England | Updated fluvial modelling required to determine impact of Proposed Development on River Cam flows and levels. | Revised fluvial modelling has been undertaken (App Doc Ref 5.4.20.5 Fluvial model report) and results are discussed in the FRA (Appendix 20.1, App Doc Ref 5.4.20.1 Flood Risk Assessment) and Section 4.2 (Operation phase). |

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| 27 April 2022 | Natural England | Requires confirmation that Stow-cum-Quy Fen SSSI will not be impacted by shaft dewatering but notes that this will also be confirmed through monitoring of water levels in the SSSI during construction. | Results from pumping tests conducted in 2021 at the proposed WWTP (Appendix 20.4, App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note) have led to revised shaft dewatering rates. Groundwater level impacts on hydrological receptors, including Stow-cum-Quy Fen SSSI, during dewatering are assessed in Section 4.1 (Construction phase). The impact on Stow-cum-Quy Fen SSSI is assessed as negligible.<br><br>Monitoring of water levels during construction will be undertaken. |
| 27 April 2022 | Natural England | Contamination of Black Ditch may affect Stow-cum-Quy Fen SSSI. With implementation of appropriate Code of Construction Practice (CoCP) mitigation, including monitoring, there will be negligible impact to water-dependent designated sites including Stow-cum-Quy Fen SSSI. Natural England supports this conclusion subject to CoCP mitigation and monitoring | With implementation of mitigation set out with the CoCP Part A and B (Appendix 2.1 and 2.2, App Doc Ref 5.4.2.1 & 2), together with monitoring, there will be a negligible impact to water quality in Black Ditch and water-dependent designated sites, including Stow-cum-Quy Fen SSSI, located close to Black Ditch. In addition, it is noted that Black Ditch can generally only discharge into the SSSI as a result of over-bank flow at times when water levels and flows are very high, as discussed in Section 3.1 (Current baseline), with the exception of a pond in the most northerly corner of the SSSI which receives flow from the ditch. |
| 27 April 2022 | Natural England | Recent ground investigation data to be used to update contaminant transport model, | Results from pumping tests conducted in 2021 at the proposed WWTP (Appendix 20.4, App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note) have led to revised, and higher, estimates of permeability for the West Melbury Marly Chalk Formations than indicated from testing of a single borehole (in 2020). The revised permeability range has been used for contaminant transport modelling (Appendix 20.8, App Doc Ref 5.4.20.8 Contaminant Transport Note). The results of this modelling are also referred to in the assessment in Section 4.2 (Operation phase). |
| 25 April 2022 | Quy Fen Trustees | Concerns regarding pollution of Stow-cum-Quy SSSI, protected rights (local well users) and the surface drainage network from contaminated | Pumping tests were performed in 2021 (Appendix 20.4, App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note) to better define the hydrogeological properties of the West Melbury Marly |

| Date | Consultee | Points raised | How and where addressed |
|---|---|---|---|
| | | groundwater. Preliminary contaminant transport modelling is limited. | Chalk Formation. Contaminant risk in the chalk is addressed in the revised Contaminant Transport model (ConSIM) (Appendix 20.8, App Doc Ref 5.4.20.8 Contaminant Transport Note) which uses updated hydraulic properties provided by pumping test data . The contaminant transport model considers the travel time of key groundwater contaminants reaching Black Ditch and potentially affecting sensitive environmental receptors such as Stow-cum-Quy SSSI. The results of this modelling are also referred to in the assessment in Section 4.2 (Operation phase). |
| 25 April 2022 | Quy Fen Trustees | Concerns regarding pollution of Stow-cum-Quy SSSI from surface water in the event of system failure, leakage or spills | Chapter 2: Project description shows that the proposed WWTP will be located in an excavated area surrounded by earth banks. In the event of system failure, leakage or spills, contaminants will be retained within the excavation. The lowered topographic elevation of the proposed WWTP reduces the risk of contaminant overflow pathways along the ground surface to Black Ditch or other environmental receptors. Any contaminated surface water within the proposed WWTP will be returned to the head of the works for treatment. |

## Statutory s47 local community consultation

1.5.4 The Consultation Report (App Doc Ref 6.1) details the responses to all comments made during the public consultation. Matters raised in relevance to water resources include:

- impact of high rainfall events and extreme weather events;
- water quality of the discharge into the River Cam;
- the impact of contaminated groundwater in the chalk aquifer beneath the proposed WWTP; and
- the risk of hydrological connectivity and potential for pollution of Stow-cum-Quy Fen SSSI from both groundwater and surface water.

# 2 Assessment Approach

## 2.1 Guidance

2.1.1 The National Planning Practice Guidance includes sections on flood risk and coastal change (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2021), and water supply, waste water and water quality (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2019).

2.1.2 The Environment Agency's guide H1 Annex E – Surface Water discharges (complex) (Environment Agency, 2011) gives advice on assessing impacts of complex surface water discharges arising from the operation of sewage treatment works.

2.1.3 The Environment Agency's approach to groundwater protection discusses source protection zones (SPZ) and indicates that 'All abstractions, including private water supplies, used for drinking water supply or food production purposes are, by default, in an SPZ1 or SPZ2' (Environment Agency, 2019). For private abstractions these zones equate to a minimum 50m radius for SPZ1. In some cases, depending on the volumes abstracted, a default SPZ2 with a minimum radius of 250m applies.

2.1.4 WFD assessment guidance includes National Infrastructure Planning Advice Note 18: The Water Framework Directive (Planning Inspectorate, 2017), and a Water Framework Directive risk assessment (Environment Agency and Department for Environment, Food & Rural Affairs, 2016).

## 2.2 Assessment methodology

2.2.1 The general approach to assessment is described in Chapter 5: EIA Methodology.

2.2.2 Following the preliminary assessment of the likely significant effects of the Proposed Development, any further mitigation measures (secondary mitigation) are identified and described. These mitigation measures would further reduce an adverse effect or enhance a beneficial one. The assessment of likely significant effects is then carried out taking into account the identified secondary mitigation measures to identify the 'residual' environmental effects.

2.2.3 This section provides specific details of the water resources methodology applied to the assessment of the Proposed Development.

2.2.4 The individual assessment methodologies for the FRA and the WFD Compliance Assessment are detailed within the respective appendices:

- Flood Risk Assessment (Appendix 20.1, App Doc Ref 5.4.20.1); and
- Water Framework Directive Compliance Assessment (Appendix 20.3, App Doc Ref 5.4.20.3).

## Impact assessment criteria

2.2.5 The significance of an effect is determined based on the magnitude of an impact and the sensitivity of the receptor affected by the impact of that magnitude. This section describes the criteria applied in this chapter to characterise the magnitude of potential impacts and sensitivity of receptors. The terms used to define magnitude and sensitivity are based on professional judgment and experience in preparing environmental impact assessments for other major infrastructure projects.

2.2.6 The assessment criteria used to assess the potential effects on Water resources arising from the Proposed Development differs from the generic EIA methodology and are described below.

## Magnitude of impact

2.2.7 The criteria for defining magnitude for the assessment of impacts to water resources are defined in Table 2-1.

**Table 2-1: Magnitude of impacts**

| Magnitude of Impacts | Criteria | Examples |
|---|---|---|
| **Negligible** | No change to integrity of attribute | Discharges to watercourses or works within an aquifer with no change to the integrity of the receptor. |
| **Minor** | Adverse: some measurable change in integrity of an attribute | Adverse: measurable decrease in surface water ecological or chemical quality, or flow; decrease in yield or quality of aquifer; not affecting existing users or change in classification of any WFD element. |
| | Beneficial: measurable increase, or reduced risk of negative effect of an attribute | Beneficial: measurable increase in surface water ecological or chemical quality; increase in yield or quality of aquifer; not affecting existing users or change in classification of any WFD element. |
| **Moderate** | Adverse: loss of part of attribute or decrease in integrity of attribute | Adverse: measurable decrease in surface water ecological or chemical quality, or flow; reversible change in yield or quality of an aquifer, such that existing users are affected temporarily, but not changing WFD status. |
| | Beneficial: moderate improvement in quality of attribute | Beneficial: measurable increase in surface water ecological or chemical quality; increase in yield or quality of aquifer, benefiting existing users but not changing WFD status. |
| **Major** | Adverse: loss of attribute and/or quality and integrity of attribute | Adverse: decrease in surface water ecological or chemical quality and WFD status, decrease in groundwater qualitative or quantitative WFD status; loss of flow from a spring; licensed groundwater abstraction unusable owing to |

| Magnitude of Impacts | Criteria | Examples |
|---|---|---|
| | | reduction in groundwater level or quality (temporary or permanent). |
| | Beneficial: creation of new attribute or major improvement in quality of attribute | Beneficial: increase in surface water ecological or chemical WFD status; increase in groundwater qualitative or quantitative WFD status. |

## Sensitivity of receptor

2.2.8 Each receptor is assigned a sensitivity (or value), based on quality and importance of the receptor for environmental or operational reasons, for example in the case of licensed abstractions. The criteria for defining receptor sensitivity for the assessment of impacts to water resources are defined in Table 2-2.

**Table 2-2: Potential sensitivity**

| Sensitivity | Criteria | Examples |
|---|---|---|
| **Low** | Lower quality | Surface water drain, watercourses with $Q_{95}$ flow[1] < 0.002$m^3$/s, unproductive/non-aquifer. |
| **Medium** | Moderate quality and rarity | Watercourses[2] not having a WFD classification shown in RBMP, Secondary aquifer, abstraction for industrial/ agricultural use. |
| **High** | Locally significant attribute of high value | Watercourse having a WFD classification shown in RBMP and $Q_{95}$ < 1.0$m^3$/s, Principal aquifer, private drinking water supply. |
| **Very High** | Nationally significant attribute of high value | Watercourse having a WFD classification shown in RBMP and $Q_{95}$ ≥1.0$m^3$/s, Principal aquifer; licensed groundwater abstraction for public water supply. |

## Significance of effect

2.2.9 The significance of the effect upon identified water resources receptors is determined by assigning an impact magnitude and sensitivity to the receptor. Table 2-3 sets out the significance matrix used to determine the significance of effects. Significant effects on the water environment are those that have a moderate or major effect. Only significant adverse effects are considered for further mitigation. Significant effects are highlighted in bold in Table 2-3.

2.2.10 For the purpose of this assessment, any effects in Table 2-3 with a significance level of slight or less are considered to be not significant.

[1] $Q_{95}$ is the flow exceeded for 95% of the time.
[2] Inclusive of all Environment Agency designated main rivers and ordinary watercourse. Excludes drains and ditches.

**Table 2-3: Significance of effects**

| Magnitude of impacts | Sensitivity/Value of Receptor: Low | Medium | High | Very High |
|---|---|---|---|---|
| **Negligible** | Neutral<br>Not significant | Neutral<br>Not significant | Slight<br>Not significant | Slight<br>Not significant |
| **Minor** | Neutral<br>Not significant | Slight<br>Not significant | **Moderate**<br>**Significant** | **Moderate**<br>**Significant** |
| **Moderate** | Slight<br>Not significant | **Moderate**<br>**Significant** | **Moderate**<br>**Significant** | **Major**<br>**Significant** |
| **Major** | **Moderate**<br>**Significant** | **Moderate**<br>**Significant** | **Major**<br>**Significant** | **Major**<br>**Significant** |

### Residual effect

2.2.11 The assessment of effects follows the approach set out within Chapter 5: Assessment Methodology. Effects have been assessed to take into account both embedded (primary) mitigation and legal requirements (tertiary mitigation). The effects are also assessed after the application of further mitigation measures (secondary mitigation). Effects after further mitigation are referred to as 'residual effects'.

2.2.12 Significance of residual effects is also determined using the criteria within Table 2-3.

## 2.3 Study area

2.3.1 The study area includes water bodies located within a distance of approximately 1km from the draft Scheme Order Limits applied at the time of the scoping study (Appendix 2.4, App Doc Ref 5.4.4.2 Scoping Report). However, the following additional provisions extend the study over a greater area in relation to some water resources features:

- An upstream reach of the Quy Water, together with a reach of the Bottisham Lode downstream of the Quy Water, is located within 1km of the Scheme Order Limits. The study area is also extended to include the entire length of the Quy Water between these upstream and downstream areas, so that hydraulic connectivity between these water bodies and drainage channels to the east of the Proposed Development can be considered. As a result, the study area also includes the whole of the area of the Stow-cum-Quy Fen SSSI.
- The flood zone extends to the west of the River Cam, indicated on Figure 20.1: Hydrology (Book of Figures – Water Resources App Doc Ref 5.3.20), with some areas more than 1km from the Scheme Order Limits. The study area has been extended to include the full extent of the flood zone, as the flood zones might potentially be affected by changes in stormwater discharge from the proposed

WWTP. Inclusion of the flood zones has been achieved by setting the study area boundary at a minimum of 1km from the River Cam on the western side of the river between the A14 crossing and Waterbeach.

2.3.2 The full extent of the study area is shown in Figure 20.1: Hydrology (Book of Figures – Water Resources App Doc Ref 5.3.20). As already indicated, the study area was originally defined using draft Scheme Order Limits. However, the minor revisions to the Scheme Order Limits since that time would have little effect on the definition of the study area. The study area shown in Figure 20.1: Hydrology (Book of Figures – Water Resources App Doc Ref 5.3.20) is considered sufficient to include all surface water features which may be affected by the Proposed Development. It includes the approximate 5km reach of the River Cam between:

- the treated effluent discharge outfalls from the existing Cambridge WWTP and the proposed WWTP; and
- the current downstream location of discharge of effluent, originating from the Waterbeach WRC, to the River Cam.

2.3.3 Flows and water quality in this 5km reach could be affected by:

- the additional discharge of treated effluent resulting from the transfer of waste water from Waterbeach to the proposed WWTP; and
- increasing final effluent discharge due to changes to the population in the area served by the proposed WWTP.

2.3.4 The study area also includes the discharge outfall location for the final treated effluent from the existing Waterbeach WRC into Bannold Drove Drain, shown on Figure 20.1: Hydrology (Book of Figures – Water Resources App Doc Ref 5.3.20).

2.3.5 The study area shown on Figure 20.1: Hydrology (Book of Figures – Water Resources App Doc Ref 5.3.20) includes all groundwater features which could be affected by the Proposed Development. These groundwater features are described in Section 3.1 (Current baseline).

## 2.4 Temporal scope of assessment

### Construction

2.4.1 For the assessment, these effects will be taken to be those for which the source begins and ends during the construction and commissioning stages prior to the proposed WWTP becoming fully operational as set out in Chapter 2 Project Description. The assumed assessment years for construction are from Year 1 to Year 4 (currently assumed to be 2024 until 2028).

2.4.2 Potential effects due to temporal variance are as follows:

- Depending on phasing of construction in relation to development and growth of Waterbeach New Town, it is possible that the section comprising the southern extension of the Waterbeach pipeline from the proposed WWTP to

the existing WWTP may not be required. If not required, construction related impacts and effects of the Waterbeach pipeline, discussed in Section 4.1 Construction phase, would not occur in the area between the proposed WWTP and the existing WWTP.

- A delay in construction might lead to installation of the river section of the cofferdam, discussed in Section 4.1 Construction phase, at a time of year when River Cam water levels are high, increasing fluvial flood risk. However, the change in timing does not affect the assessment of a significant, moderate adverse, residual effect relating to flood risk.
- A delay in construction might lead to the construction of the treated effluent pipeline crossings of a large ditch near the River Cam at a time of year when there is flow in the ditch. As discussed in Section 4.1 Construction phase, this may lead to a slight adverse effect on flows within the ditch, which is not significant.

***Phase 2 expansion***

2.4.3 Phase 2 construction is within the operational lifetime of the WWTP, expected to be 2036-2050, but likely before 2041

2.4.4 Construction of the final FST and PST would not result in new or worse impacts than those considered at the construction phase years 1 – 4 as the expected construction activities. These activities would be construction activities would be inside the earth bank and controlled by operational EMS in place governing activities within the operational footprint of the proposed WWTP.

2.4.5 Commissioning of the additional tanks would be managed under a commissioning management plant and accord with Environmental Permit variation requirements.

## Operation and maintenance

2.4.6 For the assessment, these are the effects that start once the proposed WWTP is commissioned and fully operational. These include the effects of the physical presence of the infrastructure, its operation, use and maintenance, as well as the permanent change in land use.

2.4.7 The proposed WWTP is planned to operational in 2028 (excluding any commissioning period for the proposed WWTP as this is part of the Construction Phase). The assessment of operational effects for water resources will be from the year 2028 and includes consideration for increased dry weather flow associated with population growth to approximately the year 2050. This covers expansion in year 7 to accommodate bringing on line a further FST and PST.

***Duration of effects***

2.4.8 Timescales associated with these effects, regardless of phase are as follows:

- Short-term – endures for up to 12 months after construction or decommissioning

- Medium-term – endures for 1 to 5 years
- Long-term – endures for 5 to 15 years
- Permanent effects – endures for more than 15 years and / or effects which cannot be reversed

2.4.9 Significant delay to operation of the proposed WWTP may require more detailed consideration of climate change impacts, in particular the impact of treated effluent discharge to the River Cam in low flow scenarios, as discussed in Section 3.2 Future baseline.

## 2.5 Baseline study

### Desktop data

2.5.1 The baseline desktop data reviewed in this ES is indicated in Table 2-4.

**Table 2-4: Baseline data reviewed**

| Baseline data | Data sets to review | Year | Data owner |
|---|---|---|---|
| Surface water features and designations | Main river map | 2021 | Environment Agency |
| | Detailed river network (DRN) | 2021 | Environment Agency |
| | SSSI designation | 2021 | Natural England |
| | Nature conservation sites with other designations (e.g., CWS, local nature reserves (LNR)) | 2021 | Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire |
| | Topographical mapping | | Ordnance Survey (OS) |
| | Monitoring data – flows, water levels, water quality | 2021 | Environment Agency |
| | Mapping and details of drainage networks | 2021 | IDB |
| WFD status | Catchment data explorer<br>RBMP / Catchment Management Plans | 2022 | Environment Agency |
| Abstractions | Surface water licences and unlicensed private abstractions | 2020 | Environment Agency (licensed)<br>Environment Agency / Local Authority (unlicensed <20m$^3$/d) |
| | Groundwater licences and unlicensed private abstractions | 2020 | Environment Agency (licensed) |

| Baseline data | Data sets to review | Year | Data owner |
|---|---|---|---|
| | | | Environment Agency / Local Authority (unlicensed <20m$^3$/d) |
| Discharges | Surface water consents | 2022 | Environment Agency |
| | Groundwater consents/ permits | | |
| Geology and hydrogeology | Geological mapping | 2022 | BGS website |
| | Regional hydrogeological map | | |
| | Existing borehole logs | 2022 | |
| | | 2021 | |
| | Ground investigation works | 2021/22 | Soil Engineering (report) |
| Protective designations | Nitrate vulnerable zones | 2021 | Environment Agency |
| | Groundwater SPZ | | |
| | Groundwater vulnerability maps | 2021 | |
| | | 2021 | |
| Flood zone | Flood risk mapping | 2021 | Environment Agency |

## Surveys

2.5.2 The following site surveys for primary data collection were undertaken in 2021 and 2022.

***Water Features Survey***

2.5.3 A water features survey was undertaken in May and December 2021. The survey comprised two main elements as follows:

- visits to unlicensed private groundwater abstractions within, or in proximity to, the Scheme Order Limits to determine construction details, depth, source and use; and
- a visual assessment of surface water features, including drains, ditches, ponds and reservoirs, to inform the conceptual understanding of the surface water network within the Scheme Order Limits.

2.5.4 The information from the survey was used to inform the assessment of potential impacts on these water features during construction and operation of the Proposed Development.

***WFD Survey***

2.5.5 A visual assessment of the section of the River Cam between the southern and northern extent of the Scheme Order Limits was completed in November 2021. The assessment focused on defining the river morphology characteristics and identifying

existing channel modifications such as flow control structures, bridges and embankments.

2.5.6 The survey was completed to provide on-site observational information for the WFD assessment of the River Cam in relation to potential operational impacts from the Proposed Development.

***Borehole Pumping Tests***

2.5.7 A ground investigation was undertaken in 2021 in the area of the proposed WWTP. The investigation included the construction of four boreholes for the purpose of undertaking test pumping at the proposed location for the TPS shaft, together with observation boreholes at variable distances from the test boreholes.

2.5.8 The purpose of test pumping was to determine the hydrogeological properties of the Grey Chalk aquifer. Four test boreholes were constructed to allow for the potential variability in aquifer properties in the lowermost section of the Grey Chalk underlying the proposed WWTP. A series of tests, comprising step discharge tests with a duration of a few hours, and a seven-day continuous discharge test and subsequent period of groundwater level recovery monitoring, were completed between October and November 2021. Groundwater levels were monitored in each test borehole during test pumping. In addition, groundwater level data for an additional three boreholes were analysed for the continuous discharge test and subsequent period of recovery.

2.5.9 The main objective of the pumping tests was to inform the assessment of the potential impact of dewatering activities during construction of the TPS shaft on groundwater levels in the Grey Chalk (see Appendix 20.4, App Doc Ref 5.4.20.4: Dewatering/Pump Test Technical Note). In addition, the hydrogeological properties were utilised in the assessment of the potential impacts on the groundwater environment resulting from the operation of the proposed WWTP.

## 2.6 Maximum design envelope (Rochdale) parameters for assessment

2.6.1 The design parameters and assumptions presented are in line with the 'maximum design envelope' approach (base scheme design), as described in Chapter 2: Project Description and Chapter 5: EIA Methodology. For each element the maximum design envelope parameters detailed within Table 2-5 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group.

2.6.2 The assessment parameters are based on the design of the proposed WWTP and access, waste water transfer tunnel route and outfall location, Waterbeach pipeline route and connections within the existing Cambridge WWTP, as described in Chapter 2: Project Description. The assessment considers a realistic maximum design envelope based on the maximum scale of the elements. As a result, no effects of greater significance than those assessed are likely.

**Table 2-5: Maximum design envelope for water resources assessment**

| Potential impact | Maximum design scenario | Justification |
|---|---|---|
| Dewatering during construction affects groundwater flows and levels | Dewatering within land required for the proposed WWTP sub surface structures to maximum depth of 28m bgl (below ground level).<br><br>Dewatering may be required over a circular area with a diameter of about 24m. | 28m bgl represents the maximum excavated formation depth below finished ground level of the deepest permanent structure (TPS) (including an allowance for a vertical deviation of 2m), although foundations comprising piling may extend below this depth to 35mbgl.<br><br>24m represents the approximate external, excavated diameter of the TPS. |
| Dewatering within land required for shafts associated with the waste water transfer tunnel to maximum depth of about 24m bgl. | Overall period within which dewatering will be required at times at different shaft locations is up to 21 months. Overall period within which dewatering will be required at times during installation of various below ground structures for the proposed WWTP is up to 27 months. | Represents the greatest depth of the waste water transfer tunnel (24m bgl).<br><br>Represents the overall duration of tunnel construction and proposed WWTP construction. However, there is overlap in these construction periods. The total overall construction period for shafts and below ground structures for the proposed WWTP is up to about 36 months. |
| Construction of permanent below ground structures affects groundwater flows | Construction of structures within land required for the proposed WWTP sub-surface structures to maximum depth of 35m bgl for the TPS (including piling below the shaft).<br><br>Other below-ground structures at the proposed WWTP have a maximum depth of 8m?, although this does not include piled foundations which have a depth of up to 25m (for the STC). These other structures include:<br><br>• Primary settlement tanks (circular 6 No. 37m diameter, overall footprint 175m by 115m, depth below finished ground level 8m, including PST required at Phase 2) | 35mbgl represents the maximum depth below finished ground level of the deepest permanent structure (TPS) including an allowance for 2m tolerance. |

| Potential impact | Maximum design scenario | Justification |
|---|---|---|
| | • Enhanced activated sludge process tanks (Rectangular 4 No. 20m wide by 90m long, overall footprint 115m by 135m, depth below finished ground level 6m)<br>• Final settlement tanks (circular 8 No. 39m diameter, overall footprint 130m by 225m, depth below finished ground level 5m, including FST required at Phase 2)<br>• Storm tanks (Rectangular 71m long by 54m wide, or circular/cylindrical - total surface area of tanks = 3,774m$^2$, depth below finished ground level 5m)<br>• Piled foundations for digesters may be up to 25m deep. | |
| | Construction of structures within the land required for the waste water transfer tunnel including shafts to maximum depth of up to 24m bgl. | Represents the deepest permanent structures as part of the waste water transfer tunnel which is up to 24m bgl including an allowance for 2m tolerance. |
| Construction of the outfall affects water quality | Approximate 70m by 12m temporary working area within the River Cam for up to four months.<br>Dewatering of area of river temporarily isolated to create dry working area – dewatering for up to four months. | Represents the maximum extent of the temporary working area in the river. |
| Construction of the outfall creates a flood risk | A temporary working area of up to 70m by 12m will be required for a cofferdam in the River Cam, for up to 4 months.<br>The cofferdam will be a temporary structure expected to be up to 300mm above the flood level, or 150mm above the local riverbank, to ensure the temporary works are protected from flooding. The final design and heights will be agreed through a flood risk activities permit. | Represents the maximum extent of the cofferdam within the river.<br>Represents the maximum duration of the presence of this temporary structure. |
| Crossing of the River Cam | Trenchless techniques used for surface watercourse crossings by Waterbeach pipeline and waste water transfer tunnel.<br>Pipeline up to 20m deep and at least 4m below the depth of the River Cam. | The maximum design scenario for impacts to surface water bodies that would result from the use of trenchless techniques. |

| Potential impact | Maximum design scenario | Justification |
|---|---|---|
| Permanent disruption to field drainage within the land required for the construction of the proposed WWTP and landscape masterplan | Up to 22ha of existing fields with field drains, drainage channels and connections to surface water systems will be permanently removed for construction of the proposed WWTP and permanent access road.<br>Up to 70ha of existing fields with field drains, drainage channels and connections to surface water systems will be permanently altered through implementation of the landscape masterplan. | A permanent disconnect of the historical field drainage network may lead to the backing up of field drainage channels and surface water systems leading to potential surcharging and flood risk via overland flow. |
| Testing and commissioning impacts on water quality in the River Cam | Testing and wet commissioning activities will be for up to six months with effluent discharge from existing and new outfalls. | Represents the maximum duration of interim operations during the testing phase with the existing Cambridge WWTP and proposed WWTP in operation. |
| Operation of the outfall erodes the bed / banks of the River Cam | Th outfall will be a maximum of approximately 12m long x 7m wide x 3m deep with associated riverbank protection extending up and downstream.<br>Operation of the outfall with final effluent discharges of up to 172,350$m^3$/d and with combined discharges of final effluent and storm flows of up to 582,586$m^3$/d during storm events.<br>Use of up to 55m of riverbank protection structures.<br>Removal of 150$m^2$ of riverbed for the placement of erosion protection. | 172,350$m^3$/d represents the flow passed forward to treatment.<br>The maximum design scenario for assessing impacts to the riverbed and bank that would result from the new outfall. |
| Operation of the waste water transfer tunnel results in leaks or seeps to groundwater | Tunnel maximum depth is 24m bgl.<br>TPS maximum depth is 28m bgl (with piling up to 35m bgl). | Represents the extent and depth of the below ground tunnel structures. |
| Operation of the final effluent pipeline results in | Final effluent and storm water pipelines of maximum depth 7m bgl. | Represents the extent and depth of the below-ground structures and construction materials. |

| Potential impact | Maximum design scenario | Justification |
|---|---|---|
| leaks or seeps to groundwater | | |
| Operation of the Waterbeach pipeline results in leaks or seeps to groundwater | Pipelines located at an average depth of 2 to 5m bgl except where passing beneath the River Cam (and larger drainage ditches) where up to 20m deep and at least 2m below the depth of the watercourses. | Represents depth of the below ground structures |

## 2.7 Impacts scoped out of the assessment

2.7.1 In the EIA scoping report (Appendix 4.2, App Doc Ref 5.4.4.2) submitted to the Planning Inspectorate in October 2021, it was proposed that three potential water resources impacts which were considered at that stage could be scoped out of the assessment. However, the Planning Inspectorate scoping opinion (Appendix 4.1, App Doc Ref 5.4.4.1), received in November 2021 (ID 3.16.17, ID 3.16.18, ID 3.16.19), indicated these impacts should not be scoped out. Therefore, all identified water resources impacts from the EIA scoping report have been included in this assessment.

## 2.8 Mitigation measures adopted as part of the Proposed Development

### Mitigation measure types

2.8.1 This section refers to the mitigation types, as defined in Chapter 5: EIA Methodology, and indicates how they apply to the assessment of water resources.

2.8.2 Planning of the Proposed Development has progressed through an iterative process including consultation and engagement with consultees, and through the Environmental Impact Assessment (EIA). As part of the EIA process, the Applicant has sought to identify and incorporate suitable measures and mitigation for potentially significant adverse effects, as well as maximising beneficial effects where possible.

2.8.3 Some measures are 'embedded' in the design of the Proposed Development as set out in Schedule 1 to the DCO and the accompanying Works Plans. These measures are considered primary mitigation, for example, adjustment of Order Limits to avoid sensitive features, and amending the sizing and location of temporary access routes and compounds.

2.8.4 Secondary measures include additional activities, for example the preparation and delivery of a monitoring plan for specific matters or the preparation and delivery of specific environmental management plans. The preparation and implementation of these additional activities is secured through the CoCP. These secondary measures are, however, differentiated from what are considered to be standard, good practice measures for construction.

2.8.5 Tertiary measures are actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements and secured through permits and or consents.

2.8.6 The required permits and consents related to the Proposed Development are set out with the Other Consents and Permits Register (App Doc Ref 7.1).

2.8.7 Where beneficial effects are introduced without the requirement to mitigate an effect, these are termed 'enhancement measures'.

2.8.8 The remainder of this section sets out the embedded (primary) and tertiary measures, and additional measures (secondary) relevant to the assessment of water resources.

## Primary (embedded) and tertiary measures

2.8.9 Primary and tertiary mitigation forms part of the Proposed Development and, therefore, the preliminary assessment of effects takes account of these measures. Table 2-6 sets out the primary and tertiary mitigation measures that will be adopted during the construction, operation, maintenance and decommissioning of the Proposed Development.

**Table 2-6: Primary and tertiary mitigation measures relating to water resources adopted as part of the Proposed Development**

| Potential Impact | Mitigation measures | Type | Applied to | Justification |
|---|---|---|---|---|
| **Construction** | | | | |
| Watercourse protection (geomorphology) | Trenchless technology<br>Pipe-jack micro-tunnelling or HDD are proposed for crossing of the River Cam, larger drainage ditches, A14 and railway. Pipe-jacking will be used for the waste water transfer tunnel. | Primary | Waterbeach pipeline crossings.<br>Transfer tunnel. | Avoid direct damage to existing watercourses. |
| Groundwater quality | Borehole designs<br>All boreholes constructed as permanent installations would be sealed around casing tubes in soil and sub-soil deposits close to the surface. The seal would prevent contamination from any surface water which might collect around the borehole and, potentially, seep down around the borehole to the water table.<br>Shaft design<br>Specialised deep shaft construction techniques will be used. These may involve segmental shaft lining, contiguous bored shafts, or similar techniques to be determined. Shafts will be sealed to minimise minor inflows of groundwater or wastewater outflow. | Primary | Boreholes and shafts | Mitigate groundwater contamination. |
| Disposal of testing fluids | Controlled discharges of testing fluids, such as dechlorinated water or final treated effluent, used in wet testing of pipelines or tanks, will be under conditions agreed with the EA. A permit will be obtained for this discharge. | Tertiary | All wet testing, temporary discharges and dewatering activities | Mitigation of damage to existing watercourses |

| Potential Impact | Mitigation measures | Type | Applied to | Justification |
|---|---|---|---|---|
| Flood risk | <u>Flood risk</u><br>The cofferdam will be set at a height above the flood level and agreed with the Environment Agency through the flood risk activities permit. The outfall will be built within a temporary sheet pile cofferdam which will be designed to maintain the flood protection levels provided by the current riverbank.<br><u>Climate change</u><br>Climate change allowances for peak river flow and peak rainfall intensity have been factored into design. | Tertiary<br><br>Primary | Waterbeach pipeline crossings.<br>Waste water transfer tunnel.<br>Final effluent and stormwater pipelines.<br>Outfall. | Mitigation of damage to watercourses or flood defences.<br>Mitigation of increasing flood risk along the River Cam. |
| **Operation** | | | | |
| Groundwater protection | <u>Design of shafts</u><br>Any significant risk of inflow of groundwater to shafts (including the Terminal Pumping Station shaft), or outflow of waste water from shafts would be reduced by the robust design and construction of shafts.<br>Specialised deep shaft construction techniques will be used. Shafts will be sealed to minimise minor inflows of groundwater or wastewater outflow | Primary | Shafts. | Mitigation of groundwater contamination and groundwater inflow. |

| Potential Impact | Mitigation measures | Type | Applied to | Justification |
|---|---|---|---|---|
| | Design of Waterbeach pipeline<br><br>The pipe to be used for the Waterbeach pipeline would be made from HDPE, a plastic material. Pipe sections are heat welded together, and the welds should be stronger than the pipe itself. As the Waterbeach pipeline will be pressurised during operation in order to pump the waste water to the proposed WWTP, pipeline pressure testing will be undertaken on completion. The test pressure will exceed the normal working pressure of the pipeline. As a result, the risk of leakage or losses from failure of the pipeline materials or welds, leading to contamination of groundwater in the vicinity of the pipelines, would be extremely low. In addition, pressure in the pipeline will be monitored during operation to confirm that the pipeline is functioning correctly. | Primary | Waterbeach pipeline. | Mitigation of groundwater contamination. |
| | Design of FE pipeline<br><br>The materials and methods of installation of the treated effluent and stormwater discharge pipelines are standard for this type of use in the water industry. Although the joints are not as strongly sealed as for the Waterbeach waste water transfer pipeline, the gravity flow would not exert any notable pressure on the pipeline joints. Any leakage from the joints would, therefore, be minimal. The pipelines are also conveying treated final effluent and intermittent stormwater discharges, rather than the untreated waste water conveyed continuously by the Waterbeach pipeline. | Primary | FE & stormwater pipeline to outfall. | Mitigation of impact to groundwater quality. |
| Surface water quality | Surface water drainage design<br><br>Surface water runoff from potentially contaminated areas will be collected within a dedicated drainage network and returned to the head of the works for treatment.<br><br>Surface water runoff from uncontaminated hard surfaces will be managed through a surface water drainage system. | Primary | Land required for the proposed WWTP and permanent access. | Mitigation of increasing surface water flood risk elsewhere. |

| Potential Impact | Mitigation measures | Type | Applied to | Justification |
|---|---|---|---|---|
| | Climate change allowances for peak rainfall intensity have been factored into surface water drainage design. | | | |
| River Cam water quality | Storm water management and storage<br>Design of the proposed WWTP provides improved stormwater management, which includes stormwater storage of up to 20,400m$^3$ and a 'flow to full treatment' capacity of 2,000l/s. This means that CSO and storm overflows are less likely to occur and the frequency of stormwater discharges to the River Cam will be reduced | Primary | Proposed WWTP | Mitigation of impacts to water quality in the River Cam. |
| | Final effluent discharge<br>Design of the treatment plant will deliver treated effluent that meets the set concentrations for all key pollutants. These conditions will be set out in the permit for discharge approved by Environment Agency. | Primary, Tertiary | Proposed WWTP | Mitigation of impacts to water quality in the River Cam. |
| Riverbank protection | Outfall design<br>WFD compliant riverbank and riverbed protection to prevent scour is included in the design (Design Outfall Plans and Sections 4.13). The outfall requirements will be subject to agreement with the Environment Agency, and will be to CIRIA guidelines (CIRIA, 2019). Computational Fluid Dynamics modelling will further inform detailed design of the outfall structure, to minimise treated effluent discharge impacts on the riverbank and bed. | Primary, Tertiary | Outfall | Mitigation of hydro-morphological impacts to the River Cam. |
| **Operational management plans and consents** | | | | |
| Operational Environmental Management System (EMS) | The Environmental Permit for the proposed WWTP requires a written management system to be in place in the form of an EMS.<br>The EMS covers general management of the proposed WWTP, equipment maintenance, contingency plans, accident prevention and emergency response (including pollution response) as well as defining monitoring activities. The EMS sets out an organisational structure with environmental | Tertiary | Proposed WWTP | Mitigation of water resources impacts during operation. |

| Potential Impact | Mitigation measures | Type | Applied to | Justification |
|---|---|---|---|---|
| | management roles and responsibilities. The EMS will include specific requirements to take into account changing climate conditions during the lifetime of the proposed WWTP . | | | |
| Treated effluent quality | Plant design to operate in accordance with permit conditions. Consent conditions relating to final treated effluent quality for discharge from the proposed WWTP to the River Cam will be agreed with the Environment Agency.<br>Design of proposed WWTP to operate in accordance with emission limit values (defined in Environmental Permit)<br>Design incorporates ability to modify to accommodate technological changes in the future that may be required to meet changing regulatory limits<br>Design of proposed WWTP process technology to operate within condition limits (defined in Environmental Permit).<br>Operational performance will be monitored in line with consent and operational activities modified if required. | Tertiary | Proposed WWTP | Mitigation of impacts to water quality in the River Cam. |
| Treated effluent volumes | Plant design to operate in accordance with permit conditions including provision of appropriate storage volumes, Consent conditions relating to dry weather flow (DWF) discharge from the proposed WWTP to the River Cam will be agreed with the Environment Agency. | Primary, Tertiary | Transfer tunnel, storage tanks | Mitigation of impacts to flow in the River Cam. |
| **Decommissioning** | | | | |
| Existing Cambridge WWTP | Decommissioning as part of redevelopment activities will include:<br>• relocation of a number of existing incoming sewers, including rising mains and gravity sewers;<br>• removal/closure of the existing outfall; and | Primary | Existing Cambridge WWTP. | Mitigation of spills/leaks to groundwater or surface water from redundant infrastructure and |

| Potential Impact | Mitigation measures | Type | Applied to | Justification |
|---|---|---|---|---|
| | • draining down and cleaning of tanks (including the disposal/treatment of any residual waste). | | | during redirection of existing sewers. |

## Secondary measures

2.8.10 Secondary measures will be applied to provide further controls to avoid or reduce impacts. Those applied during construction, decommissioning, operation and maintenance for water resources are indicated below.

***Construction***

*Code of Construction Practice*

2.8.11 During construction phase, the CoCP and associated management plans specify the range of measures to avoid and minimise impacts that may occur in construction. Post grant of the DCO and prior to commencement of construction of specific construction activities, the contractor will prepare the CEMP and associated sub-plans as specified in the COCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1). These detailed plans will be approved by the Employer. The CEMP and associated management plans will remain 'live' documents and periodically modified throughout the duration of construction.

2.8.12 Part A of the CoCP (Appendix 2.1, App Doc Ref 5.4.2.1) includes for the following measures:

- preparation of an Emergency Preparedness Plan which includes pollution incident control measures and response procedures for flood events.
- preparation of a Construction Water Quality Management Plan for protection of surface water, groundwater and aquifers. This includes measures relating to dewatering, flood risk and the management of surface water runoff and silt during construction.
- preparation of a Pollution Incident Control Plan which includes mitigation measures to avoid pollution incidents and response procedures to be adopted in the event of a pollution incident, detailing appropriate equipment, materials and resources, timescales and notification procedures
- Measures in relation to existing land drains. If it is not possible to avoid affecting land drains during construction, repairs to the drains will be carried out. However, in localised areas where there could be extensive damage, it may become necessary to install a pre- and post-works land drainage system in consultation with landowners.

2.8.1 One of the associated management plans would be an Outfall management and monitoring plan related to measures applied to avoid or minimise impacts associated with the construction of the outfall including works to the ditch parallel to the River Cam. This plan will be a live document and updated to integrate requirements specified by related permits and consents including:

- Environmental permit (flood risk activities)

- Environmental permit (Discharges to surface water)
- Land drainage consent (for works to the ordinary watercourse)

***Operation***

2.8.2 Operation and maintenance activities would be subject to operational management plans and procedures. The management plans and procedures will sit within the EMS required under the environmental permitting regime. These documents will identify the environmental risks and legal obligations associated with the operations of the Proposed Development once construction has been completed. The documents will specify the management measures the operator will implement in order to prevent or minimise the environmental effects associated with the Proposed Development. These documents will be regularly updated and reviewed to ensure applicability and functionality.

*Outfall Management and Monitoring Plan (Operation)*

2.8.3 During operation the Outfall Management and Monitoring Plan (OMMP) will be implemented to:

- monitor and respond to environmental changes resulting in operation i.e. scour as a result of the outfall operation

2.8.4 Regulatory monitoring and reporting (storm events, treated effluent quality and river monitoring) would be part of normal operations and responding to the requirements of the environmental permit and not covered in this plan.

2.8.5 An outline OMMP is provided in Appendix 8.24 (App Doc Ref 5.4.8.24).

***Decommissioning***

2.8.6 Decommissioning of the existing Cambridge WWTP would be subject to a Decommissioning Management Plan which is to be agreed with the Local Planning Authority (LPA). An outline Decommissioning Management Plan (App Doc Ref 5.4.2.3) describes measures applied to this activity. Post grant of the DCO and prior to commencement of decommissioning a detailed plan will be prepared and agreed with the LPA.

## 2.9 Assumptions and limitations

### Data limitations and assumptions

2.9.1 Considerable effort has been made to identify licensed and unlicensed groundwater sources that could potentially be impacted by the Proposed Development. The Environment Agency and local councils provided initial data (in 2020) on licensed and unregulated groundwater sources. Site visits to identified unlicensed private groundwater abstractions were undertaken in 2021, during which local knowledge of any additional sources was sought. Direct stakeholder engagement by the Applicant with community groups also provided a forum for any protected rights concerns to be raised. However, there remains a possibility that, despite these actions, there may be unidentified unlicensed groundwater sources which might be impacted by the Proposed Development.

2.9.2 In assessing flood risk, it is assumed that river flow and flood model data (Halcrow, 2012), supplied by the Environment Agency, are appropriate for consideration of flood risk to and from the Proposed Development. It is possible that the flood model data may be superseded during the DCO application process.

2.9.3 In considering storm flow predictions, it is assumed that model approach, as discussed with the Environment Agency and reported within the Storm Model Report (App Doc Ref 5.4.20.10) accounts for the current design standards for storm overflows used by the regulator to devise storm storage requirements intended to meet the no deterioration objective. It is possible that the standard may be superseded during the DCO application process.

2.9.4 In considering the predicted performance of the outfall, the model approaches and inputs, reported within Appendix 20.6: 3D Velocity/Mixing Model Report (App Doc Ref 5.4.20.6) and Appendix 20.7 Outfall CFD Report (App Doc Ref 5.4.20.7) are specific to the outfall design. It is possible that the model data representing river flows may be superseded during the DCO application process.

### Assessment assumptions

2.9.5 The assessment of flooding assumes the outfall design can operate in flood 1% AEP event plus 20% allowance for climate change.

2.9.6 The assessment assumes that the drainage design will accommodate a 1 in 100 year1:100yr event plus 40% allowance for climate change.

2.9.7 The assessment has taken into account the maximum storm storage volumes being a total of 23,000$m^3$ and that storm events of 1% annual exceedance probability (AEP) plus a 20% climate change magnitude are contained within system.

2.9.8 Methods used for calculation of shaft and trench dewatering and contaminant transport, based on aquifer details obtained from ground investigations and other sources, produce approximate estimates of potential impacts on receptors. However, the estimates of potential impacts should be sufficiently well defined to provide reasonable confidence in the assessments.

2.9.9 In relation to the consideration of works to cross ditches for construction of Waterbeach waste water pipeline or treated final effluent and storm water pipelines these will be temporarily stopped up and over- pumped. Over-pumping might be expected to remain in place for up to five days to allow construction of the Waterbeach pipeline.

2.9.10 Decommissioning at the existing Cambridge WWTP will involve the cleaning and washing down of up to 14 tanks over a period of 6 months.

2.9.11 The assessment of impacts to water quality within the River Cam considers that regulatory compliance monitoring and ongoing assessment approaches of permit conditions for the proposed WWTP by the Environment Agency will ensure that the quantities of consented determinants in the final effluent discharge will never exceed the quantities indicated by the current permit conditions for the existing Cambridge WWTP.

2.9.12 It is assumed that the operational treated effluent consent limits will be the same as those indicated in environmental permit pre-application advice provided by the Environment Agency and will also apply to the phased expansion (Phase 1 and Phase 2) of the proposed WWTP. Similarly, it is assumed that the calculated storm storage requirements remain unchanged from those identified as part of the pre-application consultation. It is also assumed that a phased approach to the environmental permit for the proposed WWTP (discharge to surface waters) is taken forward and that in doing so the phased expansion of the proposed WWTP would allow for future amendments to the operational consent limits in line with future regulatory requirements.

2.9.13 Piling risk/foundation works risk assessments, where required, will be prepared at a later stage and will inform detailed design and construction. It is assumed that the risk assessments will include measures to mitigate for concerns relating to the impact of piling and foundation works on groundwater quality. Hence, concerns for groundwater quality in connection with piling and foundation works have not been included in the EIA.

2.9.14 Locations for dewatering discharge during construction have yet to be designated and have not been considered in the EIA. The locations will be agreed with the Environment Agency and/or other relevant body.

There are no other substantial concerns which would appear likely to limit the effectiveness of the EIA and confidence in the assessment.

# 3 Baseline Environment

## 3.1 Current baseline

### Surface water

***River Cam and other surface water bodies***

3.1.1 Surface water features in the study area are shown in Figure 20.1: Hydrology (Book of Figures – Water Resources App Doc Ref 5.3.20), together with the extent of flood zones. The main hydrological feature in the study area, the River Cam, is located approximately 1km to the west of the proposed WWTP. The river flows northwards from the Cambridge area towards Waterbeach. Downstream of the A14 crossing the land close to the banks of the River Cam is just below 5m AOD. The River Cam is located within the Environment Agency's Cam Lower operational catchment in the study area. The River Cam is classified as a main river by the Environment Agency.

3.1.2 The proposed WWTP is located at approximately 10m AOD in an area which is flat lying but slightly elevated above surrounding surface water features. Contouring at 5m intervals on OS mapping indicates that there is a topographical divide running from north to south across the area, although the location of the divide cannot be defined precisely. The western part of the landscape masterplan area surrounding the proposed WWTP drains towards the River Cam. Much or all of the land within the proposed WWTP, together with surrounding areas to north, south and east, drain towards a set of channels which discharge to Black Ditch at or just below 5m AOD. The drainage channels and Black Ditch are managed by Swaffham IDB. The reaches of Black Ditch comprise a series of straight drainage lines which cut across a ribbon of peat deposits. These peat deposits appear to have formed the original course of Black Ditch. Hence, Black Ditch and the associated network of drainage channels are presumed to be features constructed in order to control drainage in the Black Ditch catchment.

3.1.3 Black Ditch discharges to the north, along and just within the boundary of Stow-cum-Quy Fen, in the direction of Bottisham Lode. However, Black Ditch does not discharge to Bottisham Lode. Instead, Black Ditch is connected beneath Bottisham Lode to the Commissioner's Drain which then continues on to the north. Water in the Commissioner's Drain is pumped to the River Cam at Upware about 10km downstream of the A14 crossing.

3.1.4 Quy Water, located to the east of the proposed WWTP and Black Ditch, is the principal watercourse contributing to Bottisham Lode. Under normal conditions, it is understood that there is no hydraulic connectivity between Black Ditch and Quy Water. Quy Water flows in a north to north-easterly direction downstream of the A14 crossing. Wilbraham Fens SSSI is present in an area of drainage channels adjacent to a reach of Quy Water upstream of the A14 crossing. The SSSI is approximately 2km from the proposed WWTP.

3.1.5 Bottisham Lode discharges to the River Cam near Waterbeach, about 5km downstream of the A14 crossing. Quy Water and Bottisham Lode are classified as main rivers. Information on the status of the combined Bottisham Lode – Quy Water WFD water body is also included in Table 3-2.

3.1.6 Some open, still water bodies are located in the Black Ditch drainage area. These include:

- Allicky Farm Pond, a CWS, adjacent to Black Ditch and about 1km north-east of the proposed WWTP. A site survey at Allicky Farm Pond indicated the presence of a pipe, located high up in the bank between the CWS and Black Ditch, which presumably discharges towards the CWS when water levels and flows in Black Ditch are very high. There was no evidence found of a connection between the CWS and Black Ditch at any lower level.
- Ponds, together with a rectangular open water body (The Cut), in the Stow-cum-Quy Fen SSSI, about 1.5km north-east of the proposed WWTP. Some ponds are located near to Black Ditch in an area where the ditch is located just within the SSSI boundary. Black Ditch could discharge into ponds connected to The Cut, and across some of the surrounding grassland of the SSSI, as a result of over-bank flow at times when water levels and flows are very high. Otherwise, it is understood that flows in Black Ditch cannot discharge to these areas at lower water levels. A culvert and one-way valve at a lower level in the bank of Black Ditch in the vicinity of The Cut allows flow from Stow-cum-Quy Fen into Black Ditch during periods of high water levels in the Fen. However, the valve is closed to any flow from Black Ditch back into the Fen.
- A pond located on Black Ditch in the most northerly corner of the SSSI. Flow in the ditch passes through the pond before continuing to discharge to the north-east.

3.1.7 A small part of the study area, close to the western boundary in the vicinity of the existing Cambridge WWTP, is drained by ditches which are located in the catchment of the River Great Ouse rather than the River Cam. However, all works in the vicinity of the existing WWTP should be restricted to the area south of the A14 and east of Milton Road which, from existing mapping, appears to drain to the River Cam. Therefore, no impacts are anticipated on water resources receptors in the catchment of the River Great Ouse, and the River Great Ouse catchment is not considered further in this assessment.

***Watercourse flow and levels***

3.1.8 Bottisham Lock gauging station is located on the River Cam approximately 5km downstream of the existing Cambridge WWTP. Flow records for Bottisham Lock gauging station are available from 1936 to 1987 (National River Flow Archive, 2022), which may not be representative of more recent flow conditions. Up to 1987, river flows ranged generally between about 0.9$m^3$/s (78,000$m^3$/d) ($Q_{95}$, the flow which is exceeded for 95%

of the time) in low flow conditions, and 10m$^3$/s (864,000m$^3$/d) ($Q_5$, the flow which is exceeded for only 5% of the time) at high flows. The mean (average) flow was about 3.6m$^3$/s (311,000m$^3$/d).

3.1.9 Jesus Lock gauging station is located on the River Cam approximately 5.5km upstream of the existing Cambridge WWTP. Flow records are available from 1959 to 1983 (National River Flow Archive, 2022), which also may not be representative of more recent flow conditions. Over the period up to 1983, river flows ranged from approximately 0.7m$^3$/s (60,000m$^3$/d) in low flow conditions ($Q_{95}$), to 8.8m$^3$/s (760,000m$^3$/d) in high flow conditions ($Q_5$). The mean flow was about 2.8m$^3$/s (242,000m$^3$/d).

3.1.10 River Cam levels are controlled by weir structures and sluice gates along much of its length, with Baits Bite weir and lock structure located approximately 500m downstream of the proposed outfall. These existing modifications to the natural river channel contribute to the designation of the River Cam as a heavily modified water body.

3.1.11 Quy Water at Lode gauging station is located on the Quy Water-Bottisham Lode water body, approximately 3.5km northeast of the land required for the construction of the proposed WWTP. Flow records are available from 1965 to 2020 (National River Flow Archive, 2022). Over this period, river flows ranged from approximately 0.013m$^3$/s (1,100m$^3$/d) in low flow conditions ($Q_{95}$), to 0.62m$^3$/s (53,000m$^3$/d) in high flow conditions ($Q_5$). The mean flow was about 0.19m$^3$/s (17,000m$^3$/d).

3.1.12 Black Ditch water level monitoring from November 2021 to March 2022 indicated a water level range of approximately 0.3m. Flow in Black Ditch was estimated very approximately for the HIA (App Doc Ref 5.4.20.9 Hydrogeological impact assessment (Site Selection Stage) as being of the order of 0.05m$^3$/s in December 2020. This estimate of flow (on 7 December 2020) was made following a few days of high river flows, evident at gauging stations in the River Cam catchment, and presumably resulting from heavy, early winter rainfall. In response to a request for information about flows, the IDB indicated[3] that Black Ditch may be groundwater fed but can go dry in summer months. Periods of standing water are quite frequent, with flow re-occurring after heavy rainfall.

***Surface water abstraction***

3.1.13 Information has been obtained from the Environment Agency on regulated (licensed) surface water sources in the study area.

3.1.14 There are no regulated or deregulated surface water abstractions directly from the River Cam within the study area. There are no surface water abstractions for either private or public drinking water supply within at least 4.5km of the study area.

3.1.15 The Environment Agency abstraction licence strategy for the Lower River Cam (Environment Agency, 2020) indicates that surface water is restricted or not available

[3] Consultation 20/09/2022

when flows are less than $Q_{50}$ (flow exceeded more than 50% of the time), and that surface water abstraction is likely to be available on average 120 days per year.

3.1.16 There are seven regulated surface water abstractions within the study area, of which six are for agricultural irrigation and one is for a heat pump. Of these seven, two are to the south of the Scheme Order Limits and five are to the north.

3.1.17 One of the agricultural abstractions is located in the Black Ditch catchment, approximately 1km north-east of the land required for the construction of the proposed WWTP.

3.1.18 The surface water abstraction source for the heat pump is Quy Water. The abstraction location is approximately 3km north-east of the land required for the construction of the proposed WWTP.

3.1.19 The remaining five surface water sources are located to the north of the Scheme Order Limits, within the vicinity of Waterbeach. Three of these are on the west side of the River Cam in the vicinity of Long Drove. Two abstraction sources are in the vicinity of Bottisham Lode, on the east side of the River Cam.

***River Cam consented discharges***

3.1.20 Final treated effluent from the existing Cambridge WWTP is consented under Environmental Permitting (England and Wales) Regulations 2016 for discharge to the River Cam 560m upstream of Baits Bite Lock. Consent limits for final effluent discharge quality are provided in Table 3-1. In addition to determinants typically monitored in waste water discharges such as ammoniacal nitrogen and Biochemical Oxygen Demand (BOD), the existing Cambridge WWTP consent also stipulates limits for total iron (as Fe) and chloride (as Cl), owing to their application in the waste water treatment process.

3.1.21 The final treated effluent from the existing Cambridge WWTP is discharged into the River Cam. The permitted DWF discharge is 37,330$m^3$/day (0.43$m^3$/s). Final effluent discharge ranged between 10,250$m^3$/d (0.12$m^3$/s) and 94,200$m^3$/d (1.09$m^3$/s) over a five-year period from 2016 to 2021, with an average flow of 50,800$m^3$/d (0.59$m^3$/s).

**Table 3-1: Permitted discharge consent limits for the existing Cambridge WWTP**

| Parameter | Existing Cambridge WWTP Consent Limits |
|---|---|
| Total phosphorus (as P) (mg/l) | 1 |
| Total suspended solids (mg/l) | 20 |
| ATU-Biochemical Oxygen Demand (as O2) (mg/l) | 15 |
| Ammoniacal nitrogen (as N) (mg/l) | 5 |
| Total iron (as Fe) µg/l | 4,000 |
| Chloride (as Cl) mg/l | 260 |

*Source: Environment Agency, 2018. Cambridge Water Recycling Centre, Permit No. ASCNF/1033.*

3.1.22 There is an existing CSO to the River Cam at Riverside, approximately 3km upstream of the existing Cambridge WWTP, which operates as part of the existing Cambridge WWTP system. During storm events, when waste water infrastructure is operating at full capacity, the CSO may be used as an overflow to convey a mixture of rainwater and waste water to the River Cam, preventing flooding of streets and homes. Analysis for the CSO at Riverside (App Doc Ref 5.4.20.10 Storm Model Report) shows that it has discharged at most four times per year between 2018 and 2020.

3.1.23 The existing Cambridge WWTP includes storm water tanks which are used during storm events to store combined volumes of waste water and storm water. Once the storm tanks are full and preliminary treatment through settlement has occurred, the settled storm water is discharged to the River Cam. Preliminary storm modelling (App Doc Ref 5.4.20.10 Storm Model Report) of the existing Cambridge WWTP indicates that settled stormwater discharges to the River Cam occur approximately once every ten years.

3.1.24 There are records (Environment Agency, 2022) for over 100 active consented discharges in the catchment of the River Cam. Most of these consents are for discharges to the river, or tributaries of the River Cam, at locations within the catchment upstream of the outfall from the proposed WWTP. Approximately 70% of the active consented discharges could be characterised as continuous, including those for treated sewage effluent and trade effluent. One consented sewage discharge, not from a water company, is located approximately 1km upstream of the proposed outfall. The remaining 30% of consented discharges could be considered intermittent, such as those for storm overflows and site drainage.

***River Cam water quality***

3.1.25 The quality of the River Cam with respect to the consented water quality elements is considered in this section. Water quality and water temperature data for the River Cam are available through the Water Quality Archive (Department for Environment Food & Rural Affairs, Environment Agency, 2022). Sample point AN-33M06 (Green Dragon Foot Bridge, Chesterton) is approximately 3km upstream of the proposed WWTP discharge on the River Cam. Sample point AB-33M09 (Bottisham Lock) is located approximately 5km downstream on the River Cam[4].

3.1.26 Both sample locations have representative sample data over at least the past ten years. The representative period for this analysis is ten years between 2012 and 2022. However, sampling of total suspended solids (TSS), biochemical oxygen demand (BOD) and chloride ceased at both upstream and downstream locations AN-33M06 and AN-

[4] There are two additional sample locations between these selected points: AN-33M08 (Clayhithe Road Bridge) and AN-33M07 (Baits Bite Lock), but these have not been used for analysis, due to either not containing data from recent years or the sampled determinants not being relevant to this analysis.

33M09 in 2014. A historical analysis period from 2004 to 2014 is used where sample data are not available in recent years.

3.1.27 Water quality indicators for the upstream and downstream sample locations have been assessed according to Water Framework Directive UK Technical Advisory Group (WFD UK TAG) guidelines (UK Technical Advisory Group on the Water Framework Directive, 2008).

3.1.28 The River Cam is considered a 'lowland and high alkalinity' river according to Table 4 of the UK WFD TAG guidelines (UK Technical Advisory Group on the Water Framework Directive, 2008).

3.1.29 With respect to phosphate, both upstream and downstream sample points (AN-33M06, AN-33M09, respectively) meet the WFD UK TAG phosphorus 'High' quality standard (based on the annual mean of Soluble Reactive Phosphorus).

3.1.30 With respect to ammoniacal nitrogen, upstream sample point AN-33M06 meets the WFD UK TAG ammonia 'High' quality standard (based on the 90th percentile ammoniacal nitrogen as N, as an indicator for total ammonia). Downstream sample point AB-33M09 meets the WFD UK TAG ammonia 'Good' to 'Moderate' quality standard.

3.1.31 Sampling of Biochemical Oxygen Demand (BOD) ceased in 2014 at both upstream and downstream sample points (AN-33M06, AN-33M09, respectively). In the period 2004 to 2014, both upstream and downstream sample points (AN-33M06, AN-33M09, respectively) met the WFD UK TAG BOD 'High' quality standard (based on the 90$^{th}$ percentile of BOD). However, the period 2004 to 2014 may not be representative of current conditions for BOD.

3.1.32 TSS is not currently a required water quality element for monitoring or compliance with respect to the Water Framework Directive UK Technical Advisory Group (WFD UK TAG) guidelines (UK Technical Advisory Group on the Water Framework Directive, 2008). Sampling for TSS ceased in 2014 at both upstream and downstream sample points (AN-33M06, AN-33M09, respectively). However, analysis of the 95$^{th}$ percentile TSS concentration indicates that between 2004 and 2014, concentrations decreased from the upstream to the downstream locations. However, period 2004 to 2014 may not be representative of current conditions for TSS.

Total iron and chloride are not currently required water quality components for monitoring or compliance with respect to the Water Framework Directive UK Technical Advisory Group (WFD UK TAG) guidelines (UK Technical Advisory Group on the Water Framework Directive, 2008). There was no sampling of total iron as Fe[5] over the 2012 to 2022 period at either upstream or downstream sample points (AN-33M06 and AN-

[5] Monitoring of Iron (Dissolved) has occurred to 2020 at downstream sample point AN-33M09. Average concentration of Iron (Dissolved ) for the ten year period 2010 to 2020 was 36 µg/l.

33M09 respectively). Sampling of chloride ceased in 2014 at both locations. Between 2004 and 2014, average chloride concentrations increased from 68 mg/l to 78 mg/l from the upstream to the downstream sampling locations. The period from 2004 to 2014 may not, however, be representative of current conditions for chloride.

***WFD surface water body status***

3.1.33 The River Cam is assessed as the Cam catchment in the study area. The Cam water body is classified as heavily modified, with 'Moderate' overall status under the Water Framework Directive (WFD) (Department for Environment Food and Rural Affairs, Environment Agency, 2021). The physico-chemical quality elements comprise key indicators of water body health such as ammonia, BOD, dissolved oxygen (DO), phosphate, temperature and pH. The Cam is classified as having 'Moderate' ecological status. Since 2010, river water quality has achieved 'Good' or 'High' status for all physico-chemical parameters except phosphate. Phosphate concentrations are assigned 'Poor' status, owing to continuous sewage discharge. High nutrient levels can potentially signal a eutrophic water body (a water body rich in nutrients), leading to excessive growth of macrophytes (aquatic plants) and algal blooms. Phosphate is the reason for the physico-chemical status of the River Cam not achieving a higher classification under the WFD. The River Cam, similar to many nationwide water bodies, was classified in 2019 as 'Fail' for chemical status, as a result of ubiquitous synthetic compounds such as perfluorooctane sulphonate (PFOS), discussed under the next sub-heading (Priority substances) below.

3.1.34 The WFD considers Quy Water and Bottisham Lode as a single water body (Bottisham Lode – Quy Water). The Bottisham Lode – Quy Water WFD water body is also heavily modified and designated as having 'Moderate' status overall under the WFD (2019). This moderate status is also due to its 'Poor' classification in relation to phosphate, caused by continuous sewage discharge (location not stated). For other water quality components, including ammonia and DO, Bottisham Lode – Quy Water achieves 'High' status. Bottisham Lode – Quy Water, similar to the River Cam and many nationwide water bodies, was classified in 2019 as 'Fail' for chemical status, as a result of ubiquitous synthetic compounds such as PFOS, discussed under the next sub-heading (Priority substances) below.

3.1.35 There are additional WFD water bodies to the west of the River Cam, e.g., Old West River (River Great Ouse) and its tributaries. The water bodies are located in the catchment of the River Great Ouse which should not be affected by the Proposed Development. Therefore, these water bodies are not considered in the assessment.

**Table 3-2: WFD status for surface water bodies in the study area**

| | River Cam | Bottisham Lode-Quy Water |
|---|---|---|
| WFD ID | GB105033042750 | GB105033042700 |

| | River Cam | Bottisham Lode-Quy Water |
|---|---|---|
| Hydro-morphological designation | heavily modified | heavily modified |
| Length (km) | 28.617 | 13.533 |
| Catchment area (km$^2$) | 36.815 | 99.59 |
| **Water body classification (2019)** | | |
| Overall | Moderate | Moderate |
| Ecological | Moderate | Moderate |
| Chemical | Fail | Fail |
| **Protected Areas (2019)** | | |
| Nitrates Directive | Huntingdon River Gravels G144<br>Ely Ouse and cut-off channel NVZ S390 | Anglian Chalk G71<br>Ely Ouse and Cut-off channel NVZ S390 |
| Urban Waste Water Treatment Directive | River Cam (Cambridgeshire) | N/A |

*Source: Catchment Data Explorer (Department for Environment Food and Rural Affairs, Environment Agency, 2021)*

*Priority substances*

3.1.36 PFOS is a group of man-made substances that have been in use for the past 50 years to provide water resistance to textiles, home furnishings and packaging. It was a chief ingredient in fire-fighting foams. Most uses of PFOS have now been phased out or banned under UK, EU and international regulation. Releases to the environment are likely to have decreased since 2001 since restrictions came into force (Environment Agency, 2021).

3.1.37 PFOS is a priority hazardous substance under the WFD. It was included as a priority substance in the revised Priority Substances Directive (2013/39/EU) (European Parliament & Council of the European Union, 2013), with the objective of achieving good chemical status in surface waters by 2027.

3.1.38 Significant PFOS sources are military bases and airports where there may have been significant use of fire-fighting foams for training purposes. Washing and disposal of older consumer items containing PFOS results in emissions entering the environment via waste water treatment works or waste management facilities, with concentrations related to the degree of urbanisation.

3.1.39 PFOS is water soluble and very mobile and tends to be transported in dissolved phase in the water column, rather than being adsorbed to suspended solids. PFOS can leach to groundwater through surface water seepage and leaching from contaminated soils.

3.1.40 PFOS is frequently detected in surface waters across England with typical levels above the freshwater annual average environmental quality standard (AA EQS). The Priority Substances Directive (European Parliament & Council of the European Union, 2013) specifies a water column AA EQS of 6.5 x $10^{-4}$ µg/l.

3.1.41 Of 470 freshwater sites monitored by the Environment Agency since 2016, only 8% had measured PFOS concentrations below AA EQS (Environment Agency, 2021).

3.1.42 PFOS monitoring from 2016 to 2017 of the River Cam at Bottisham Lock demonstrates PFOS concentrations ranging from 7.9 x $10^{-3}$ µg/l to 3.4 x $10^{-2}$ µg/l, in exceedance of AA EQS levels, and reflective of nationwide PFOS freshwater exceedances (Environment Agency, 2021) throughout the UK.

***Rainfall***

3.1.43 The River Cam is located in an area of eastern England which is substantially drier than most parts of the UK. Rainfall averages about 550mm a year (National River Flow Archive, 2022) in the catchment area around the Proposed Development.

## Groundwater

***Bedrock***

3.1.44 The bedrock geology (British Geological Survey, 2022) is shown Figure 20.2: Hydrogeology (Book of Figures – Water Resources App Doc Ref 5.3.20). It comprises the following sequence, listed from youngest to oldest formations:

- Grey Chalk (a sub-group of the Chalk), comprising:
  - Zig Zag Chalk Formation;
  - Totternhoe Stone Member; and
  - West Melbury Marly Chalk Formation.
- Gault Formation;
- Woburn Sands Formation (of the Lower Greensand Group); and
- Kimmeridge Clay Formation (underlain by the Ampthill Clay and West Walton Formations).

3.1.45 The bedrock formations dip gently (at approximately 0.5°) to the south east, with the youngest beds, the Zig Zag Chalk Formation and Totternhoe Stone present only outside the study area on the eastern side of the Quy Water catchment. The Totternhoe Stone is a hard band in the Grey Chalk and an important aquifer flow horizon and source for springs in the region. However, the Totternhoe Stone does not extend any further west than the outcrop between the Zig Zag Chalk Formation and the West Melbury Marly Chalk Formation.

3.1.46 The West Melbury Marly Chalk Formation is located in the Grey Chalk Sub-group in the lowest part of the Chalk. It comprises the uppermost bedrock formation across much of the study area and underlies the proposed WWTP. The base of the West Melbury Marly Chalk Formation, overlying the Gault Formation, was recorded at depths of between 11m and 14m in boreholes in the area of the proposed WWTP, constructed as part of a ground investigation in 2021 (Soil Engineering, 2022). The geology of the formation was described as generally comprising a predominantly weak, calcareous siltstone.

3.1.47 Groundwater monitoring has been undertaken for seven boreholes within the land required for the proposed WWTP and the associated landscape masterplan. Analysis of groundwater levels from July 2021 to May 2022 indicates seasonal variation, with deepest groundwater levels of 2m to 5m below ground level in December 2021, and shallowest groundwater levels of 0.5m to 3m below ground level in March 2022. Groundwater levels for the seven monitored boreholes typically varied by an average of 2m over this time period.

3.1.48 The Cambridge Greensand Member (previously known as the Upper Greensand) is found in some locations at the boundary of the Grey Chalk with the underlying Gault Formation, although it is not present in outcrop in the Cambridge area. However, it was found in the base of the West Melbury Marly Chalk Formation in some boreholes constructed during the ground investigation in 2021 (Soil Engineering, 2022), as shown in Figure 20.3: Cross-section (Book of Figures – Water Resources App Doc Ref 5.3.20). The Cambridge Greensand Member had a thickness of up to about 0.5m where identified in boreholes in the land required for the proposed WWTP and the associated landscape masterplan. It was generally found to comprise a slightly sandy clay or siltstone with some phosphatic nodules. BGS indicates that there are no significant abstractions solely from the Cambridge Greensand Member in the region covered by the hydrogeological map Figure 20.2: Hydrogeology (Book of Figures – Water Resources App Doc Ref 5.3.20).

3.1.49 The Gault Formation, comprising generally a dark grey clay with occasional phosphatic and siltstone nodules, underlies the West Melbury Marly Chalk Formation in and around the proposed WWTP. It comprises the uppermost bedrock formation in the west of the study area. The thickness of the Gault Formation ranges from about 25m to a maximum of approximately 35m where it underlies the West Melbury Marly Chalk Formation, based on geological logs for boreholes constructed as part of the ground investigation in 2021 (Soil Engineering, 2022), as shown in Figure 20.3: Cross-section (Book of Figures – Water Resources App Doc Ref 5.3.20). Chapter 2: Project Description describes the structures located in the Gault Formation, which will include the waste water transfer tunnel, shafts associated with the tunnel, and some deep foundations at the proposed WWTP. The Gault Formation is classified by the Environment Agency as an unproductive aquifer (effectively a non-aquifer).

3.1.50 The Woburn Sands Formation (Lower Greensand Group) is present in a narrow outcrop to the north-west of the study area and dips below the Gault Formation to the south-

east. It is also present in an anticlinal structure along the River Cam to the north of the study area. Geological logs available on the Geology of Britain viewer (British Geological Survey, 2022) indicate the Lower Greensand is about 8m to 10m thick where it underlies the Gault Formation to the west of the River Cam. In a borehole drilled as part of site investigations for construction of the A14, the formation is described as generally comprising sandy clay, clayey sand or sandstone. Piezometric levels for the Lower Greensand are monitored by the Environment Agency in three boreholes located around and up to about 2km from the proposed WWTP. The piezometric levels for these boreholes were recorded in the range 4.5m to 7m AOD in the period from 2010 to 2019.

3.1.51 The top few metres of the Lower Greensand were sampled in several boreholes constructed in and around the proposed WWTP as part of the ground investigation in 2021 (Soil Engineering, 2022). The strata encountered comprised mainly greenish grey, sandy clay and clayey or gravelly sand. The upper boundary of the Lower Greensand with the Gault Formation was encountered at a depth of about 46m bgl in a borehole close to the proposed location for the TPS shaft.

3.1.52 The deepest engineering works, comprising the waste water transfer tunnel, excavations for shafts associated with the tunnel, and deep foundations at the proposed WWTP, are not expected to extend down to the Lower Greensand.

3.1.53 The Lower Greensand is underlain by the Kimmeridge Clay which is present in outcrop to the west of the Lower Greensand outcrop.

3.1.54 Both the Chalk and the Lower Greensand are classified by the Environment Agency as Principal aquifers. However, based on the pumping tests in 2021, the West Melbury Marly Chalk Formation is unlikely to produce substantial yields at any groundwater abstraction sites in the study area. The most reliable aquifer transmissivity values, derived from observation borehole water level data during test pumping as part of the ground investigation in 2021, were generally low, in the range 3 to 34$m^2$/d (App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note). Seepages from the West Melbury Marly Chalk Formation may, however, contribute to local drains and watercourses.

3.1.55 The materials present in the Lower Greensand aquifer are fine and variable, and the formation is of limited thickness. The aquifer is also unlikely, therefore, to produce substantial yields at existing groundwater abstraction sites in the study area.

***Superficial deposits***

3.1.56 Superficial river terrace deposits, comprising sand and gravel, overlie the bedrock across a substantial part of the study area, as indicated in Figure 20.2: Hydrogeology (Book of Figures – Water Resources App Doc Ref 5.3.20). However, the proposed WWTP is located directly over Grey Chalk (West Melbury Marly Chalk Formation) bedrock below the soil/sub-soil.

3.1.57 BGS mapping indicates that alluvium, comprising clay, silt, sand and gravel, is present in low-lying areas along the course of the River Cam, with extensive river terrace deposits at a slightly higher elevation, particularly along the western side of the river (Figure 20.2: Hydrogeology (Book of Figures – Water Resources App Doc Ref 5.3.20)). BGS geological logs for existing boreholes (British Geological Survey, 2022) indicate that sandy clay and peat are present to a depth of 6m to 7m in parts of the valley floor at the A14 crossing, overlying sand and gravel to a depth of up to about 8m. About 500m further downstream, however, the superficial deposits have a depth of approximately 3.2m, indicating that there is considerable variability in thickness (and composition) of superficial deposits along the watercourse. The river terrace deposits on the western side of the River Cam are typically 2.5m to 4m in depth. Peat is present in some areas to the east of Waterbeach.

3.1.58 River terrace deposits and alluvium are classified by the Environment Agency as Secondary A aquifers. Peat is classified as an unproductive aquifer.

***Location of nature conservation sites***

3.1.59 Stow-cum-Quy Fen SSSI is located on the West Melbury Marly Chalk Formation, overlain in the northern half of the SSSI by superficial deposits comprising peat and river terrace deposits. The largest single area of open water present on Stow-cum-Quy Fen , an approximately 200 m long rectangular water body (The Cut), was formed in an excavation in the West Melbury Marly Chalk Formation. The Cut is estimated to be approximately 2 to 3m deep. Taking into account the low-lying elevation of the SSSI (below 5mAOD), The Cut is very likely to be supported mainly by groundwater from the West Melbury Marly Chalk Formation.

3.1.60 Allicky Farm Pond CWS is located across a ribbon of peat deposits which appears to define the original course of Black Ditch. Hence the pond may be dependent on groundwater in the superficial deposits, or on a combination of groundwater in the superficial deposits and the underlying West Melbury Marly Chalk Formation bedrock.

3.1.61 Wilbraham Fens SSSI is located on the West Melbury Marly Chalk Formation in an area where the bedrock is overlain almost entirely by superficial deposits. The superficial deposits comprise peat and river terrace deposits.

***Groundwater abstraction***

3.1.62 The following information has been obtained on groundwater sources in the study area:

- licensed and deregulated (unlicensed) groundwater sources, provided by the Environment Agency;
- unlicensed private sources (abstraction less than 20 $m^3/d$), provided by local councils; and

- records of other boreholes and wells obtained from the BGS (British Geological Survey, 2022a).

3.1.63 Environment Agency data (2022) on regulated groundwater abstractions indicate that there are no licensed groundwater sources within the study area for private or public supply.

3.1.64 No part of the study area is within an Environment Agency designated SPZ associated with groundwater abstraction for public water supply. The nearest SPZ in the Chalk outcrop (SPZ3, the total contributing recharge catchment around a source) extends into the south-east corner of the area shown in Figure 20.2: Hydrogeology (Book of Figures – Water Resources App Doc Ref 5.3.20). The SPZ is approximately 3km from the proposed WWTP.

3.1.65 A total of 17 potentially unlicensed groundwater sources were identified in the vicinity of the proposed WWTP and pipeline routes using the available information. Additional information was obtained during site surveys regarding the exact location, construction details, current status and use of these sources as private abstractions.

3.1.66 The site surveys confirmed that nine of the identified groundwater sources are currently in use. The remaining eight sources are either no longer in use or no longer exist.

3.1.67 Of the nine groundwater sources currently in use, seven are unlicensed private abstractions used for domestic purposes, including drinking water, and are therefore subject to the Environment Agency's default SPZ, as discussed in Section 2.1 (Guidance). The other two sources are unlicensed private abstractions, one used for general farming and the other for gardening.

3.1.68 A review of the data obtained from the site survey visits, borehole logs available on the BGS GeoIndex (British Geological Survey, 2022a) and geological mapping (British Geological Survey, 2022) was carried out to identify the likely source of the nine abstractions that remain in use, as follows:

- Seven of the sources, including five of the domestic supplies and the two used for farming and gardening, utilise groundwater solely from the Lower Greensand. The location of most of these abstractions is to the west of the Grey Chalk (West Melbury Marly Chalk Formation) outcrop, or close to the contact of the Grey Chalk outcrop with the Gault Formation. The Proposed Development is more than 250m from all these abstractions. It is therefore outside any default SPZs, if applied by the Environment Agency, to these private water supply sources.

- A shallow well, used as a domestic supply, in the vicinity of the Waterbeach pipelines is located close to the boundary of the Grey Chalk outcrop as indicated on geological mapping (British Geological Survey, 2022).The well is understood to have a depth of 8m. The lithological log available for a borehole located about 100m from the well indicates a thickness of 2.1m of Grey Chalk below the soil

layer (British Geological Survey, 2022a).The source of the abstraction from the shallow well could therefore be a combination of the thin layer of Grey Chalk, together with any seepages from overlying superficial deposits in the vicinity, and possibly seepages from an upper, weathered section of the Gault Formation. The well is located approximately 210m from the Waterbeach pipeline corridor. As a result, the pipeline would be within a default SPZ (SPZ2), extending 250m from the shallow well, if applied by the Environment Agency.

- A borehole used as a domestic supply, constructed in the Lower Greensand through the base of an older well in the Grey Chalk (West Melbury Marly Chalk Formation), is located in the vicinity of the proposed WWTP. Groundwater from the West Melbury Marly Chalk Formation may still contribute to this water supply source, although the yield for the source is obtained from the borehole in the Lower Greensand. However, the proposed WWTP is more than 250m from this abstraction source and therefore would not be located within any default SPZ, as defined by the Environment Agency.

***Groundwater consented discharges***

3.1.69 There are records (Environment Agency, 2022) of 16 consented discharges to land/infiltration systems within the River Cam catchment[6], of which eight are related to commercial premises, four are related to agriculture and four are domestic. Infiltration systems slowly discharge to groundwater. A total of 15 of the 16 consented discharges are at least 3km from the study area. One of the discharges, related to final effluent discharge from a golf club at Milton, is within the study area. The location is to the west of the River Cam and 2.5km north-west of the land required for the construction of the proposed WWTP.

***Aquifer vulnerability***

3.1.70 The Environment Agency has mapped aquifer vulnerability nationally using information on recharge, soil leaching properties, superficial cover and the unsaturated zone above the groundwater table. Aquifer vulnerability mapping indicates that the proposed WWTP is located directly on the Grey Chalk in a high-risk area which the Agency identifies as being 'able to easily transmit pollution to groundwater'. High risk areas are 'characterised by high leaching soils and the absence of low permeability superficial deposits'.

3.1.71 In the absence of low permeability deposits overlying the bedrock, any contamination at the proposed WWTP might transfer quickly to the aquifer in the Grey Chalk. However, as indicated by the results of test pumping in boreholes constructed in 2021 (App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note), the Grey Chalk in the area

[6] Locations explicitly related to the River Cam and upstream tributaries have been considered; these are R.Cam (Cambridge), R.Cam/The Lodes, R. Rhee/R. Mel/R. Shep, R. Granta (Linton) and Bourn Brook.

underlying the proposed WWTP has low permeability. Therefore, limited groundwater flow is likely to occur within the Grey Chalk in this area.

3.1.72 In addition, during testing, the Grey Chalk appears to behave as a fracture system in combination with a component of delayed yield. Delayed yield may occur when the initial contribution to any groundwater abstraction is obtained mainly from fractures, with some of the yield then provided by delayed drainage from pore spaces within the bedrock. Abstraction produces a short-term response in reducing the groundwater pressure in the fractures. This reduction in pressure then leads to a slower release of groundwater from the bedrock around the fractures. Under non-pumping conditions, it seems likely therefore that low permeability materials overlying the fractures in the Grey Chalk would also act to prevent the rapid transmission of any pollutants to these fractures.

3.1.73 The proposed WWTP is also identified as being in an area with 'soluble rock risk' in which 'solution features that enable rapid movement of a contaminant may be present'. However, as indicated by the results of test pumping (App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note), the West Melbury Marly Chalk Formation underlying the proposed WWTP is expected to have low transmissivity, with no indication of the presence of solution features at the location of the proposed WWTP.

3.1.74 The study area is also within a nitrate vulnerable zone for the Anglian Chalk groundwater.

***WFD groundwater status***

3.1.75 The Proposed Development is partially located within the Cam and Ely Ouse Chalk WFD groundwater body.

3.1.76 The Cam and Ely Ouse Chalk groundwater body is approximately 3,000km$^2$ in overall area and has been continuously classified as having 'Poor' overall status since 2013 under the WFD (Department for Environment Food and Rural Affairs, Environment Agency, 2021).

3.1.77 The chemical WFD status of the Cam and Ely Ouse Chalk groundwater body has been designated 'Poor' since 2013, due to continuous point-source sewage discharge from both the water industry and domestic sources, and diffuse pollution from agriculture and transport drainage. The quantitative WFD status of the groundwater body has also been designated 'Poor' since 2013, due to abstraction for the water industry, agriculture and industrial use.

3.1.78 The Cam and Ely Ouse Woburn Sands WFD groundwater body (95km$^2$) is located along the outcrop of the Woburn Sands Formation. The outcrop, part of which is included in the north-west corner of the map in Figure 20.2: Hydrogeology (Book of Figures – Water Resources App Doc Ref 5.3.20), is outside the study area and more than 2.5km west of the Proposed Development. The Woburn Sands Formation (Lower Greensand) is present

below the Gault Formation in the area of the Proposed Development. However, the Proposed Development does not intersect the Cam and Ely Ouse Woburn Sands WFD groundwater body.

## Flood Risk

***Fluvial***

3.1.79 The study area is located within Environment Agency Flood Zones 1, 2 and 3 (Appendix 20.1, App Doc Ref 5.4.20.1 Flood Risk Assessment). Fluvial flood risk associated with flood zones can be summarised as follows:

- Flood Zone 1 has a less than 1 in 1,000 year (0.1%) annual probability of river flooding;
- Flood Zone 2 has a 1 in 1,000 year to 1 in 100 year (0.1% to 1%) annual probability of river flooding; and
- Flood Zone 3 has a greater than 1 in 100 year (1%) annual probability of river flooding.

3.1.80 The proposed WWTP is located predominantly within Flood Zone 1, but with below-ground pipelines and tunnels within Flood Zones 2 and 3, linking existing and proposed infrastructure.

3.1.81 The flood defences along the River Cam, in the vicinity of the Proposed Development, generally consist of higher ground, and provide a 1 in 10 year (10%) standard of protection. In the Waterbeach area, the standard of protection provided by the embankments on the River Cam is 1 in 100 year (1%).

3.1.82 Fluvial modelling has been undertaken (Appendix 20.5, App Doc Ref 5.4.20.5 Fluvial Model Report) based on the River Cam Urban model (Halcrow, 2012). Modelled flood outlines, which include the discharge contribution from the existing outfall, demonstrate that the land required for the construction of the proposed WWTP is at low risk in any fluvial event from the 1 in 2-year to the 1 in 1000-year event.

3.1.83 The risk of fluvial flooding is considered low in the land required for the construction of the proposed WWTP, and medium to high in the immediate vicinity of the River Cam.

3.1.84 Along Quy Water, flood defences in the form of high ground and embankments are not assigned a standard of protection by the Environment Agency. It is assumed that the standard of protection provided by the flood defences in this area is low.

3.1.85 Bottisham Lode has flood defences that alternate between high ground and embankments. The standard of protection provided by the flood defences varies along Bottisham Lode between 1 in 50 year (2%) and 1 in 100 year (1%).

***Surface Water (pluvial)***

3.1.86 The Environment Agency Extent of Flooding from Surface Water mapping (Environment Agency, 2021) shows that the Proposed Development is predominantly located in an area at very low risk (less than 0.1% chance of flooding annually) from surface water flooding.

***Groundwater***

3.1.87 Groundwater monitoring between July 2021 and May 2022 indicates relatively shallow groundwater levels within the Grey Chalk, approximately 0.5m to 5m below ground level within the land required for the construction of the proposed WWTP and the associated landscape masterplan.

3.1.88 The Greater Cambridge Strategic Flood Risk Assessment (SFRA) susceptibility to groundwater flooding map (Stantec on behalf of Greater Cambridge Shared Planning, 2021) indicates that the proposed WWTP is located in an area where there is potential for groundwater flooding for structures below ground level and, in a small part of the area, potential for groundwater flooding at the surface.

3.1.89 The risk of groundwater flooding to the Proposed Development may therefore be considered medium to high.

***Historical flooding***

3.1.90 The Environment Agency holds records of fluvial flooding within the district. The closest recorded fluvial flooding events occurred in 1947 and 2001, in the reach of the River Cam adjacent to the existing Cambridge WWTP and were associated with exceedance of channel capacity (no raised defences) of the River Cam. Maximum recorded flood extents in these events were approximately 1km west of the proposed WWTP.

3.1.91 The Greater Cambridge SFRA historical flooding map (Stantec on behalf of Greater Cambridge Shared Planning, 2021) indicates no additional reported flooding incidents from groundwater or surface water sources within the Scheme Order Limits.

## 3.2 Future baseline

3.2.1 The future baseline may be summarised as comprising either of the following two options:

- Proposed Development:
  - The Proposed Development will be subject to environmental permitting regulations. Further phased development or adaptations within the proposed WWTP would be secured through Asset Management Plan (AMP) cycles within the context of RBMP cycles. This will ensure that WFD standards are upheld and that there will be no deterioration of river

water quality. Monitoring upstream and downstream of the outfall location will be required by the Environment Act (UK Government, 2021), which will support discharge permit modifications and adaptive asset management. Waterbeach WRC will be decommissioned, with waste water flows diverted to the proposed WWTP. Time horizon is to 2050.

- Existing Cambridge WWTP:
  - The existing Cambridge WWTP will require investment and adaption to support the proposed DWF to the year 2050. The existing Cambridge WWTP will be subject to the same adaptive environmental permitting considerations and monitoring requirements as the Proposed Development, ensuring that WFD standards are upheld and that there will be no deterioration of river water quality. Waterbeach WRC will be decommissioned with waste water flows diverted to the existing Cambridge WWTP.

### Surface water

3.2.2 Both future baseline scenarios will require statutory monitoring upstream and downstream of the outfall location and will ensure that WFD standards are upheld, with no deterioration of river water quality.

3.2.3 Both future baseline scenarios may be impacted by the Environment Agency national framework for water resources (Environment Agency, 2020). National framework requirements include environmental improvement in the form of sustainable abstraction. This includes management of deterioration risks for existing licensed abstractions within RBMP cycles, in accordance with WFD regulations (Environment Agency, 2021). However, this must be balanced against a requirement for increased public water supplies by the year 2050. Future baseline impacts in the River Cam catchment, due to requirements of the national framework which could affect groundwater and surface water resources, cannot be determined at present. Publication of final regional plans is expected in September 2023.

### Groundwater

3.2.4 Both future baseline scenarios may include new phased asset development. Future phased construction of assets which include deep foundations or infrastructure would be subject to rigorous groundwater protection measures, which will ensure no deterioration of groundwater quality and no long-term impact on groundwater levels.

3.2.5 Construction at the proposed WWTP would be on Grey Chalk (West Melbury Marly Chalk Formation), a part of the Principal aquifer covering the whole of the Chalk. Additional construction at the existing Cambridge WWTP would be on river terrace deposits, a Secondary A aquifer, overlying unproductive (i.e., not an aquifer) Gault Formation. Construction at the existing Cambridge WWTP would be unlikely to extend

beyond the existing footprint and therefore would be unlikely to impact baseline aquifer conditions.

## Flood Risk

3.2.6 Both future baseline scenarios will manage the same quantum of Dry Weather Flow (DWF) to the year 2050. Fluvial modelling Appendix 20.5, App Doc Ref 5.4.20.5 Fluvial Model Report indicates that there will be a negligible change in river levels or flood outlines due to the increased DWF, with an allowance for climate change, and therefore fluvial flood risk elsewhere will not increase.

3.2.7 Surface water (pluvial) runoff in both future baseline scenarios will be managed through the drainage strategy (Appendix 20.12, App Doc Ref 5.4.20.12) and therefore will not increase surface water (pluvial) flood risk elsewhere.

## Impacts of climate change on future baseline

3.2.8 Climate change is expected to lead to changes in future weather patterns, with warmer temperatures, seasonal rainfall variations, more extreme events and sea level rise. The Proposed Development is likely to be at a greater risk of flooding in the future.

***Peak river flows***

3.2.9 Peak river flow variations to the 2080s have been considered for the Proposed Development scenario in fluvial modelling (Appendix 20.5, App Doc Ref 5.4.20.5 Fluvial Model Report); see also Chapter 9: Climate Resilience (App Doc Ref 5.2.9). Phased additional development within either future baseline scenario would be subject to Environment Agency ongoing assessment of permit conditions, with requirement for peak river flow climate change considerations.

***Low river flows***

3.2.10 Modelling performed by the UK Centre for Hydrology & Ecology (UK Centre for Ecology & Hydrology, Accessed April 2022) for the 2050s shows a decrease in annual flow of up to 20% in the East Anglia region for about half of the modelled scenarios. One modelled scenario suggests a decrease of 40% for mean river flow in this area.

3.2.11 The UK Centre for Hydrology & Ecology models (UK Centre for Ecology & Hydrology, Accessed April 2022) for the 2050s show up to 20% decrease in low flows ($Q_{95}$ flows) in the East Anglian region for most modelled scenarios.

3.2.12 The climate change impact of low flow/drought conditions on the River Cam is applicable to both future baseline scenarios. The reductions in river flows indicated by these model scenarios could cause a substantial reduction in river flow available to dilute the final effluent discharge for either future baseline scenario. However, ongoing regulatory compliance monitoring (UK Government, 2021) and Environment Agency review of permit conditions is expected to prevent deterioration of water quality within the River Cam in future baseline low flow conditions.

***Rainfall***

3.2.13 Peak rainfall intensity allowances to the 2080s have been considered for the Proposed Development scenario in the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12 Drainage Strategy); see also Chapter 9: Climate resilience. Phased additional development within either future baseline scenario would be subject to the planning application process with requirement for climate change considerations of peak rainfall intensity.

# 4 Assessment of Effects

## 4.1 Construction phase

4.1.1 The section presents the assessment of effects from the construction of the Proposed Development and sets out a preliminary assessment that takes into account primary and tertiary mitigation in determining effects and then considers secondary mitigation and the assessment of residual effects.

### Proposed WWTP

4.1.2 This section sets out the assessment of effects in relation to the construction of the proposed WWTP including the landscaping proposals, final effluent pipeline, outfall, waste water transfer tunnel and new access connection with the B1047 Horningsea Road.

***Construction of waste water transfer tunnel and shafts – Lower Greensand***

4.1.3 This assessment considers the impact of deep excavations for the tunnel and associated shafts on groundwater flows, groundwater levels and groundwater quality within the Lower Greensand (Woburn Sands Formation) aquifer.

*Magnitude of impact*

4.1.4 Neither the proposed waste water transfer tunnel from the existing Cambridge WWTP to the proposed WWTP nor the associated shafts will be located at depths within, or in close proximity to, the Lower Greensand aquifer.

4.1.5 The deepest engineering works, comprising the waste water transfer tunnel and excavations for shafts associated with the tunnel, including the TPS shaft, are not expected to extend down to the Lower Greensand (Woburn Sands Formation). See Figure 20.3: Cross-section (Book of Figures – Water Resources App Doc Ref 5.3.20). The aquifer is overlain and confined throughout the study area by the unproductive Gault Formation, comprising mainly clays and silts. The Lower Greensand aquifer should not, therefore, be affected by any works in the overlying Gault Formation, or in the West Melbury Marly Chalk Formation or superficial deposits. No connecting pathway would be expected between the deepest engineering works and the Lower Greensand aquifer. The magnitude of impact of deep engineering works on the Lower Greensand aquifer should therefore be **negligible**.

*Sensitivity of receptor*

4.1.6 The Lower Greensand (Woburn Sands Formation) is classified by the Environment Agency as a Principal aquifer and its sensitivity is **high**.

*Significance of effect*

4.1.7 The impact from engineering works during construction of the waste water transfer tunnel and associated shafts on the Lower Greensand aquifer is assessed as **negligible**. Combined with a **high** sensitivity receptor, there would be a **slight adverse** effect on the Lower Greensand aquifer, which is **not significant**.

*Secondary mitigation or enhancement*

4.1.8 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

4.1.9 On the basis that no significant adverse effect is predicted or further mitigation proposed, the residual effect remains **not significant** as detailed above.

***Construction of waste water transfer tunnel and interception and intermediate access shafts – River Cam levels and flows***

4.1.10 This assessment considers the impact to River Cam levels and flows close to and downstream of the crossing of the proposed waste water transfer tunnel from the existing Cambridge WWTP to the proposed WWTP, and associated access shafts.

*Magnitude of impact*

4.1.11 The waste water transfer tunnel crossing will be constructed using pipe-jacking techniques in the Gault Formation below the river, with the crown of the tunnel approximately 10m below the riverbed. As pipe-jacking techniques should cause no disturbance in the bedrock or superficial deposits located more than a few metres above the tunnel, no impact is expected on the river.

4.1.12 Intermediate access shafts, one of which is located about 50m from the River Cam, are expected to be constructed using methods which will not affect River Cam levels or flows. The access shafts will be excavated in shallow river terrace deposits or alluvium overlying Gault Formation or, at the location of two access shafts to the east of the River Cam, in West Melbury Marly Chalk Formation overlying Gault Formation. As indicated in Chapter 2: Project Description (App Doc Ref 5.2.2), the construction methods for the access shafts are likely to comprise either:

- Underpinning, a technique that permits a shaft structure to be constructed by incrementally excavating and installing precast segments beneath a collar. At the end of each day the completed rings are grouted in place; or
- Caisson, which suits wet ground, permits the shaft to be sunk progressively with a cutting edge, typically using a bentonite lubricant between the ground and the shaft. Once the shaft is complete the bentonite is recovered and the shaft grouted in place.

4.1.13 With either method, limited dewatering should be required during construction in shallow river terrace deposits or alluvium, classified as Secondary A aquifers, as well as in the Gault Formation which is effectively a non-aquifer. As discussed in Apppendix 20.4 (App Doc Ref 5.4.20.4) Dewatering/Pump Test Technical Note, estimates have been made of the dewatering requirements in the West Melbury Marly Chalk Formation during construction of the TPS shaft. The access shafts will be smaller in diameter than the TPS shaft and, as a result, temporary dewatering requirements should be less than the range of 1.7l/s to 5.2l/s calculated for the TPS shaft. In addition, based on the geological log for a borehole in the area, the access shaft closest to the River Cam is likely to encounter clayey or silty materials comprising the West Melbury Marly Chalk Formation to a depth of less than 5m, overlying Gault Formation. This clayey or silty material would be expected to yield only minor dewatering quantities during excavation. Therefore, any temporary dewatering required during construction of access shafts in the West Melbury Marly Chalk Formation is likely to be substantially less than the maximum of 5.2l/s calculated for the TPS shaft, particularly for the shaft closest to the River Cam.

4.1.14 As discussed in Section 3.1, the indicator of low flows, $Q_{95}$ (flow exceeded for 95% of the time), was calculated as about 0.7 $m^3/s$ and 0.9 $m^3/s$ respectively for gauging stations on the River Cam a few kilometres upstream and downstream of the area in which the shafts would be constructed. These indicators of low flow are both more than 100 times greater than the maximum dewatering rate calculated for the TPS shaft. Temporary dewatering for the access shafts would therefore be expected to have no discernible impact on flows or levels in the River Cam.

4.1.15 The impact of construction of the waste water transfer tunnel and associated shafts on the River Cam levels and flows is considered **negligible**.

*Sensitivity of receptor*

4.1.16 The River Cam is a WFD water body. River flows recorded at Bottisham Lock indicate a $Q_{95}$ flow (flow exceeded 95% of the time) of 0.906$m^3/s$. As the $Q_{95}$ is less than 1.0$m^3/s$, the River Cam is considered to have **high** sensitivity.

*Significance of effect*

4.1.17 The impact of engineering works during construction of the waste water transfer tunnel and associated shafts to River Cam levels and flows is **negligible** in terms of magnitude. Combined with a **high** sensitivity, there would be a **slight adverse** effect on the River Cam, which is **not significant**.

*Secondary mitigation or enhancement*

4.1.18 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

4.1.19 On the basis that no significant adverse effect is predicted or further mitigation proposed, the residual effect remains **not significant** as detailed above.

***Construction of final effluent and storm flow pipelines to outfall – groundwater flows and levels***

4.1.20 This assessment considers the potential for a reduction in groundwater flows and levels due to dewatering of open-cut trenches during the final effluent and storm flow pipeline installation, within:

- superficial deposits; and
- the West Melbury Marly Chalk Formation.

*Magnitude of impact*

4.1.21 There may be a temporary reduction in groundwater flows and levels in some areas due to the dewatering of trenches during installation of the final effluent and storm flow pipelines. Trench excavations should be limited to within a few metres of ground level. However, where this excavation is below the water table in any section of a trench, dewatering may be necessary to maintain dry conditions. This dewatering would be expected to give rise to temporary, short-term changes in groundwater flows and water levels in the area around the section of the trench. Pipelines are expected to be installed in short sections of trench, up to approximately 50m in length, which could be open for a period of up to a few weeks. Any dewatering would occur in shallow deposits taking into account the depth of the pipeline in open-cut. The sections of the trench would then be backfilled following pipeline installation.

4.1.22 Estimates of trench dewatering rates for superficial deposits and the West Melbury Marly Chalk Formation were included in the HIA (Appendix 20.9, App Doc Ref 5.4.20.9 Hydrogeological impact assessment (Site selection stage)). Dewatering rates for sections of trench in the West Melbury Marly Chalk Formation were updated with permeability values derived using test pumping data obtained during the geotechnical investigation in 2021, as described in Appendix 20.4 (App Doc Ref 5.4.20.4) Dewatering/Pump Test Technical Note. Calculated dewatering rates vary from about 0.7l/s to 4l/s for superficial deposits and 0.7l/s to 1.3l/s for the West Melbury Marly Chalk Formation.

4.1.23 Dewatering will have a short-term, localised impact on flows and levels for any groundwater encountered in the excavations within a few metres of ground level. This temporary dewatering should have no impact on the integrity of the receptor. Therefore, dewatering is considered to have a **negligible** magnitude of impact on local aquifers.

*Sensitivity of receptor*

4.1.24 Superficial deposits, comprising mainly alluvium in the vicinity of the final effluent and storm flow pipelines, are Secondary A aquifers and are considered to have **medium** sensitivity.

4.1.25 The Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, is classified by the Environment Agency as a Principal aquifer and is therefore assigned **high** sensitivity.

*Significance of effect*

4.1.26 The impact of dewatering on groundwater levels and flows is considered **negligible** in terms of magnitude. The effect on the **medium** sensitivity superficial deposits is **neutral** and **not significant**. The effect on the **high** sensitivity West Melbury Marly Chalk Formation would be a **slight adverse** temporary effect, which is also **not significant**.

*Secondary mitigation or enhancement*

4.1.27 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

***On the basis that no significant adverse effect is predicted or further mitigation proposed, the residual effect remains not significant as detailed above. Construction of final effluent and storm flow pipelines to outfall – existing groundwater abstractions***

4.1.28 This assessment considers the potential for existing groundwater abstractions to be affected due to dewatering of open-cut trenches during the final effluent and storm flow pipeline installation.

*Magnitude of impact*

4.1.29 As indicated in Section 3.1, the corridor for the final effluent and storm flow pipelines is not located within any of the default SPZ for private groundwater abstractions identified during surveys. The closest of these groundwater abstractions would be a minimum of 1.1km from the pipeline corridor. Dewatering would be expected to have no temporary or permanent impact on groundwater flows and levels in the vicinity of these groundwater abstractions. The magnitude of impact of the work on groundwater abstractions is therefore assessed as **negligible**.

*Sensitivity of receptor*

4.1.30 Groundwater abstractions for private water supplies are assigned **high** sensitivity.

*Significance of effect*

4.1.31 The magnitude of impact on groundwater abstractions due to dewatering of open-cut trenches is considered **negligible**. Combined with **high** sensitivity for existing

groundwater abstractions, there would be a **slight adverse** temporary effect, which is **not significant**.

*Secondary mitigation or enhancement*

4.1.32 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

4.1.33 On the basis that no significant adverse effect is predicted or further mitigation proposed, the residual effect remains **not significant** as detailed above.

***Construction of final effluent and storm flow pipelines to outfall on ditches near the River Cam***

4.1.34 This assessment considers the potential for flow in large ditches to be affected due to dewatering of open-cut trenches during the final effluent and storm flow pipeline installation.

4.1.35 There is a substantial ditch with a length of about 600m just east of the River Cam which will be crossed using open-cut methods. As indicated in Chapter 2: Project Description, the flow in the ditch is known to be small, and sometimes zero. The preferred crossing option would be to complete the works at a time of zero flow. If this is not possible, however, and flow is present in the ditch, the flow will be temporarily diverted potentially by transferring the flow further along the ditch, using a temporary diversion channel or over-pumping.

*Magnitude of impact*

4.1.36 There would be a temporary impact removing flow or standing water in a section of the ditch (assumed to be less than 50m) during construction. Following construction, the ditch would be reinstated. The temporary impact on the ditch as a water body is assessed as **moderate adverse**, taking into account the dewatering of the section of a ditch (with a **negligible** permanent impact).

*Sensitivity of receptor*

4.1.37 The ditch is assessed as having **low** sensitivity in relation to flow.

*Significance of effect*

4.1.38 The magnitude of impact of dewatering of open-cut trenches on flow in large ditches is considered **moderate adverse**. Combined with the **low** sensitivity for flow in the ditch, there would be a **slight adverse** temporary effect, which is **not significant**. The permanent effect on the ditch as a water body would be **neutral** and **not significant**.

*Secondary mitigation or enhancement*

*4.1.39* No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

4.1.40 On the basis that no significant adverse effect is predicted or further mitigation proposed, the residual effect remains **not significant** as detailed above.

***Construction of final effluent and storm flow pipelines – land drains and groundwater flow***

4.1.41 This assessment considers the impact of excavation and backfill of final effluent and storm flow pipeline trenches on land drains and groundwater flow.

*Magnitude of impact*

4.1.42 The pipelines are expected to be installed through areas where land drains are present. Cutting through the land drains during excavation would disrupt the drainage pattern in the area. It could lead to water logging of land in wet periods in some areas on the up-gradient side of the excavation and, possibly, more rapid drying out of the ground on the down-gradient side in drier conditions.

4.1.43 If permeable materials are used to backfill trenches around the pipelines, the trenches might further disrupt land drainage in the area by acting as additional drains cutting through the existing network. Where pipeline trenches are excavated below the water table, these trenches could also act as groundwater drains changing the direction of shallow groundwater flow locally and affecting the water table around the trenches. The changes to the water table could add to the changes in drainage and ground conditions in the area.

4.1.44 It is anticipated, however, that the materials excavated from pipeline trenches would be suitable for pipe bedding and trench backfill. None of the materials, including superficial deposits, or uppermost layers of Gault Formation or West Melbury Marly Chalk, are expected to comprise a hard material which could damage the pipelines. Both pipe bedding and backfilling would therefore utilise materials from the sections of trench from which they are excavated. As a result, the trenches would not be expected to form new pathways for drainage of shallow groundwater. Hence, as far as is practicable, there should be no change to drainage patterns in the vicinity of the pipelines.

4.1.45 Should locally excavated materials prove unsuitable for pipe bedding in any section of the pipelines, a more uniform, sandy or granular material might be used. In the event that groundwater drainage was a concern, additional measures would then be considered and might include the use of clay plugs or partitions (also referred to as clay stanks) across the trench at suitable locations as described in Chapter 2: Project Description. However, such measures are not expected to be necessary.

4.1.46 Depending on the extent of land drainage encountered, the magnitude of impact of pipeline trenches in interrupting flow from land drains, could be **major adverse**.

*Sensitivity of receptor*

4.1.47 As land drainage may prevent flooding by shallow groundwater in wet periods, it is considered to be a receptor with **high** sensitivity.

*Significance of effect*

4.1.48 The impact of the final effluent and storm flow pipeline trenches on land drains is potentially **major adverse** in terms of magnitude. The effect on the land drains, which are **high** sensitivity receptors, could be **major adverse** and **significant**.

*Secondary mitigation or enhancement*

4.1.49 All land drains will be identified before works commence and the CoCP specifies land drain protection measures which will be implemented in the CEMP. Any potential impacts in disrupting land drainage during pipeline construction will therefore be mitigated by the CoCP.

*Residual effect*

4.1.50 The implementation of land drainage protection measures will reduce the impact on land drainage to **negligible**. Combined with the **high** sensitivity assigned to land drainage, the residual effect is **slight** and **not significant**.

***Construction of outfall – dewatering***

4.1.51 This assessment considers the impact of dewatering during outfall construction on groundwater and surface water flows and levels.

*Magnitude of impact*

4.1.52 The outfall will be located within the River Cam CWS. The outfall structure is likely to be built within a sheet pile cofferdam. If so, a substantial rate of initial dewatering would be required to drain the area behind the cofferdam. However, following this initial short period, dewatering requirements will be much reduced, sufficient just to ensure that inflows through joints in the cofferdam, or through the base and sides of the excavation in the river bank, are removed in order to maintain reasonably dry conditions suitable for construction. Groundwater levels could be reduced in superficial deposits along the river bank in the vicinity of the cofferdam. However, this impact would be very limited in extent as, outside the cofferdam, the banks would remain in contact with river flows.

4.1.53 The overall magnitude of impact of dewatering on groundwater and surface water flows and levels during outfall construction is considered **negligible**.

*Sensitivity of receptor*

4.1.54 Any inflows to the outfall construction area are likely to originate from the River Cam or from groundwater in the banks of the river sustained by river levels.

4.1.55 The River Cam is a WFD water body. River flows recorded at Bottisham Lock indicate a $Q_{95}$ flow (flow exceeded 95% of the time) of 0.906$m^3$/s. As the $Q_{95}$ is less than 1.0$m^3$/s, the River Cam is considered to have **high** sensitivity.

4.1.56 Superficial deposits at the location of the proposed outfall consist of alluvium, which is a Secondary A aquifer and is considered **medium** sensitivity.

*Significance of effect*

4.1.57 The impacts of dewatering of the outfall construction area on levels and flows in the River Cam and on groundwater are **negligible** in terms of magnitude. The River Cam is **high** sensitivity, resulting in a **slight adverse** temporary effect, which is **not significant**. The temporary dewatering effect on groundwater within alluvium deposits, which are **medium** sensitivity, would be **neutral** and **not significant**.

*Secondary mitigation or enhancement*

4.1.58 No significant adverse effect is predicted and no secondary mitigation is required.

*Residual effect*

4.1.59 On the basis that no significant adverse effects are predicted or further mitigation proposed, the residual effect remains **not significant** as detailed above.

***Construction of outfall – River Cam water quality***

4.1.60 This assessment considers the impact of the cofferdam, used to maintain dry conditions during outfall construction, on water quality for the River Cam.

*Magnitude of impact*

4.1.61 The outfall will be located within a CWS. The outfall structure and emplacement of riverbed scour protection materials (rip-rap) are likely to be built within a sheet pile cofferdam. If so, a substantial rate of initial dewatering would be required to drain the area behind the cofferdam. However, following this initial short period, dewatering requirements will be much reduced, sufficient just to ensure that inflows through joints in the cofferdam, or through the base and sides of the excavation in the river bank, are removed in order to maintain reasonably dry conditions suitable for construction. Nonetheless, any dewatering discharge is likely to contain some sediment, although the resulting magnitude of impact on water quality of discharging directly to the river would be **moderate adverse** initially, reducing to **minor adverse** once the area behind the cofferdam has been drained.

4.1.62 Installation and subsequent removal of the cofferdam would be expected to have a temporary impact on the sediment content of the river water over a reach of the river downstream of the outfall. It is not possible to predict how far this impact would extend downstream. However, the velocity of the river water is slow in normal flow conditions. Therefore, following installation and later removal of the cofferdam, most of the

disturbed sediment would be expected to settle out in a period of a few days. Environment Agency records of regulated surface water sources in the study area indicate that the closest downstream abstraction from the River Cam is approximately 6.5km downstream of the proposed outfall. The resulting temporary impact on river water quality is therefore assessed as **moderate adverse**.

*Sensitivity of receptor*

4.1.63 The River Cam is a WFD water body. River flows recorded at Bottisham Lock indicate a $Q_{95}$ flow (flow exceeded 95% of the time) of 0.906$m^3$/s. As the $Q_{95}$ is less than 1.0$m^3$/s, the River Cam is considered to have **high** sensitivity.

*Significance of effect*

4.1.64 The impact of dewatering of the outfall construction area on water quality in the River Cam is **moderate adverse** initially in terms of magnitude, reducing to **minor adverse** once the area behind the cofferdam has been drained. Combined with **high** sensitivity for the river, there would be a **moderate adverse** temporary effect, which is **significant**.

4.1.65 The impact of installation and removal of the cofferdam on water quality in the River Cam is **moderate adverse** in terms of magnitude. Combined with **high** sensitivity for the river, there would be a short duration **moderate adverse** temporary effect, which is **significant**.

*Secondary mitigation or enhancement*

4.1.66 During construction of the outfall, any unacceptable levels of sediment in water pumped from the cofferdam would be removed by settlement before the water was discharged back into the river. Measures to prevent run-off from land side construction such avoiding vegetation removal right up to the banks, minimising the areas of land that are disturbed/cleared, avoiding stockpiling of material close to the banks would be applied and all measures would be set out with an Outfall Management and Monitoring Plan (OMMP) appended to the CEMP. An outline OMMP is provided in Appendix 8.24 (App Doc Ref 5.4.8.24).

4.1.67 No further mitigation is possible in relation to installation and removal of the cofferdam.

*Residual effect*

4.1.68 The temporary residual effect of installation and removal of the cofferdam on water quality remains significant as detailed above. The removal of any unacceptable levels of sediment in water before discharge back into the River Cam would reduce the impact on river water quality to negligible. Combined with high sensitivity for the river, there would be a slight adverse residual effect which is not significant.

***Construction of outfall – flood risk***

4.1.69 This assessment considers the impact to fluvial flood risk due to construction of the outfall.

*Magnitude of impact*

4.1.70 The outfall structure is likely to be built within a sheet pile cofferdam over a period of approximately four months. The cofferdam will be designed to maintain the flood protection levels currently provided by the riverbank.

4.1.71 While the cofferdam is in place, the cross-sectional area of the river will be reduced by approximately 25%. This may cause a local and temporary increase in water levels and/or an increase in water velocity upstream and within the zone where the constriction occurs. Any small local changes in water level or velocity are likely to be eliminated at Baits Bite Lock. Outfall construction will be planned for what is generally a dry time of year, when risk of fluvial flooding is relatively low.

4.1.72 As indicated in Table 2-5, all construction activities in, over, under or within 8m of main rivers will be subject to an Environmental Permit (flood risk activities). Construction will, therefore, will accord with the conditions of the permit in relation to construction methods and temporary works and will be agreed with the Environment Agency. However, in a fluvial flood event, the cofferdam will increase flood risk. Therefore, the temporary impact of the cofferdam on local water levels and velocity and, consequently, flood risk, may be considered **moderate adverse**.

*Sensitivity of receptor*

4.1.73 With respect to flood risk, the outfall location is within Flood Zone 3. However, fluvial flood defences along the River Cam within the vicinity of the outfall structure consist of high ground to a 1 in 10 year design standard of protection. Environment Agency historical flood records demonstrate that the outfall location was not affected in the 2001 flood event, although it was affected in the 1947 flood event. The River Cam at the outfall location is therefore considered to have **medium** sensitivity in terms of fluvial flood risk.

*Significance of effect*

4.1.74 The magnitude of impact of the outfall construction area on flood risk for the River Cam is **moderate adverse**. Combined with the **medium** sensitivity for flood risk, there would be a **moderate adverse** temporary effect on flood risk for the River Cam, which is **significant**.

*Secondary mitigation or enhancement*

4.1.75 Construction planning will include a programme to minimise the time in which the cofferdam is in place. Works phasing to be detailed within the CEMP prepared for the outfall construction.

*Residual effect*

4.1.76 A risk of flooding will remain regardless of the programming of outfall construction. Therefore a residual **moderate adverse** temporary effect remains applicable, the same as detailed above**.**

***Construction of the TPS shaft – flows in watercourses***

4.1.77 This assessment considers the impact of dewatering of the West Melbury Marly Chalk Formation on flows in watercourses including the River Cam, Black Ditch and Quy Water, during construction of the TPS shaft.

*Magnitude of impact*

4.1.78 Analysis has been undertaken (Appendix 20.4, App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note) of the potential rates of dewatering required during excavation and construction of the TPS shaft. The analysis indicated that dewatering rates could be in the range of 1.7l/s to 5.2l/s, equivalent to 146m$^3$/d to 450m$^3$/d. These rates are for the reasonable worst-case condition in which dewatering is from a limited horizon at the base of the West Melbury Marly Chalk Formation with dewatering required over a period of seven days.

4.1.79 The main impact of dewatering would be expected to occur to flows in Black Ditch which is located downgradient of the TPS. However, any impact on surface flows as a result of dewatering should be attenuated over time in response to changes in groundwater flows and groundwater storage in the aquifer. The impact on Black Ditch is therefore expected to comprise a temporary reduction in flows of substantially less than 5.2l/s over a period of several weeks, or possibly months, following the start of dewatering in the TPS shaft. If this temporary reduction occurs in a dry period in which flows in the ditch are already very low, the flows could be further reduced temporarily or possibly reduced to no flow. As discussed in Section 3.1, the IDB has indicated that, currently, Black Ditch can go dry in summer months and periods of standing water (no flow or very low flow) are quite frequent. Hence, a limited additional, temporary reduction in flow should produce no change to the overall integrity of the receptor. Therefore, on a precautionary basis assuming the worst case of very low flows, the impact on Black Ditch is classified as **minor adverse**. With higher flows in the ditch at the time of dewatering, the overall flow regime should not be affected.

4.1.80 The River Cam and Quy Water are at a greater distance than Black Ditch from the TPS shaft and are both larger water bodies. The magnitude of impact of the dewatering on the River Cam and Quy Water is therefore expected to be **negligible**.

*Sensitivity of receptor*

4.1.81 The River Cam is a WFD water body. River flows recorded at Bottisham Lock indicate a $Q_{95}$ flow (flow exceeded 95% of the time) of 0.906m$^3$/s. As the $Q_{95}$ is less than 1.0m$^3$/s, the River Cam is considered to have **high** sensitivity.

4.1.82 Quy Water has a $Q_{95}$ flow of 0.013$m^3$/s (flow exceeded 95% of the time). It is an Environment Agency main river and is part of a WFD water body (known as Quy Water – Bottisham Lode) and is considered to have **high** sensitivity.

4.1.83 Black Ditch is not a WFD water body but has a substantial drainage catchment within the project area. Black Ditch is therefore considered to have **medium** sensitivity.

*Significance of effect*

4.1.84 The magnitude of impact of dewatering of the West Melbury Marly Chalk Formation to the River Cam and Quy Water during construction of the TPS shaft is **negligible**. Combined with **high** sensitivity for the River Cam and Quy Water, there would be a **slight adverse** temporary effect, which is **not significant.**

4.1.85 In the worst case, in a period of very low flows, the impact of dewatering of the West Melbury Marly Chalk Formation to Black Ditch during construction of the TPS shaft would be **minor** in terms of magnitude. Combined with the **medium** sensitivity for Black Ditch, there would be a **slight adverse** temporary effect, which is **not significant.**

*Secondary mitigation or enhancement*

4.1.86 No significant adverse effect is predicted, and no further secondary mitigation is required.

4.1.87 However, as specified in the CoCP Part B (Appendix 2.2, App Doc Ref 5.4.2.2), monitoring of water levels in Black Ditch would be undertaken for a period prior to, during and following dewatering of the shaft excavation.

*Residual effect*

4.1.88 On the basis that no significant adverse effect is predicted or further mitigation proposed, the residual effect remains **not significant** as detailed above.

***Construction of the TPS shaft affects agricultural abstraction from Black Ditch***

4.1.89 This assessment considers the impact of dewatering of the West Melbury Marly Chalk Formation on a surface water abstraction for agriculture in the Black Ditch catchment. As indicated in Section 3.1, the abstraction is located approximately 1km north-east of the land required for the construction of the proposed WWTP.

*Magnitude of impact*

4.1.90 The precise impact on the abstraction would be dependent on flows at the time in the Black Ditch catchment and any reduction in flow caused by the dewatering. However, as the abstraction is for agriculture, the licensed abstraction rate is likely to be much greater than any temporary reduction in flows due to dewatering during TPS shaft construction. Dewatering would therefore be expected to reduce the amount of flow available for the abstraction by only a small amount relative to the licensed abstraction rate.

4.1.91 As a result, the magnitude of impact on the abstraction is assessed as **minor adverse**.

*Sensitivity of receptor*

4.1.92 Agricultural abstractions are considered **medium** sensitivity.

*Significance of effect*

4.1.93 Combined with the **medium** sensitivity for the agricultural abstraction, there would be a **slight adverse** temporary effect, which is **not significant**.

*Secondary mitigation or enhancement*

4.1.94 No significant adverse effect is predicted, and no secondary mitigation is required.

4.1.95 However, as specified in the CoCP Part B (Appendix 2.2, App Doc Ref 5.4.2.2), monitoring of water levels in Black Ditch would be undertaken for a period prior to, during and following dewatering of the shaft excavation.

*Residual effect*

4.1.96 On the basis that no significant adverse effect is predicted or further mitigation proposed, the residual effect remains **not significant** as detailed above.

***Construction of the TPS shaft – dewatering in the West Melbury Marly Chalk Formation***

4.1.97 This section considers the impact of dewatering of the West Melbury Marly Chalk Formation on groundwater levels during construction of the TPS shaft.

*Magnitude of impact*

4.1.98 Analysis has been undertaken (Appendix 20.4, App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note) to assess the impact of TPS shaft dewatering in reducing groundwater levels at local receptors. The analysis indicated that, for the range of dewatering rates from 1.7l/s to 5.2l/s, the reduction in groundwater level is calculated to vary between zero and 0.25m at a distance of about 600m from the shaft, towards the Scheme Order Limits in the direction of Black Ditch. For the maximum dewatering rate (5.2l/s), the reduction in groundwater level is calculated to be 0.001m (1mm) at about 1.7km from the shaft. However, the impacts on groundwater levels would be temporary and localised. Groundwater levels would start to recover once dewatering had ceased, although full recovery might take a few weeks or months depending on the season and whether natural recharge of the aquifer was occurring at the time. The dewatering should, however, produce no permanent change to the integrity of the aquifer. The impact is classified as **minor adverse** owing to the temporary, localised, short-term changes to groundwater levels.

4.1.99 The analysis also indicated that the temporary impact in reducing groundwater levels in the West Melbury Marly Chalk Formation at the location of a private groundwater

source in the vicinity of the proposed WWTP could potentially be up to 20mm. As discussed in the information on groundwater abstraction in Section 3.1 Current baseline, the source comprises a borehole constructed in the Lower Greensand through the base of an older well in the West Melbury Marly Chalk Formation. Groundwater from the West Melbury Marly Chalk Formation may still contribute to this water supply source, although most of the yield for the source is obtained from the Lower Greensand. Therefore, the magnitude of impact on this private water source is considered to be **negligible**.

*Sensitivity of receptor*

4.1.100 The Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, is classified by the Environment Agency as a Principal aquifer and is therefore assigned **high** sensitivity.

4.1.101 The sensitivity of the private drinking water source is assessed as **high**.

*Significance of effect*

4.1.102 The impact of dewatering during construction of the TPS shaft on groundwater is **minor** in terms of magnitude. Combined with **high** sensitivity, there would be a **moderate adverse** effect on the aquifer in the West Melbury Marly Chalk Formation, which is **significant.** The effect on the aquifer would, however, be temporary and localised.

4.1.103 The impact of dewatering during construction of the TPS shaft on the private groundwater supply is **negligible** in terms of magnitude. Combined with **high** sensitivity, there would be a **slight adverse** effect on the private groundwater supply, which is **not significant.**

*Secondary mitigation or enhancement*

4.1.104 No further mitigation is possible in relation to the impact of dewatering during construction of the TPS shaft on groundwater in the West Melbury Marly Chalk Formation.

4.1.105 However, in order to confirm the impacts due to the dewatering, monitoring of water levels would be undertaken in available monitoring boreholes within the land required for the landscape masterplan, as specified in the CoCP Part A (Appendix 2.1, App Doc Ref: 5.4.2.1). The monitoring would be carried out for a period prior to, during and following dewatering of the shaft excavation. The scope and duration of borehole water level and quality monitoring will be agreed with all relevant stakeholders before works commence.

4.1.106 No significant adverse effect is predicted for the private groundwater abstraction and no further secondary mitigation is required. However, a no-derogation agreement will be made with the owner of the private groundwater source, which will

be effective throughout the construction of the proposed WWTP. This legal agreement will ensure that, in the unlikely event that the private supply from the groundwater source could be significantly affected, measures would be taken to maintain a supply throughout the period in which the groundwater source was affected.

*Residual effect*

4.1.107 On the basis that no further mitigation is possible, the residual effects remains the same as detailed above; significant for the West Melbury Marly Chalk Formation aquifer, and not significant for the private groundwater supply.

***Construction of the TPS shaft – nature conservation sites***

4.1.108 This section considers the impact of dewatering during construction of the TPS shaft on groundwater levels at nature conservation sites in the vicinity of the proposed WWTP. These sites comprise:

- Allicky Farm CWS, located adjacent to Black Ditch and about 1km north-east of the proposed WWTP;
- Stow-cum-Quy Fen SSSI, about 1.5km north-east of the proposed WWTP. A section of Black Ditch is located just within the SSSI boundary; and
- Wilbraham Fens SSSI, in an area of drainage channels adjacent to an upstream reach of Quy Water, approximately 2km from the proposed WWTP.

*Magnitude of impact*

4.1.109 The analysis undertaken (Appendix 20.4, App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note) on the impact of TPS shaft dewatering on groundwater levels indicated that, for the maximum estimate of the dewatering rate (5.2l/s), the impact on groundwater levels at the three conservation sites would be less than 1mm (<0.001m). Therefore, there should be a **negligible** impact on groundwater levels at the sites as a result of the dewatering.

4.1.110 As indicated in Section 3.1 (Current baseline), Black Ditch discharges along and within the boundary of Stow-cum-Quy Fen SSSI. The above assessment for Black Ditch indicates that, in the worst case of very low flows, the temporary impact resulting from dewatering during construction of the TPS shaft on flows and water levels in Black Ditch would be **minor adverse**. With higher flows in the ditch at the time of dewatering, the overall flow regime should not be affected.

*Sensitivity of receptor*

4.1.111 The sensitivity of receptors is not determined for nature conservation sites as part of the water resources assessment. The sensitivity for Stow-cum-Quy Fen SSSI is specified as part of Chapter 8: Biodiversity (App Doc Ref 5.2.8).

*Significance of effect*

4.1.112 The significance of effect is not determined for nature conservation sites as part of the water resources assessment. The significance of effect for Stow-cum-Quy Fen SSSI is specified in Chapter 8: Biodiversity, taking into account the impact on water resources at the sites as a result of the dewatering.

*Secondary mitigation or enhancement*

4.1.113 No further mitigation is required in relation to the impact of the dewatering on groundwater levels at nature conservation sites. However, monitoring of water levels would be undertaken in the Allicky Farm Pond CWS and Stow-cum-Quy Fen SSSI nature conservation sites which are located in the Black Ditch catchment down-gradient of the proposed WWTP. Water levels would be monitored in The Cut at Stow-cum-Quy Fen. As indicated in Section 3.1 Current baseline, The Cut is an open water body formed in an excavation in the West Melbury Marly Chalk Formation. Monitoring would include a period prior to, during and following dewatering of the shaft excavation.

4.1.114 In addition, monitoring of water levels in Black Ditch would be undertaken to include a period prior to, during and following dewatering of the shaft excavation, as set out in CoCP Part B (Appendix 2.2, App Doc Ref: 5.4.2.2). The scope and duration of borehole water level and quality monitoring will be agreed with all relevant stakeholders before works commence.

*Residual effect*

4.1.115 The residual effect is not determined for nature conservation sites as part of the water resources assessment. The residual effect for Stow-cum-Quy Fen SSSI is specified in Chapter 8: Biodiversity, taking into account the negligible impact on groundwater levels at the sites as a result of the dewatering.

***Groundworks for proposed WWTP – dewatering in the West Melbury Marly Chalk Formation***

4.1.116 This assessment considers the reduction in groundwater flows and levels due to dewatering in the West Melbury Marly Chalk Formation, associated with the construction of below-ground structures and foundations for the proposed WWTP. The associated impact that the reductions in groundwater flows and levels could have on flows in the River Cam, Quy Water and Black Ditch, on a surface water abstraction in the Black Ditch catchment, and on groundwater levels at nature conservation sites, is also assessed.

*Magnitude of impact*

4.1.117 Detailed assessments of the impacts of dewatering associated with excavation of the TPS shaft are discussed in separate sections above relating to the construction of the shaft. These assessments indicate that dewatering rates are likely to be relatively low, in

the range of 1.7l/s to 5.2l/s. The estimated dewatering rates are a result of the low transmissivity of the aquifer identified from testing in the vicinity of the shaft.

4.1.118 Although no detailed separate assessment has been carried out for dewatering associated with foundations and other below-ground structures, it is considered unlikely that aquifer conditions will vary greatly in the West Melbury Marly Chalk Formation across the area of the proposed WWTP. No other excavations for below-ground structures are expected to penetrate through the entire thickness of the West Melbury Marly Chalk Formation, as is the case for the TPS shaft. The shallower depths of these structures should, therefore, contribute to limiting dewatering requirements. However, some of the structures cover a much greater area than the TPS shaft excavation, and dewatering requirements and periods of dewatering will vary between structures. The main below-ground structures, extending to 5m or more below ground level, will cover a total area of about 27,000m$^2$. Of these structures, the settlement tanks are installed to the greatest depth (8m) and cover an area of more than 6,000m$^2$.

4.1.119 Data obtained in 2021/22 indicates that groundwater levels within the land required for the construction of the proposed WWTP varied between about 2m and 5m below ground level between late winter/spring and summer/autumn conditions. Therefore, some dewatering could be needed during construction of all the main below-ground structures, with the highest level of dewatering likely to be required for the settlement tanks. However, the dewatering associated with these structures will take place intermittently over an extended period during the construction programme, spreading out the impact on local groundwater levels. As a result, the temporary magnitude of impact on groundwater levels is assessed as **minor adverse**, taking into account the factors described above. In addition, based on the analysis for dewatering associated with the TPS shaft and the calculated extents of drawdown, the impact on groundwater levels at nature conservation sites in the area (Allicky Farm CWS, Stow-cum-Quy Fen SSSI and Wilbraham Fens SSSI) is assessed as **negligible**.

4.1.120 Any temporary reduction in groundwater levels in the West Melbury Marly Chalk Formation at the location of the private groundwater source in the vicinity of the proposed WWTP should also have a **negligible** impact on this private water source. As indicated previously, the source comprises a borehole, constructed in the Lower Greensand through the base of an older well in the West Melbury Marly Chalk Formation. Although groundwater from the West Melbury Marly Chalk Formation may still contribute to this water supply source, most of the yield is obtained from the Lower Greensand.

4.1.121 The main impact of dewatering for groundworks would be expected to occur to flows and water levels in Black Ditch, located downgradient of the proposed WWTP in which the below-ground structures and foundations will be constructed. As already discussed, there is also a licensed surface water abstraction for agriculture from Black Ditch. The temporary magnitude of impact of dewatering for groundworks on both flows and levels in Black Ditch, and on this surface water abstraction, should be **minor adverse**, as

discussed for dewatering during construction of the TPS shaft. However, the impact is likely to extend intermittently over a substantially longer period than for construction of the TPS shaft.

4.1.122 As also discussed in the assessment of the impact of TPS shaft dewatering, the River Cam and Quy Water are at a greater distance than Black Ditch from the proposed WWTP and are both larger water bodies. The magnitude of impact of the dewatering on the River Cam and Quy Water is therefore expected to be **negligible**.

*Sensitivity of receptor*

4.1.123 The Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, is classified by the Environment Agency as a Principal aquifer and is therefore assigned **high** sensitivity.

4.1.124 The sensitivity of the private drinking water source is also assessed as **high**.

4.1.125 The River Cam and Quy Water are Environment Agency main rivers and are WFD water bodies and are considered to have **high** sensitivity.

4.1.126 Black Ditch is not a WFD water body and is considered to have **medium** sensitivity.

4.1.127 Agricultural abstractions are considered **medium** sensitivity.

4.1.128 The sensitivity of receptors is not determined for nature conservation sites as part of the water resources assessment but is considered in Chapter 8: Biodiversity.

*Significance of effect*

4.1.129 The magnitude of impact of dewatering on groundwater in the West Melbury Marly Chalk Formation is minor adverse in terms of magnitude. Combined with a high sensitivity, there would be a moderate adverse temporary and localised effect on the aquifer in the West Melbury Marly Chalk Formation which is **significant**. Subsequent recharge of the aquifer by rainfall, following the completion of the groundworks, would be expected to compensate for the temporary loss of groundwater.

4.1.130 The magnitude of impact of dewatering on the private drinking water source is negligible. Combined with a high sensitivity, there would be a slight adverse effect, which is **not significant.**

4.1.131 The magnitude of impact of dewatering of the West Melbury Marly Chalk Formation on the River Cam and Quy Water is negligible. Combined with high sensitivity, there would be a slight adverse temporary effect on the River Cam and Quy Water, which is **not significant.**

4.1.132 The magnitude of impact of dewatering of the West Melbury Marly Chalk Formation on Black Ditch, and the agricultural abstraction from Black Ditch, is minor adverse. Combined with the medium sensitivity for Black Ditch and the agricultural abstraction, there would be a slight adverse temporary effect, which is **not significant.**

4.1.133 The significance of effect is not determined for nature conservation sites as part of the water resources assessment but is considered in Chapter 8: Biodiversity.

*Secondary mitigation or enhancement*

4.1.134 No mitigation is possible in relation to the impact of dewatering during groundworks on groundwater in the West Melbury Marly Chalk Formation.

4.1.135 No significant adverse effect is predicted for the private groundwater abstraction and no secondary mitigation is required. However, a no-derogation agreement will be made with the owner of the private groundwater source, which will be effective throughout the construction of the proposed WWTP. This legal agreement will ensure that, in the unlikely event that the private supply from the groundwater source could be significantly affected, measures would be taken to maintain a supply throughout the period in which the groundwater source was affected.

4.1.136 No significant adverse effect is predicted for watercourses in the vicinity of the proposed WWTP, or the surface water abstraction from Black Ditch, and no secondary mitigation is required.

4.1.137 In order to assess the impacts due to the dewatering, monitoring of water levels would be undertaken in available monitoring boreholes within the land required for the landscape masterplan, and in Black Ditch as set out in the CoCP Parts A and B (Appendix 2.1 and 2.2, App Doc Ref: 5.4.2.1, App Doc Ref: 5.4.2.2). In addition, monitoring of water levels would be carried out in the Allicky Farm Pond CWS and in the largest, open water body at Stow-cum-Quy Fen SSSI (The Cut), formed in an excavation in the West Melbury Marly Chalk Formation. Monitoring of water levels in boreholes and these water features would be carried out for a period prior to, during and following all dewatering activities for construction at the proposed WWTP. The scope and duration monitoring will be agreed with all relevant stakeholders before works commence.

*Residual effect*

4.1.138 On the basis that no mitigation is possible in relation to the impact of dewatering during groundworks on groundwater in the West Melbury Marly Chalk Formation, the residual effect remains **significant**.

4.1.139 On the basis that no significant adverse effect is predicted or further mitigation proposed in relation to the private groundwater abstraction, watercourses in the vicinity of the proposed WWTP, or the surface water abstraction from Black Ditch, the residual effects remain **not significant**.

***Groundworks and other construction activities for the proposed WWTP – groundwater quality***

4.1.140 This assessment considers the potential impacts of spillages of potentially contaminating materials used in construction, and the potential for construction-related turbidity, giving rise to contamination of groundwater.

*Magnitude of impact*

4.1.141 Without rigorous groundwater protection measures during excavation and construction activities, spillage of contaminants could lead to the localised contamination of the aquifer. The magnitude of impact on groundwater quality, resulting from a risk of contaminant spills, is assessed as **moderate adverse**.

4.1.142 Best practice groundwater protection measures, which are standard practice to prevent contamination, will be implemented during all construction. The measures are discussed in CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1). They will be included in a CEMP and implemented throughout construction. Taking into account best practice measures the magnitude of impact on groundwater quality, resulting from a risk of contaminant spills, is assessed as **slight adverse** and **not significant.**

4.1.143 There is a private groundwater source located on the West Melbury Marly Chalk Formation in the vicinity of the proposed WWTP. As indicated in the information on groundwater abstraction in Section 3.1 Current baseline, the source comprises a borehole constructed in the Lower Greensand, through the base of an older well in the West Melbury Marly Chalk Formation. Groundwater from the West Melbury Marly Chalk Formation may still contribute to this water supply source, although the yield for the source is obtained from the borehole in the Lower Greensand. If contamination was not controlled and allowed to migrate away from the proposed WWTP it is possible that water quality in this private groundwater source could be affected. The magnitude of impact on the private groundwater source, resulting from a risk of contaminant spills, would also be **moderate adverse**.

4.1.144 There is also potential for below-ground engineering work to increase turbidity levels in groundwater sources. However, dewatering associated with the construction of below-ground structures for the proposed WWTP should mitigate the turbidity risk, as groundwater flow locally will be towards the dewatering location.

4.1.145 The turbidity impact on this private water source due to construction activity in the West Melbury Marly Chalk Formation at the proposed WWTP should therefore be **negligible**. In addition, the turbidity risk to the aquifer, other than in the immediate vicinity of groundworks during construction, should also be **negligible**.

4.1.146 In summary, the magnitude of impact on groundwater quality in the aquifer and the private groundwater source, taking into account the risk of contaminant spills, is considered **moderate adverse.** The magnitude of impact of below-ground construction

activity on turbidity of groundwater, and on the private water source, is considered **negligible**.

*Sensitivity of receptor*

4.1.147 The Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, is classified by the Environment Agency as a Principal aquifer and is therefore assigned **high** sensitivity.

4.1.148 Private water sources are also considered **high** sensitivity.

*Significance of effect*

4.1.149 The impact of groundworks for the proposed WWTP on groundwater quality in the aquifer and the private groundwater source is assessed as **moderate adverse** in terms of magnitude. The effect on the West Melbury Marly Chalk Formation aquifer and the private groundwater source, both assessed as **high** sensitivity receptors, would be **moderate adverse** and **significant**.

4.1.150 The impact of groundworks for the proposed WWTP on turbidity is assessed as **negligible** in terms of magnitude. The effect on the West Melbury Marly Chalk Formation aquifer and the private groundwater source, both **high** sensitivity receptors, would be **slight adverse** and **not significant**.

*Secondary mitigation or enhancement*

4.1.151 The CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) includes provision for monitoring of water quality in available monitoring boreholes, within the land required for the landscape masterplan, which would be undertaken for a period prior to, during and following all dewatering activities for construction at the proposed WWTP.

4.1.152 In addition, a no-derogation agreement will be made, if required, with the owner of the private groundwater source which will be effective throughout the construction of the proposed WWTP, and for an agreed period following construction, as set out in the COCP Part B (Appendix 2.2, App Doc Ref: 5.4.2.2). This legal agreement will ensure that, in the unlikely event that the private supply from the groundwater source could be significantly affected, measures would be taken to maintain a supply throughout the period in which the groundwater source was affected.

*Residual effect*

4.1.153 The implementation of rigorous groundwater protection measures would reduce the potential impact on groundwater quality and the private groundwater source to **negligible**. Combined with **high** sensitivity for the Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, and for the groundwater source, there would be a **slight adverse** residual effect for both receptors, which is **not significant**.

4.1.154 On the basis that no significant adverse effect is predicted, or further mitigation proposed, the residual effect in relation to increased turbidity in the aquifer remains **not significant**.

***Groundworks and other construction activities for the proposed WWTP – surface water quality***

4.1.155 This assessment considers the following impacts to surface water quality due to:

- spillages of potentially contaminating materials used in construction giving rise to contamination of surface water features, including Black Ditch and the River Cam; and
- discharge of silt-laden water from dewatering of pits and excavations, or in run-off from construction areas, affecting surface water quality.

*Magnitude of impact*

4.1.156 Spillages could lead to the contamination of local drains, including any land drainage in the construction area, which might then spread downgradient to watercourses. The main impact of construction on surface water bodies would be expected to occur in surface drains connected to Black Ditch, which is located downgradient of the proposed WWTP. However, the area of the main site compound drains towards the River Cam. The magnitude of impact on surface water quality resulting from contaminant spills would be **major adverse**.

4.1.157 Sediment could be discharged via overland flow to drains and, hence, to these downgradient watercourses. Particularly high sediment loads could occur in drains in periods of wet weather when runoff rates increase. The magnitude of impact of high sediment loads on watercourses would be **moderate adverse**.

*Sensitivity of receptor*

4.1.158 Surface water drains within the vicinity of the proposed WWTP are assigned **low** sensitivity. Black Ditch is not a WFD water body and is considered to have **medium** sensitivity. The River Cam is an Environment Agency main river and a WFD water body; it is considered to have **high** sensitivity.

*Significance of effect*

4.1.159 The magnitude of impact resulting from the risk of accidental construction spillages on surface water bodies is considered **major adverse**. Combined with the **low** and **medium** sensitivity of surface water drains and Black Ditch, there would be a **moderate adverse** temporary effect, which is **significant.** Combined with the **high** sensitivity for the River Cam, there would be a **major adverse** temporary effect, which is **significant.**

4.1.160 The magnitude of impact of the discharge of silt-laden water on surface water bodies is considered **moderate adverse**. Combined with the **low** sensitivity of surface water drains, there would be a **slight adverse** temporary effect, which is **not significant.** Combined with the **medium** sensitivity of Black Ditch, there would be a **moderate adverse** temporary effect, which is **significant.** Combined with the **high** sensitivity for the River Cam, there would also be a **moderate adverse** temporary effect, which is **significant.**

*Secondary mitigation or enhancement*

4.1.161 Rigorous protection measures, which are standard practice to prevent contamination and discharge of silt-laden water in run-off, will be implemented during all construction. The measures are discussed in the CoCP Parts A and B (Appendix 2.1 and 2.2, App Doc Ref 5.4.2.1, App Doc Ref 5.4.2.2 ).

4.1.162 The protection measures will be included in a CEMP and implemented throughout construction. The measures will minimise the risk of contaminant spills or discharge of silt-laden water to surface water bodies and include provision for monitoring of water quality at Black Ditch. Monitoring would be undertaken for a period prior to, during and following construction activities at the proposed WWTP.

4.1.163 Assuming best-practice construction measures are adopted it is considered that:

- accidental contaminant spillages will be prevented from contaminating any ditches, drains or surface watercourses; and
- any silt-laden discharge would be of short duration and of sufficiently low concentration as to be acceptable to the Environment Agency.

4.1.164 The predicted magnitude of impact to surface water bodies in the event of contaminant spillages or discharge of silt-laden water is therefore considered **negligible**.

*Residual effect*

4.1.165 The implementation of rigorous protection measures would reduce the potential impacts to surface water resulting from the risk of contaminant spillages or from discharge of silt-laden water to **negligible**. Combined with the **low** sensitivity of surface water drains and the **medium** sensitivity of Black Ditch, there would be a **neutral** temporary effect, which is **not significant.** Combined with the **high** sensitivity for the River Cam, there would be a **slight** temporary effect, which is also **not significant.**

***Groundworks and other construction activities for the proposed WWTP – surface water flood risk***

4.1.166 This assessment considers the impact of construction sites increasing surface water flood risk by increasing surface water runoff during periods of heavy rainfall. The FRA (Appendix 20.1, App Doc Ref 5.4.20.1 Flood risk assessment) demonstrates that the existing surface water flood risk to the Proposed Development is very low.

*Magnitude of impact*

4.1.167 Uncontrolled runoff from areas of hardstanding or impermeable surfaces in areas of construction would contribute to increased runoff and surface water flood risk associated with local drains and the catchments of Black Ditch and the River Cam.

4.1.168 The impact in the area around the construction sites and on local drains would be **moderate adverse**.

4.1.169 During periods of heavy rainfall, surface water runoff would follow topography. Overland flow is therefore likely to be towards the north-east, where it would be intercepted by a series of surface drains which discharge to Black Ditch. Taking into account the small area of the proposed WWTP and associated construction features, as compared to the extent of the Black Ditch catchment, the impact on surface water flood risk in the catchment is considered to be **minor adverse**. The impact on surface water flood risk for a residential receptor located in the catchment to the east of the Proposed Development, is also considered to be **minor adverse**.

4.1.170 The area of the main site compound drains towards the River Cam. However, taking into account the very limited area of the compound and associated construction features in the River Cam catchment, the impact on surface water flood risk in this wider catchment is considered to be **negligible**.

*Sensitivity of receptor*

4.1.171 Surface water drains are considered **low** sensitivity. Black Ditch is not a WFD water body and is considered to have **medium** sensitivity.

4.1.172 The area of the main site compound drains towards the River Cam. The River Cam is an Environment Agency main river and a WFD water body; it is considered to have **high** sensitivity.

4.1.173 A residential receptor in the Black Ditch catchment, east of the Proposed Development, is classified as 'more vulnerable' or 'highly vulnerable' according to flood risk vulnerability classification within the NPPF (Department for Levelling Up, Housing and Communities, 2021) and is therefore considered to be of **high** sensitivity.

*Significance of effect*

4.1.174 The impact of construction increasing surface water flood risk in local drains and the residential receptor by increasing surface water runoff during periods of heavy rainfall is considered **moderate adverse** in terms of magnitude. Combined with the **low** sensitivity of the drains, the effect is **slight** and **not significant.**

4.1.175 The impact of construction increasing surface water flood risk in the catchment for Black Ditch during periods of heavy rainfall is considered **minor** in terms of magnitude. Combined with the **medium** sensitivity of Black Ditch, the effect is **slight**

**adverse** and **not significant.** However, combined with the **high** sensitivity of the residential receptor, the effect is **moderate adverse** and **significant.**

4.1.176 The impact of construction increasing surface water flood risk in the catchment for the River Cam during periods of heavy rainfall is considered **negligible** in terms of magnitude. Combined with the **high** sensitivity of the River Cam, the effect is **slight adverse** and **not significant**.

*Secondary mitigation or enhancement*

4.1.177 An Emergency Preparedness Plan will be a sub-plan appended to the CEMP. This plan will set out requirements in construction areas to minimise impacts to the works areas and surrounding area from flooding and prevent any significant effects on the existing flood risk in the surrounding area.

*Residual effect*

4.1.178 The implementation of the plans to minimise impacts to the works and surrounding area from flooding and prevent any significant effects on the existing flood risk in the surrounding area will reduce the impact on flooding to **negligible** in:

- local surface water drains; and
- the Black Ditch catchment, including at the location of the residential receptor east of the Proposed Development.

4.1.179 Combined with the **low** sensitivity of the drains, the residual effect is **neutral** and **not significant.** Combined with the **medium** sensitivity of Black Ditch, the residual effect is also **neutral** and **not significant.**

4.1.180 Combined with the **high** sensitivity of the residential receptor in the Black Ditch catchment, the residual effect is **slight adverse** and **not significant**.

***Testing and commissioning of proposed WWTP – groundwater quality***

4.1.181 This assessment considers the impact to groundwater quality due to wet testing of tanks and pipes.

4.1.182 Tests will be undertaken on tanks and pipes following installation to ensure they will hold water at the design pressure and not leak. The source of this water will be agreed as part of a commissioning plan. The source may comprise final effluent from the existing Cambridge WWTP or from the existing Waterbeach WRC, conveyed to the proposed WWTP via the new waste water transfer tunnel or Waterbeach pipeline.

4.1.183 A temporary lagoon may be constructed in the vicinity of the proposed WWTP to hold the water for testing. The lagoon will be lined to prevent leakage to the underlying aquifer in the West Melbury Marly Chalk Formation.

4.1.184 It is anticipated that a permit to discharge the final effluent used for testing into local watercourses will be obtained to minimise land discharge as part of the commissioning plan. It is therefore assumed that any discharge will be at an approved location. Any impacts to groundwater quality, if discharged to ground, would be subject to control measures secured by an environmental permit.

*Magnitude of impact*

4.1.185 The magnitude of impact on groundwater quality in the West Melbury Marly Chalk Formation aquifer should be **negligible** assuming:

- all plant and equipment is installed correctly and approved for testing following any necessary inspections for defects;
- the lagoon storing the water used for testing is lined to prevent leakage; and
- discharge of any testing water to ground, if feasible, would be implemented in accordance with requirements set out within the associated environmental permit.

*Sensitivity of receptor*

4.1.186 The Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, is classified by the Environment Agency as a Principal aquifer and is therefore assigned **high** sensitivity.

*Significance of effect*

4.1.187 The impact of wet testing of tanks and pipelines on groundwater quality is **negligible** in terms of magnitude. Combined with a **high** sensitivity, there would be a **slight adverse** effect on the aquifer in the West Melbury Marly Chalk Formation, which is **not significant**.

*Secondary mitigation or enhancement*

4.1.188 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

4.1.189 On the basis that no significant adverse effect is predicted or further mitigation proposed, the residual effect remains **not significant** as detailed above.

***Testing and commissioning of proposed WWTP - transfer of waste water treatment from existing WWTP***

4.1.190 During the wet commissioning period for the proposed WWTP, expected to be approximately 6 months in duration, the treatment of waste water will be gradually transferred from the existing Cambridge WWTP to the proposed WWTP. There will be a progressive reduction in final effluent discharge from the existing Cambridge WWTP

outfall, and a corresponding increase in discharge from the proposed WWTP outfall. Discharge from the existing outfall, which is approximately 90m upstream of the proposed outfall, will eventually cease entirely as part of the decommissioning of the existing Cambridge WWTP.

4.1.191 This transfer of final effluent discharge between locations is expected to have an impact on water quality in the River Cam.

*Magnitude of impact*

4.1.192 Table 4-1 includes the current discharge consent limits and proposed discharge consent limits (based on Pre-application advice) for water quality determinants. The consent limits for determinant concentrations listed in the pre-application advice are between 27% and 60% lower than the current consent limits for these determinants. Hence, during the transfer from the existing Cambridge WWTP to the proposed WWTP, there should be an improvement in water quality downstream of the proposed WWTP, as compared to current water quality in the same reaches of the River Cam. This reduction in determinant concentrations would result from the treatment processes incorporated in the proposed WWTP, needed to meet the proposed (indicative) consent limits for the effluent discharge.

**Table 4-1: Discharge consent limits: concentrations and DWF**

| Water quality parameter/determinant | Existing Cambridge WWTP | Proposed (indicative)* |
|---|---|---|
| DWF ($m^3/d$) | 37,330 | 55,000 |
| Total phosphorus (as P) (mg/l) | 1 | 0.4 |
| Total suspended solids (mg/l) | 20 | 14 |
| ATU-Biochemical Oxygen Demand (as $O_2$) (mg/l) | 15 | 11 |
| Ammoniacal nitrogen (as N) (mg/l) | 5 | 3 |
| Total iron (as Fe) µg/l | 4,000 | Not itemised in pre-application advice |
| Chloride (as Cl) mg/l | 260 | |

**Pre-application advice only. The permit application process is ongoing and discharge consent limits may be subject to change*

4.1.193 In addition, as the final effluent discharge volume from the existing Cambridge WWTP reduces, and eventually ceases entirely, there would be an improvement in water quality in the reach of the River Cam between the outfall for the existing WWTP and the proposed outfall.

4.1.194 As the population equivalent increases, a small increase in effluent discharges (and DWF) may occur between the period in which the current consent conditions apply

and the end of the transfer period. The increase in effluent discharges could increase the theoretical effluent load (DWF multiplied by concentration of each determinant) discharged to the River Cam. However, overall, any change in population equivalent between the period in which the current consent conditions apply and the end of the transfer period should only marginally affect the assessment of impact on water quality downstream of the proposed WWTP.

4.1.195 The overall improvement in water quality in the River Cam should result in a beneficial impact. In the early part of the transfer period there could be a **minor beneficial** impact on water quality when compared to current conditions; by the end of the transfer period the impact is assessed to be **moderate beneficial** when compared to current conditions.

*Sensitivity of receptor*

4.1.196 The River Cam is a WFD water body. River flows recorded at Bottisham Lock indicate a $Q_{95}$ flow (flow exceeded 95% of the time) of 0.906$m^3$/s. As the $Q_{95}$ is less than 1.0$m^3$/s, the River Cam is considered to have **high** sensitivity.

*Significance of effect*

4.1.197 The impact of the transfer in final effluent discharge from the existing WWTP to the proposed WWTP on water quality in the River Cam increases from **minor** to **moderate beneficial** during the period of transfer. Combined with **high** sensitivity, there could be a **moderate beneficial** effect on the River Cam during the period of transfer, which is **significant**.

*Secondary mitigation or enhancement*

4.1.198 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

4.1.199 On the basis that no significant adverse effect is predicted or further mitigation proposed, the residual effect remains **significant**.

## Waterbeach pipelines

4.1.200 This section sets out the assessment of effects in relation to the Waterbeach pipelines, comprising the following:

- the pipelines route transfer section from the north near Waterbeach to Low Fen Drove Way;
- the route section crossing the area of land required for the construction of the proposed WWTP; and

- the route section south of the A14, connecting to the area of land where the existing Cambridge WWTP is located.

***Open-cut installation of pipe sections – groundwater flows and levels***

4.1.201 This assessment considers the potential for a reduction in groundwater flows and levels, due to dewatering of open-cut trenches during pipeline installation, within:

- superficial deposits; and
- bedrock, in locations where superficial deposits are absent and the bedrock comprises the West Melbury Marly Chalk Formation.

*Magnitude of impact*

4.1.202 If excavation is required below the water table in any section of a trench, dewatering would be necessary to maintain dry conditions. This dewatering would be expected to give rise to temporary, short-term changes in groundwater flows and water levels in the area around the open section of the trench. However, groundwater flows and levels in the area of the pipeline corridor are expected to recover quickly after dewatering. Subsequent aquifer recharge by rainfall should compensate for any residual temporary effects on groundwater.

4.1.203 Pipelines are expected to be installed in short sections, up to about 100m in length, which could be open for a period of a few weeks. The pipelines will be located in open-cut at an average depth of 2m to 5 m below ground level. The sections of the trench would then be backfilled following pipeline installation.

4.1.204 Estimates of trench dewatering rates for superficial deposits and the West Melbury Marly Chalk Formation were included in the HIA (Appendix 20.9, App Doc Ref 5.4.20.9 Hydrogeological impact assessment (Site Selection Stage)). Dewatering rates for sections of trench in the West Melbury Marly Chalk Formation were, however, updated with permeability values derived using test pumping data obtained during the geotechnical investigation in 2021, as described in Appendix 20.4,App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note. Calculated dewatering rates vary from about 2l/s to 9l/s for superficial deposits and 1.7l/s to 3.3l/s for the West Melbury Marly Chalk Formation, assuming a worst case in which groundwater levels are at ground level in the vicinity of the trench. Any dewatering would occur in the shallow excavated deposits, depending on the depth of the groundwater level and the depth of the pipelines in open-cut.

4.1.205 Dewatering would only reduce groundwater flows and levels on a short-term basis in the vicinity of any section of trench where dewatering was needed. There would be no permanent effect on groundwater flows and levels in aquifers and therefore dewatering should have a **negligible** impact in terms of magnitude.

*Sensitivity of receptor*

4.1.206 Superficial deposits include river terrace deposits and alluvium, which are Secondary A aquifers and are considered to have **medium** sensitivity. Peat deposits, where present, are considered unproductive (not an aquifer) and are considered **low** sensitivity. The Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, is classified by the Environment Agency as a Principal aquifer and is therefore assigned **high** sensitivity.

*Significance of effect*

4.1.207 The impact of dewatering on groundwater levels and flows is considered **negligible** in terms of magnitude. The effect on the superficial deposits, comprising the **medium** sensitivity river terrace deposits and alluvium and the **low** sensitivity peat deposits in the vicinity of the waste water transfer pipelines, is **neutral** and **not significant.** Combined with **high** sensitivity for the West Melbury Marly Chalk Formation, there would be a **slight adverse** temporary effect, which is also **not significant**.

*Secondary mitigation or enhancement*

4.1.208 No significant adverse effect is predicted and no further secondary mitigation is required.

*Residual effect*

4.1.209 On the basis that no significant adverse effects are predicted or further mitigation proposed, the residual effect remains **not significant** as detailed above.

***Open-cut installation of pipe sections – groundwater abstractions***

4.1.210 This assessment considers the potential for groundwater abstractions to be affected due to dewatering of open-cut trenches during Waterbeach pipeline installation.

*Magnitude of impact*

4.1.211 As indicated in the current baseline description for groundwater in Section 3.1 Current baseline, the corridor for the Waterbeach transfer pipelines is located within the default SPZ2 for one private groundwater abstraction identified during surveys. The 8m deep well is located about 210m from the Waterbeach pipeline corridor. At this distance, dewatering, if required along this section of the pipelines, would be expected to have, at most, a **minor adverse** temporary impact (and no permanent impact) on groundwater flows and levels in the vicinity of the groundwater abstraction. If dewatering is required, groundwater flows and levels in the area of the pipeline corridor are also expected to recover quickly following pipeline installation. Dewatering would be undertaken under the Regulatory Position Statement (RPS)261 of the Environment Agency or Environmetnal Permit whichever is applicable.

*Sensitivity of receptor*

4.1.212 Any groundwater abstraction used as a private water supply is assigned **high** sensitivity.

*Significance of effect*

4.1.213 The magnitude of impact of dewatering on private water supplies is considered at most temporary **minor adverse**. Combined with **high** sensitivity for the groundwater abstractions, there would be, a **moderate adverse** temporary effect which is **significant**.

*Secondary mitigation or enhancement*

4.1.214 A no-derogation agreement will be made with the owner of the private supply source, located about 210m from the pipeline corridor, which may be impacted by dewatering during construction of the proposed WWTP.

4.1.215 The agreement would ensure that, while construction is in progress along the pipeline route in the area, regular contact would be maintained with the owner of the private groundwater abstraction in order to monitor the supply. In the unlikely event that the private supply from the groundwater source might be affected, measures would be taken to maintain a temporary supply to the property. These measures would remain in operation throughout the period in which the supply from the groundwater source was affected.

*Residual effect*

4.1.216 A no-derogation agreement will ensure continuity of water supply in the unlikely event that the groundwater source is temporarily affected during dewatering. Therefore, there will be a **negligible** residual impact in terms of magnitude.

4.1.217 Combined with **high** sensitivity for the groundwater abstraction, there would be, at most, a **slight adverse** residual effect which is **not significant**.

***Open cut installation of pipe sections – land drains and groundwater flow***

4.1.218 This assessment considers the impact of excavation and backfill of pipeline trenches on land drains and groundwater flow.

*Magnitude of impact*

4.1.219 The pipelines are expected to be installed through areas where land drains are present. Cutting through the land drains during excavation would disrupt the drainage pattern in the area. It could lead to water logging of land in wet periods in some areas on the up-gradient side of the excavation and, possibly, more rapid drying out of the ground on the down-gradient side in drier conditions.

4.1.220 If permeable materials are used to backfill trenches around the pipelines, the trenches might further disrupt land drainage in the area by acting as additional drains

cutting through the existing network. Where pipeline trenches are excavated below the water table, these trenches could also act as groundwater drains changing the direction of shallow groundwater flow locally and affecting the water table around the trenches. The changes to the water table could add to the changes in drainage and ground conditions in the area.

4.1.221 It is anticipated, however, that the materials excavated from pipeline trenches would be suitable for pipe bedding and trench backfill. None of the materials, including superficial deposits, or uppermost layers of Gault Formation or West Melbury Marly Chalk, are expected to comprise a hard material which could damage the pipelines. Both pipe bedding and backfilling would therefore utilise materials from the sections of trench from which they are excavated. As a result, the trenches would not be expected to form new pathways for drainage of shallow groundwater. Hence, as far as is practicable, there should be no change to drainage patterns in the vicinity of the pipelines.

4.1.222 Should locally excavated materials prove unsuitable for pipe bedding in any section of the pipelines, a more uniform, sandy or granular material might be used. In the event that groundwater drainage was a concern, additional measures would then be considered and might include the use of clay plugs or partitions (also referred to as clay stanks) across the trench at suitable locations as described in Chapter 2: Project Description (App Doc Ref 5.2.2). However, such measures are not expected to be necessary.

4.1.223 Depending on the extent of land drainage encountered, the magnitude of impact of pipeline trenches in interrupting flow from land drains, could be **major adverse**.

*Sensitivity of receptor*

4.1.224 As land drainage may prevent flooding by shallow groundwater in wet periods, it is considered to be a receptor with **high** sensitivity.

*Significance of effect*

4.1.225 The impact of the Waterbeach pipeline trenches on land drains is potentially **major adverse** in terms of magnitude. The effect on the land drains, which are **high** sensitivity receptors, could be **major adverse** and **significant**.

*Secondary mitigation or enhancement*

4.1.226 All land drains will be identified before works commence and the CoCP Part A Section 5.14 specifies land drain protection measures which will be implemented in the CEMP. Any potential impacts in disrupting land drainage during pipeline construction will therefore be mitigated by the CoCP.

*Residual effect*

4.1.227 The implementation of land drainage protection measures will reduce the impact on land drainage to **negligible**. Combined with the **high** sensitivity assigned to land drainage, the residual effect is **slight** and **not significant**.

***Crossing beneath the River Cam – water quality and flows***

4.1.228 This assessment considers the impact of the Waterbeach pipeline river crossings to the River Cam water quality and flows. An Environment Agency Activity Permit may be required for construction within 8m of Environment Agency flood defences. Boreholes drilled as part of ground investigations prior to construction will be used to identify measures needed to construct the crossings without affecting river flows or water quality. As indicated in CoCP Part A (Appendix 2.1 App Doc Ref 5.4.2.1), it is proposed to install the Waterbeach pipeline river crossing using horizontal directional drill (HDD) to avoid any direct impact on the River Cam and river banks. HDD pits will be set back a minimum of 10 metres from the edge of the river.

4.1.229 The following assessment therefore assumes mitigation by design.

*Magnitude of impact*

4.1.230 Trenchless crossing techniques are proposed for the two Waterbeach transfer pipelines crossings of the River Cam. The crossings will be constructed either by HDD or pipe-jack micro-tunnelling.

4.1.231 At river crossings, the pipelines will be installed in the Gault Formation below the alluvium or other superficial deposits which underlie the riverbed. The Gault Formation is not an aquifer and comprises materials with very low permeability. Therefore, minimal leakage would be expected of fluids used during the HDD or micro-tunnelling works through the Gault Formation to the superficial deposits underlying the river, or to the river itself, and negligible leakage would be expected from the river to the pipeline routes. No connecting pathway would be expected between the pipeline crossings in the Gault Formation and the riverbed. Hence the Waterbeach pipeline crossings should have a **negligible** impact on river water quality or river flows.

*Sensitivity of receptor*

4.1.232 The River Cam is an Environment Agency main river and a WFD water body; it is considered to have **high** sensitivity.

*Significance of effect*

4.1.233 The impact of the Waterbeach pipeline river crossings to River Cam water quality and flows is **negligible** in terms of magnitude. Combined with a **high** sensitivity receptor, there would be a **slight adverse** effect, which is **not significant.**

*Secondary mitigation or enhancement*

4.1.234 No significant adverse effect is predicted and no further secondary mitigation is required.

*Residual effect*

4.1.235 On the basis that no significant adverse effect is predicted, and no further mitigation is proposed, the residual effect remains **not significant** as detailed above.

***Testing and commissioning of completed pipelines – water quality***

4.1.236 This assessment considers the impacts to water quality in watercourses close to the Waterbeach pipelines due to the discharge of fluids used for pipeline testing.

*Magnitude of impact*

4.1.237 Watercourses which may be impacted are:

- River Cam;
- Black Ditch; and
- Bannold Drove Drain.

4.1.238 Pressure testing will be carried out when the pipelines are commissioned before being put into operation. Testing typically occurs in section lengths of approximately 1.5km, with reuse of the testing fluid for several sections of pipeline. Standard practice for pressure testing of pipelines is to use potable (chlorinated) water. Chlorine will, however, be removed before the water is discharged after testing, and all necessary discharge consents will be obtained and the requirements of the consents adhered to, as indicated in COCP Part B (Appendix 2.2, App Doc Ref: 5.4.2.2). If discharge from pipeline sections is required, a permit will be obtained for discharge to local drains or watercourses close to the pipelines.

4.1.239 On the basis that discharge is expected to be clean, de-chlorinated water, and discharge quality and volume will be according to permit conditions and will be temporary and of short duration, the magnitude of impact of testing fluid discharge upon local watercourses is considered **negligible**.

*Sensitivity of receptor*

4.1.240 The testing fluid may be discharged to drains or watercourses which connect downstream to the River Cam and, possibly, in some locations, to Black Ditch. As the discharge could contribute to the flows in these more substantial downstream water bodies, the sensitivities of the downstream water bodies are considered in the assessment.

4.1.241 The River Cam is a WFD water body and is considered to have **high** sensitivity. Black Ditch is not a WFD water body and is considered to have **medium** sensitivity.

4.1.242 Some testing fluid may also be discharged to Bannold Drove Drain near Waterbeach. This is a surface water drain which is considered **low** sensitivity.

*Significance of effect*

4.1.243 The impact of discharge of testing fluid during pipeline testing to the water quality of the River Cam, Black Ditch or Bannold Drove Drain is **negligible** in terms of magnitude.

4.1.244 The effect on the River Cam, which is a **high** sensitivity receptor, is **slight adverse** and **not significant.** The effect on Black Ditch and Bannold Drove Drain, which are **medium** and **low** sensitivity receptors, is **neutral** and **not significant.**

*Secondary mitigation or enhancement*

4.1.245 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

4.1.246 On the basis that no significant adverse effect is predicted and no further mitigation proposed, the residual effect remains **not significant** as detailed above.

## Existing Cambridge WWTP

4.1.247 This section sets out the assessment of effects in relation to activities within the existing Cambridge WWTP.

***Connection of the waste water transfer tunnel to existing Riverside tunnel – groundwater quality***

4.1.248 This assessment considers the impact to groundwater quality in the event of accidental wastewater spills during connection of the waste water transfer tunnel to the existing Riverside tunnel.

*Magnitude of impact*

4.1.249 When breaking into the existing tunnel, over-pumping of waste water is likely to be carried out. The works required may involve the construction of an additional temporary shaft for use when diverting flows from the riverside tunnel into the transfer tunnel. In addition, gravity and rising main pipelines will also be diverted into the new tunnel.

4.1.250 Any wastewater spillages occurring during the connection of these tunnels and pipelines could give rise to a temporary, localised impact on groundwater quality in the vicinity of the tunnels. The magnitude of impact of spillages to groundwater quality is considered to be **moderate adverse**.

*Sensitivity of receptor*

4.1.251 The tunnel will be constructed within the Gault Formation, which is classified by the Environment Agency as unproductive (not an aquifer). The Gault Formation is considered to be of **low** sensitivity. Some works may, however, be undertaken in superficial river terrace deposits overlying the Gault Formation. The river terrace deposits (sand and gravel) are classified as a Secondary A aquifer and are therefore considered to have **medium** sensitivity.

*Significance of effect*

4.1.252 The impact of connection of the riverside tunnel to the waste water transfer tunnel, and associated works, to groundwater quality is **moderate adverse** in terms of magnitude. Combined with a **low** sensitivity receptor (the Gault Formation), there would be a **slight adverse** effect which is **not significant.** Combined with a **medium** sensitivity receptor (the river terrace deposits), there would be a **moderate adverse** effect which is **significant.** The implementation of best construction practices and applying rigorous groundwater protection measures would reduce the potential impact on groundwater quality to **negligible**.

*Secondary mitigation or enhancement*

4.1.253 Work required for the connection of the waste water transfer tunnel to the existing riverside tunnel and other pipelines will be undertaken using best construction practices and measures set out within Section 7.5 of the CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) and implemented through the CEMP.

*Residual effect*

4.1.254 Combined with **medium** sensitivity for the river terrace deposits and **low** sensitivity for the Gault Formation, there would be a **neutral** residual effect for both receptors, which is **not significant**.

***Construction of shafts – groundwater quality***

4.1.255 This assessment considers the impact to groundwater quality due to construction of interception Shaft 1, intermediate Shaft 2 and intermediate Shaft 3 at the existing Cambridge WWTP within the:

- superficial deposits; and
- Gault Formation.

4.1.256 Specialised deep shaft construction techniques will be used. These may involve segmental shaft lining, contiguous bored shafts, or similar techniques, to be determined based on geotechnical information.

*Magnitude of impact*

4.1.257 Without rigorous groundwater protection measures during excavation and construction, spillage of contaminants could lead to the localised contamination of aquifer formations in which the shafts are constructed. The magnitude of impact on groundwater quality, resulting from a risk of contaminant spills, is assessed as **moderate adverse**.

*Sensitivity of receptor*

4.1.258 The river terrace deposits (sand and gravel) are classified as a Secondary A aquifer and are therefore considered to have **medium** sensitivity. The underlying bedrock Gault Formation is unproductive and is considered **low** sensitivity.

*Significance of effect*

4.1.259 The impact of shaft construction to groundwater quality is **moderate** in terms of magnitude. Combined with the **medium** sensitivity for the river terrace deposits, the effect is **moderate adverse** and **significant.** Combined with the **low** sensitivity for the Gault Formation, the effect is **slight adverse** and not **significant.**

*Secondary mitigation or enhancement*

4.1.260 Work required in construction of the shafts will be undertaken using best construction practices and applying rigorous groundwater protection measures as outlined in CoCP Part A, Appendix 2.1 (App Doc Ref 5.4.2.1) and implemented through the CEMP.

*Residual effect*

4.1.261 The implementation of best construction practices and applying rigorous groundwater protection measures would reduce the potential impact on groundwater quality to **negligible**. Combined with **medium** sensitivity for the river terrace deposits and **low** sensitivity for the Gault Formation, there would be a **neutral** residual effect for both receptors, which is **not significant**.

***Construction of shafts – groundwater levels***

4.1.262 This assessment considers the impact to groundwater levels due to construction of interception shaft 1, intermediate shaft 2 and intermediate shaft 3 within the existing Cambridge WWTP within:

- superficial deposits; and
- Gault Formation.

4.1.263 The base of the superficial deposits is a maximum of 3.8mbgl in borehole logs for the existing Cambridge WWTP available from the BGS (British Geological Survey, 2022).

4.1.264 Specialised deep shaft construction techniques will be used. These may involve segmental shaft lining, contiguous bored shafts, or similar techniques, to be determined based on geotechnical information.

*Magnitude of impact*

4.1.265 No detailed assessment has been carried out for dewatering associated with the shafts and there may be a temporary, localised impact on groundwater levels within the river terrace deposits (a Secondary A aquifer), which is assessed as **minor adverse** in terms of magnitude. The magnitude of impact of dewatering on the Gault Formation, which is unproductive and not an aquifer, would be considered **negligible**.

*Sensitivity of receptor*

4.1.266 The river terrace deposits (sand and gravel) are classified as a Secondary A aquifer and are therefore considered to have **medium** sensitivity. The underlying bedrock Gault Formation, which is unproductive, is considered **low** sensitivity.

*Significance of effect*

4.1.267 For the Gault Formation, the impact of shaft construction on groundwater levels is **negligible** in terms of magnitude. Combined with a **low** sensitivity receptor, there would be a **neutral** effect which is **not significant**.

4.1.268 For the river terrace deposits, the impact of shaft construction on groundwater levels is **minor adverse** in terms of magnitude. Combined with a **medium** sensitivity receptor, there would be a **slight** effect which is **not significant.**

*Secondary mitigation or enhancement*

4.1.269 No significant adverse effect is predicted, and no further secondary mitigation is required.

*Residual effect*

4.1.270 On the basis that no significant adverse effect is predicted and no further mitigation proposed, the residual effect remains **not significant** as detailed above.

***Diversion of rising mains and gravity sewers – groundwater quality***

4.1.271 This assessment considers the impact of accidental spills on groundwater quality while relocating rising mains and gravity sewers at the existing Cambridge WWTP. These will be diverted to the interception shaft at the existing Cambridge WWTP and routed to the waste water transfer tunnel via a vortex drop pipe. The details of the services to be diverted from the existing Cambridge WWTP are as follows:

- CAMBSM local gravity foul/combined sewer (450mm dia. concrete);
- FDIGSM Fen Ditton rising main (6” PVC);

- MILPSM local rising main (8" PVC);
- MILCSM local rising main (180mm polyethylene);
- HISHSP Histon rising main (450mm dia. cast-iron);
- COBLSP Cottenham rising main (350mm dia. cast-iron);
- Histon 'jam factory' main;
- MILLSM local rising main; and
- Waterbeach pipelines (south of the proposed WWTP).

4.1.272 The diversion of the rising mains and gravity sewers will require excavation and working within superficial deposits underlain by Gault Formation. The superficial deposits consist of river terrace deposits (sand and gravel) which are approximately 2m to 2.5m thick at the existing Cambridge WWTP, according to BGS borehole data.

*Magnitude of impact*

4.1.273 Any wastewater spillages occurring during the diversion of these rising mains and gravity sewers could give rise to a temporary, localised impact on groundwater quality in the vicinity of the diversion works. The magnitude of impact of spillages to groundwater quality is considered **moderate adverse**. Sensitivity of receptor

4.1.274 The river terrace deposits (sand and gravel) are classified as a Secondary A aquifer and are therefore considered to have **medium** sensitivity. The underlying bedrock Gault Formation, which is unproductive, is considered **low** sensitivity.

*Significance of effect*

4.1.275 The magnitude of impact of accidental spills on groundwater quality within the river terrace deposits would be **moderate adverse**. The effect on groundwater quality within the river terrace deposits, which is a **medium** sensitivity receptor, is **moderate adverse** and **significant**. The effect on groundwater quality within the Gault Formation, which is a **low** sensitivity receptor, is **slight adverse** and **not significant**.

*Secondary mitigation or enhancement*

4.1.276 It is assumed that rigorous groundwater protection measures, which are standard practice to prevent contamination, will be implemented during these diversion works.

*Residual effect*

4.1.277 The implementation of rigorous groundwater protection measures would reduce the potential impact on groundwater quality to negligible. Combined with **medium** sensitivity for the river terrace deposits and **low** sensitivity for the Gault Formation, there would be a **neutral** residual effect for both receptors, which is **not significant**.

## Monitoring

4.1.278 Seven boreholes within the land required for the proposed WWTP and associated Landscape Masterplan (Fig Z: Monitoring boreholes) will be retained for monthly groundwater level monitoring until 31 December 2024. Where feasible these boreholes should also be retained during construction of the proposed WWTP:

- BH_STW_001
- BH_STW_009
- BH_STW_015
- BH_STW_023
- BH_STW_024
- BH_STW_025
- BH_STW_026

4.1.279 For optimised coverage two additional monitoring boreholes should be installed downgradient (north-east) of the proposed WWTP to monitor groundwater levels and groundwater quality pre-construction, during construction and post-construction:

- Location 1: between BH_STW_025 and BH_STW_026; and
- Location 2: between BH_STW_026 and BH_STW_024.

4.1.280 The scope and duration of borehole water level and quality monitoring will be agreed with all relevant stakeholders before works commence.

4.1.281 Baseline water level monitoring at Black Ditch has been undertaken since July 2021. Ongoing water level, flow and quality monitoring prior to, during and following construction is recommended at Black Ditch and in a drain connecting to Black Ditch towards the northern boundary of the land required for the landscape masterplan, to monitor potential dewatering or construction impacts on these water bodies. The scope and duration of monitoring will be agreed with all relevant stakeholders before works which could potentially impact the ditch commence

4.1.282 Monitoring of water levels would also be implemented in the Allicky Farm Pond CWS and Stow-cum-Quy Fen SSSI. Water levels would be monitored in The Cut at Stow-cum-Quy Fen SSSI. As indicated in Section 3.1 Current baseline, The Cut is the largest open water body on the SSSI, formed in an excavation in the West Melbury Marly Chalk Formation. Monitoring in the Allicky Farm Pond CWS and Stow-cum-Quy Fen SSSI would be carried out for a period prior to, during and following all dewatering activities for construction at the proposed WWTP.

## 4.2 Operation phase

4.2.1 The potential environmental impacts to water resources from the operation of the Proposed Development are indicated in Table 2-5 together with the maximum design scenario. These are the assumptions (maximum parameters) for the purposes of the water resources assessment against which each impact has been assessed.

4.2.2 A description of the potential effect on water resources receptors caused by each identified impact is set out below. This assessment has been completed on the basis that primary and tertiary mitigation measures (see Table 5-2) are implemented.

### Proposed WWTP

4.2.3 This section sets out the assessment of effects in relation to the proposed WWTP including the landscaping proposals, final effluent pipeline, outfall, waste water transfer tunnel and new access connection with the B1047 Horningsea Road.

***Operation of outfall – scour***

4.2.4 This assessment considers the impact of treated effluent discharge (comprising final effluent and stormwater flows) from the proposed outfall on River Cam hydromorphology.

*Magnitude of Impact*

4.2.5 Initial hydrodynamic modelling of outfall discharges from the final effluent and stormwater transfer pipelines has been undertaken, see Appendix 20.6 (App Doc Ref 5.4.20.6) 3D velocity/mixing model and Appendix 20.7 (App Doc Ref 5.4.20.7) Outfall CFD report.

4.2.6 Computational Fluid Dynamic (CFD) modelling was undertaken to examine the local impacts from the treated effluent discharge on a short reach of the River Cam, from just downstream of the A14 bridge to 100m downstream of the proposed outfall (Appendix 20.7, App Doc Ref 5.4.20.7: Outfall CFD report). Wider scale modelling of treated effluent discharge velocities and mixing within a 1km reach of the River Cam was also undertaken (Appendix 20.6, App Doc Ref 5.4.20.6: 3D velocity/mixing model), extending approximately 600m upstream and 400m downstream of the proposed outfall.

4.2.7 Both models seek an outfall design configuration which minimises potential impacts to river users, the riverbed and riverbank, by dissipation of treated effluent flow energy and by ensuring adequate mixing of treated effluent with river water. The hydrodynamic models will inform final design of the outfall.

4.2.8 There is existing sheet piling on the west riverbank, opposite the proposed outfall, along the full extent of the CFD model from just downstream of the A14 bridge to 100m downstream of the proposed outfall.

4.2.9 CFD modelling demonstrates that under $Q_{50}$ (flows exceeded 50% of the time) river flow conditions of 2.4m$^3$/s, and normal final effluent discharge conditions of 2m$^3$/s:

- velocities at the opposite (west) riverbank would be approximately 0.2m/s. For natural riverbanks, comprising cohesive sediments such as clay and sediment, velocities of this magnitude would be considered a low erosion risk (Benn, et al., 2019). However, the west riverbank is currently sheet-piled at this location and the erosion risk should therefore be reduced further.
- velocities at the riverbed would not exceed 0.5m/s. Rip-rap riverbed protection will be used in the vicinity of the outfall to prevent local riverbed scour impacts.

4.2.10 Stormwater discharges from the proposed outfall are expected to be infrequent, with predicted occurrences less than once every ten years (Appendix 20.10, App Doc Ref 5.4.20.10: Storm Model Report). CFD modelling indicates that in a 1 in 2 year event, with high river flows of 21.8m$^3$/s and with maximum stormwater discharge of 5m$^3$/s:

- velocities at the opposite (west) riverbank may exceed 0.5m/s. For natural riverbanks, velocities of this magnitude may increase riverbank erosion risk (Benn, et al., 2019). However, the west riverbank is currently sheet-piled at this location.
- velocities at the riverbed may exceed 1m/s. Rip-rap riverbed protection will be used in the vicinity of the outfall to prevent local riverbed scour impacts. However, velocities immediately outside the rip-rap area may exceed 0.5m/s, which may increase riverbed erosion risk.

4.2.11 As rip-rap riverbed protection will be used in the vicinity of the outfall to prevent local riverbed scour impacts, and as the riverbank opposite the outfall currently benefits from sheet piling, the magnitude of impact of final effluent velocities to the riverbank and riverbed is considered **minor adverse** in abnormal stormwater discharge conditions**,** and **negligible** in normal operation conditions**.**

*Sensitivity of receptor*

4.2.12 The River Cam is a heavily modified WFD water body. However, as with other assessments related to the River Cam, river sensitivity is considered in terms of flow. River flows recorded at Bottisham Lock indicate a Q95 flow (flow exceeded 95% of the time) of 0.906m$^3$/s. As the Q95 is less than 1.0m$^3$/s, the River Cam is considered to have high sensitivity.

*Significance of effect*

4.2.13 During normal operating conditions, the impact of final effluent discharge on River Cam hydromorphology will be **negligible** in terms of magnitude. Combined with a **high** sensitivity receptor, there would be a **slight** effect which is **not significant.**

4.2.14 During abnormal stormwater discharge conditions, expected to occur less than once every ten years, the impact of stormwater discharge on River Cam hydromorphology is

**minor adverse** in terms of magnitude. Combined with a **high** sensitivity receptor, there would be a **moderate adverse** effect which is **significant.**

*Secondary mitigation or enhancement*

4.2.15 Recommendations within the Outfall CFD report (Appendix 20.7, App Doc Ref 5.4.20.7) include further outfall design to be assessed by CFD modelling, to reduce potential scour impacts relating to maximum stormwater discharges. Any potential scour impacts relating to stormwater discharges may be mitigated by design refinement during the detailed design phase and approved through the Environmental Permit required for the permanent structure. With impacts to be assessed by modelling if necessary to inform final outfall design.

4.2.16 Following implementation of best practice design of the outfall structure to reduce scour risks associated with discharges from the outfall, there could remain a low residual risk in the event of an infrequent stormwater discharge which is expected to occur less than once every ten years. This low residual risk will be mitigated further through routine visual inspection of both riverbanks downstream of the proposed outfall following a stormwater discharge event, with maintenance or repair of eroded sections of riverbank as necessary. The monitoring will be set out within the operational phase OMMP.

*Residual effect*

4.2.17 During normal operating conditions the residual effect remains **slight adverse** and **not significant.**

4.2.18 Following abnormal stormwater discharge events, expected to occur less than once every ten years, and allowing for further mitigation including visual inspection and maintenance or repair of eroded riverbank sections, there remains, at most, a low residual scour risk. This residual scour risk is, however, still assessed as a **minor adverse** impact. Combined with a **high** sensitivity receptor, the assessment of impact gives rise to a **moderate adverse** residual effect which is **significant.**

***Operation of outfall (normal conditions) – water quality***

4.2.19 This assessment considers the impact of final effluent discharge from the proposed new outfall on water quality for the River Cam. As indicated in Section 2.9, regulatory compliance monitoring and Environment Agency ongoing assessment of permit conditions for the proposed WWTP will ensure that the quantities of consented determinants in the final effluent discharge will never exceed the quantities indicated by the current permit conditions for the existing Cambridge WWTP. This assessment therefore assumes that environmental permitting for all development phases will prevent any risk of river water quality deterioration due to the final effluent discharge compared to the current permit conditions.

*Magnitude of impact*

4.2.20 Over its operational lifetime, the final effluent discharge from the proposed WWTP will remain subject to the Environmental Permitting Regulations. The Environment Agency is required through the RBMP process to ensure that river water quality does not deteriorate. The Environment Agency will periodically review the relevant water quality components of the Environmental Permit.

4.2.21 Permit conditions are, therefore, likely to vary over time in response to changes in effluent discharge and river flow, including changes arising from population growth, water usage, climatic or environmental factors and phasing of development. The proposed WWTP has been designed to be flexible and accommodate changes based on regulatory requirements within the land required for the construction of the proposed WWTP.

4.2.22 Discharge and water quality consent limits for the existing Cambridge WWTP, and the indicative limits[7] for the proposed WWTP, are provided in Table 4-1 in Section 4.1. The actual DWF for the discharge from the proposed WWTP will increase up to the limit of 55,000m$^3$/d over the period of operation as population increases.

4.2.23 Under the indicative consent limits for the Proposed Development, there is potential for the theoretical effluent load (DWF multiplied by concentration of determinant) for BOD and TSS to increase, when compared to the existing consent conditions. An increase in theoretical effluent load, as compared to the existing consent conditions, is estimated to occur for BOD when the DWF reaches 50,900m$^3$/d, and 53,300m$^3$/d for TSS. At the DWF limit of 55,000 m$^3$/d, the theoretical effluent loads for BOD and TSS would exceed the theoretical effluent loads under the existing consent conditions by 8% and 3% respectively. However, it is assumed that regulatory compliance monitoring (UK Government, 2021) and Environment Agency ongoing assessment of permit conditions will prevent any exceedances of the theoretical effluent load calculated using the existing discharge consent limits.

4.2.24 For total phosphorus and ammoniacal nitrogen, however, the theoretical effluent loads at the indicative DWF of 55,000m$^3$/d would be 41% and 12% lower than the theoretical effluent loads indicated by the current consent conditions. Actual reductions in effluent load for total phosphorus and ammoniacal nitrogen would result from the treatment processes incorporated in the proposed WWTP, needed to meet the proposed (indicative) consent limits for the effluent discharge. There should, therefore, be a decrease in the contribution of total phosphorus and ammoniacal nitrogen to river water at the outfall in all conditions covered by the indicative discharge consent limits.

4.2.25 Consent limits for total iron (as Fe) and chloride (as Cl) were not included in the pre-application advice and, therefore, changes to the existing consent limits as shown in

[7] Pre-application advice only.

Table 4-1 are not anticipated. There is therefore potential for effluent load to increase for total iron and chloride, when compared to existing conditions.

4.2.26 Waste water from Waterbeach WRC will be transferred to the proposed WWTP; this transfer of waste water is taken into account in the above assessment of effluent loads. As a result, discharge of the final effluent from Waterbeach WRC to the Bannold Drove Drain will cease. In some conditions, presumably during wet periods to assist with drainage, the IDB pumps water from the drain into the River Cam at Bottisham Lock. In these conditions, therefore, there should be a small improvement in river water quality downstream of Bottisham Lock with the proposed WWTP in operation.

4.2.27 As indicated above, regulatory compliance monitoring (UK Government, 2021) and Environment Agency ongoing assessment of permit conditions will prevent deterioration of water quality within the River Cam compared to current consent conditions. There should be an improvement in river water quality in relation to total phosphorus and ammoniacal nitrogen. Future benefits to river water quality would, however, also be dependent on the actual impact of climate change on low flows. There would also be some small improvement in river water quality downstream of Bottisham Lock, although this may only apply in wetter, and therefore higher flow, conditions. As a result, the overall magnitude of impact on water quality in the River Cam, taking into account the indicative DWF of 55,000m$^3$/d for the proposed WWTP, may be considered **minor beneficial**.

4.2.28 As indicated in Chapter 2: Project description, the actual development of the proposed WWTP would be in two phases:

- Phase 1, effective to the end of 2035, DWF 53,862 m$^3$/d; and
- Phase 2, assumed effective from 2036 (would occur within the operational lifetime of the WWTP between 2036-2050, but likely before 2041), DWF 57,280 m$^3$/d.

4.2.29 The DWF for Phase 1 is slightly lower than the DWF of 55,000 m$^3$/d included in the proposed (indicative) consent limits for the effluent discharge. Therefore, based on the assessment and assumptions already made, a minor beneficial overall impact on water quality in the River Cam should be applicable to Phase 1 of operation.

4.2.30 For Phase 2, the DWF exceeds the DWF of 55,000 m$^3$/d included in the proposed (indicative) consent limits by about 4%. As a result, assuming that the proposed (indicative) consent limits for total phosphorus and ammoniacal nitrogen also apply during Phase 2, the theoretical effluent loads at the indicative DWF of 57,280m$^3$/d would be 39% and 8% lower than the theoretical effluent loads for total phosphorus and ammoniacal nitrogen indicated by the current consent conditions. Therefore, in Phase 2, there should still be a decrease in the contribution of total phosphorus and ammoniacal nitrogen to river water at the outfall in all conditions covered by the indicative discharge consent limits, when compared to current consent conditions.

4.2.31 For comparison, the theoretical effluent loads for BOD and TSS would exceed the theoretical effluent loads under the existing consent conditions by 13% and 7% respectively. However, the assessment of a minor beneficial, overall impact on water quality in the River Cam should still be applicable in Phase 2 assuming that:

- Environment Agency ongoing assessment of permit conditions will prevent any exceedances of the theoretical effluent loads calculated using the existing discharge consent limits in relation to BOD and TSS; and
- The proposed (indicative) consent limits for total phosphorus and ammoniacal nitrogen, are applied during Phase 2.

*Sensitivity of receptor*

4.2.32 The River Cam is a WFD water body. River flows recorded at Bottisham Lock indicate a $Q_{95}$ flow (flow exceeded 95% of the time) of 0.906$m^3$/s. As the $Q_{95}$ is less than 1.0$m^3$/s, the River Cam is considered to have **high** sensitivity.

*Significance of effect*

4.2.33 The impact of the final effluent discharge to water quality in the River Cam is **minor beneficial**. Combined with a **high** sensitivity, there would be a **moderate beneficial** effect on the River Cam, which is **significant**. Future benefits to river water quality would, however, also be dependent on the actual impact of climate change on low flows. The changes discussed in the future baseline (Section 3.2) could cause a substantial reduction in river flow available to dilute the final effluent discharge.

*Secondary mitigation or enhancement*

4.2.34 A significant moderate beneficial effect is predicted and no further secondary mitigation is required. The assessment assumes, however, that the Environment Agency environmental permitting conditions for final effluent quality and quantity could change over time and would not allow deterioration in River Cam water quality for any of the consented water quality determinants.

*Residual effect*

4.2.35 On the basis that no significant adverse effect is predicted and no further mitigation proposed, the residual effect remains **significant**.

***Operation of outfall – river water temperature and dissolved oxygen***

4.2.36 This assessment considers the impact of the temperature of the final effluent discharge on concentrations of DO in the River Cam.

*Magnitude of impact*

4.2.37 Based on Environment Agency monitoring records from January 2012 to March 2022, the temperature of the final effluent from the existing Cambridge WWTP ranged from a

minimum of about 7°C in the winter to a maximum of 26°C in the summer. The average effluent temperature from the monitoring records was 16.1°C. In the same period, river water temperature sampled at the Green Dragon foot bridge in Chesterton, about 2.7km upstream of the existing outfall, ranged from a minimum of about 2°C to a maximum of 19 °C with an average of 10.9°C; at Bottisham Lock, river water temperature varied between about 3°C and 22°C with an average of 12.7°C.

4.2.38 Although temperatures were not taken at the three locations on the same days in the period of records, effluent temperatures were monitored approximately monthly, and river water temperatures on average six times per year in Chesterton and nine times per year at Bottisham Lock. Hence, there is good evidence for the effluent temperature being several degrees warmer than the river water. In addition, the river water at Bottisham Lock, downstream of the existing outfall, is generally warmer than upstream at Chesterton.

4.2.39 The mixing of the warmer effluent with colder river water would be expected to increase the water temperature in the river reach downstream of the outfall, most notably during periods of low flows. It is not possible to make accurate calculations of this impact as effluent and river water temperatures were not taken on the same day. However, within a period of generally low flow in late July 2019, a temperature of 22.2°C was measured for the river water at Bottisham Lock and 26°C for the effluent. These were both the highest temperatures in the record for the effluent and the river water. The temperatures were used, together with an estimate of average river flows in late July 2019, to assess the potential impact of effluent discharges on river water temperature. The assessment assumed a complete mixing of permitted effluent DWF with the river water.

4.2.40 The calculations indicated that, for the current discharge consent permit with a DWF of 37,330$m^3$/d, the river water temperature would, in theory, rise by about 3 °C. For the proposed discharge consent permit (DWF of 55,000$m^3$/d), the river water temperature would be expected to rise by about 3.5°C. The theoretical temperature rise for the proposed discharge consent permit would be just over 0.5°C higher than for the current discharge consent permit.

4.2.41 The average temperatures from the monitoring records for the effluent and river water in Chesterton upstream of the outfall in the period June to August each year are 19.7°C and 16.9°C, respectively. Using these average figures, the theoretical rise in river water temperature for the proposed discharge consent permit would be up to about 0.3°C higher than for the current discharge consent permit, a similar order of magnitude to the theoretical temperature rise calculated using the data for July 2019.

4.2.42 Both sets of calculations provide only an approximate indication of the impact of the change in the consented discharge on summer temperatures in the river. However, the calculations indicate that, in summer, the temperature of the river water is unlikely to rise much more than 0.5°C as a result of the increased DWF for the proposed WWTP.

4.2.43 The mixing of the warmer effluent with colder river water could also reduce DO levels in the river reach downstream of the outfall, particularly during periods of low flows. As with temperature, it is not possible to make accurate calculations of this impact. However, an approximate assessment was made using the temperature and river flow conditions in July 2019. The assessment indicated that the theoretical reduction in DO could be of the order of 1% as a result of the change from the currently consented DWF to the proposed DWF. Using the average temperatures in the period June to August each year, the theoretical reduction in DO would be approximately 0.6% as a result in the change from the currently consented to the proposed DWF. These assessments are also based on the variation in the saturation levels for DO in water with temperature; if DO is not at saturation level in the river water, the impact on DO might be reduced.

4.2.44 When compared with the existing Cambridge WWTP, there is unlikely to be any additional, discernible impact on DO in the river due to the temperature of the final effluent discharge and the increased DWF. In addition, if such a small change in DO was present in the river water, it might be further reduced or eliminated at Baits Bite Lock where flow is aerated by cascading over a weir. Therefore, the magnitude of impact on DO in the River Cam due to the temperature of the effluent discharge for the proposed WWTP is considered **negligible** when compared to the discharge for the existing Cambridge WWTP**.**

4.2.45 The DO in the river water would also be reduced as a result of the BOD in the final effluent. BOD is included as a water quality parameter in the discharge consent limits. However, as previously discussed, it is assumed that regulatory compliance monitoring (UK Government, 2021) and Environment Agency ongoing assessment of permit conditions will prevent any exceedances of the theoretical effluent load for the water quality parameters, including BOD, calculated using the existing discharge consent limits. Therefore, there should be no additional impact on DO resulting from the BOD of the effluent discharge from the proposed WWTP, when compared to the permitted discharge from the existing Cambridge WWTP.

4.2.46 The impact of increasing the DWF to 57,280 $m^3$/d, as proposed for Phase 2, was also assessed. The theoretical temperature rise for the DWF of 57,280 m3/d would be:

- just over 0.6$^o$C higher than for the current discharge consent permit, for river flow and temperature conditions in July 2019; and
- about 0.3$^o$C higher than for the current discharge consent permit, for average river flow and temperature conditions in the period June to August each year.

4.2.47 The theoretical reduction in saturated DO levels would be of the order of 1.1% and 0.6% for these respective temperature rises and river conditions.

4.2.48 These calculations of impacts on river water temperature and saturated DO differ only marginally, therefore, from the calculations for the assessment for a DWF of 55,000 $m^3$/d. Hence, the magnitude of impact on DO in the River Cam, due to the DWF

of 57,280 $m^3$/d in Phase 2, is also considered negligible when compared to the discharge for the existing Cambridge WWTP.

*Sensitivity of receptor*

4.2.49 The River Cam is a WFD water body. River flows recorded at Bottisham Lock indicate a $Q_{95}$ flow (flow exceeded 95% of the time) of 0.906$m^3$/s. As the $Q_{95}$ is less than 1.0$m^3$/s, the River Cam is considered to have **high** sensitivity.

*Significance of effect*

4.2.50 The impact of final effluent discharge temperature and BOD on dissolved oxygen in the River Cam is **negligible** in terms of magnitude. Combined with **high** sensitivity for the River Cam, there would be a **slight adverse** effect, which is **not significant.**

*Secondary mitigation or enhancement*

4.2.51 No significant adverse effect is predicted, and no further secondary mitigation is required.

*Residual effect*

4.2.52 On the basis that no significant adverse effect is predicted and no further mitigation proposed, the residual effect remains **not significant** as detailed above.

***Operation of the outfall (abnormal conditions) – flood risk/water levels***

4.2.53 This assessment considers the impact of treated effluent (final effluent and stormwater discharges) to water levels in the River Cam and the potential for increasing fluvial flood risk.

*Magnitude of impact*

4.2.54 The outfall will be located within the River Cam CWS. Fluvial flood modelling of the River Cam water levels has been undertaken (Appendix 20.5, App Doc Ref 5.4.20.5: Fluvial Model Report) to understand how the treated effluent from the outfall to the river could affect flood levels. This involved mathematical modelling of river flows and levels to complete an assessment of this increased risk. The model indicates that in a 1 in 100 year flood event, with a 20% allowance for climate change, there would be less than 7mm increase in water levels in the River Cam leading to a negligible change in the potential area of inundation across the floodplain. The fluvial flood model indicates stage increases of up to 22mm (0.022m) for lower magnitude events (e.g., 1 in 2 year event). This is due to WWTP discharge making up a larger proportion of the total River Cam flow in lower magnitude events.

4.2.55 The magnitude of impact on fluvial flood risk for the River Cam and the CWS due to final effluent and stormwater discharges from the proposed WWTP is considered **negligible**.

*Sensitivity of receptor*

4.2.56 In relation to flood risk, the sensitivity considered is for the potential receptors affected by the flooding. In the Cam catchment, the receptors could include properties, dwellings and infrastructure. These are classified as 'more vulnerable' or 'highly vulnerable' according to flood risk vulnerability classification within the NPPF (Department for Levelling Up, Housing and Communities, 2021) and are therefore considered to be of **high** or **very high** sensitivity.

4.2.57 The sensitivity of nature conservation sites such as the CWS is specified as part of Chapter 8: Biodiversity.

*Significance of effect*

4.2.58 The impact of final effluent and stormwater discharge on fluvial flood risk for the River Cam is **negligible** in terms of magnitude. The effect on potential receptors, which are of **high** sensitivity, is **slight adverse** and therefore assessed as **not significant**.

4.2.59 The significance of effect for the CWS is not determined as part of the water resources assessment. The significance of effect for nature conservation sites is specified in Chapter 8: Biodiversity, taking into account the negligible impact on flood risk from final effluent and stormwater discharges.

*Secondary mitigation or enhancement*

4.2.60 No significant adverse effect is predicted, and no further secondary mitigation is required.

*Residual effect*

4.2.61 On the basis that no significant adverse effect is predicted and no further mitigation proposed, the residual effect remains **not significant** .

***Operation of shafts – groundwater flow and quality***

4.2.62 This assessment considers the impact of minor inflows of groundwater to shafts or outflow of waste water from the TPS shaft. The potential for groundwater inflow or waste water outflow is, however, mitigated by robust design and construction as specified in Chapter 2: Project Description.

*Magnitude of impact*

4.2.63 Specialised deep shaft construction techniques will be used as described in Table 2-6. Shafts will be sealed to prevent minor inflows of groundwater or wastewater outflow. As the potential for groundwater inflow or waste water outflow from shafts is mitigated by design (Table 2-6), the magnitude of impact is considered **negligible**.

*Sensitivity of receptor*

4.2.64 The Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, is classified by the Environment Agency as a Principal aquifer and is therefore assigned **high** sensitivity.

*Significance of effect*

4.2.65 The impact of minor inflow of groundwater to shafts or outflow of waste water from shafts is **negligible** in terms of magnitude. The effect on the West Melbury Marly Chalk Formation, which is assigned **high** sensitivity, is **slight adverse**, which is **not significant.**

*Secondary mitigation or enhancement*

4.2.66 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

4.2.67 On the basis that no significant adverse effect is predicted and no further mitigation proposed, the residual effect remains **not significant**.

***Operation of proposed WWTP structures, foundations and areas of hardstanding – groundwater conditions/aquifer recharge***

4.2.68 This assessment considers the impact of proposed WWTP components (including below-ground structures, foundations and areas of hardstanding) and drainage in the WWTP on groundwater conditions and aquifer recharge in the West Melbury Marly Chalk Formation underlying the WWTP.

*Magnitude of impact*

4.2.69 A number of components of the proposed WWTP, including the TPS shaft, storm tanks, primary settlement tanks, activated sludge plant tanks, final settlement tanks and the filtration plant will be installed below ground level. The various tanks are expected to be installed at depths of between 5m and 8m below ground level. At these depths, the water table in the West Melbury Marly Chalk Formation is likely to be above the base of many, or possibly all, of the tanks throughout the year. Foundations for many above-ground structures are also likely to penetrate well below the water table.

4.2.70 Analysis of groundwater levels in the West Melbury Marly Chalk Formation within the land required for the proposed WWTP and landscape masterplan, from July 2021 to May 2022, indicates seasonal variation, with deepest groundwater levels of 2m to 5m below ground level in December 2021, and shallowest groundwater levels of 0.5m to 3m below ground level in March 2022. Groundwater levels for the seven monitored boreholes in the area (see Fig Z: Monitoring boreholes) typically varied by an average of 2m over this period. Groundwater levels monitored in the two boreholes within or very close to the area of the proposed WWTP rose from about 5m to 2m below ground level between December 2021 and March 2022.

4.2.71 Long-term records for Environment Agency observation boreholes monitoring groundwater levels in the West Melbury Marly Chalk Formation in or close to the study area indicate that peak groundwater levels in the winter/spring in 2021/22 were substantially below peak groundwater levels in many other winter/spring periods. Hence groundwater levels at the proposed WWTP would be expected to rise above the peak levels in 2021/22 in the winter/spring in many other years. However, in current conditions, any land drains in the area of the proposed WWTP could intercept groundwater as it rises towards ground level and direct it away to drainage ditches. As a result, depending on the effectiveness of the existing land drainage, groundwater levels may never reach ground level in current conditions.

4.2.72 The proposal for excavating to depths of one metre or more below current ground level, to form the base for the proposed WWTP, will bring groundwater levels closer to the surface. Excavation within the proposed WWTP increases the likelihood that groundwater levels could reach, or rise above, ground level in some winter/spring periods. In addition, assuming any existing land drainage within the proposed WWTP is removed during construction, the risk of regular shallow groundwater table conditions, or inundation of the area by groundwater flooding in some years, could increase significantly.

4.2.73 Groundwater flows will also be affected locally by the presence of below-ground structures and foundations in all groundwater level conditions. Groundwater flow will be redirected locally within the aquifer, with groundwater levels tending to rise on the up-gradient side of these structures and foundations. As a result, the risk of groundwater flooding in some parts of the proposed WWTP in winter/spring periods could be increased further.

4.2.74 The possibility of groundwater flooding within the proposed WWTP will, however, be taken into account in the detailed drainage design for the proposed WWTP. The drainage design will incorporate and develop further the proposals set out in Appendix 20.12 (App Doc Ref 5.4.20.12) Drainage strategy. Any emergent groundwater within the proposed WWTP will be managed by surface water drainage. This may lead to a very limited and localised loss to groundwater, as emergent groundwater will discharge to surface water. However, it is likely that groundwater currently discharges to surface water through the existing land drainage when groundwater levels are high.

4.2.75 Infiltration to the West Melbury Marly Chalk Formation in the area of the proposed WWTP is likely to be reduced as a result of the impermeable structures and areas of hardstanding installed as components of the WWTP. However, in total, of the 19.5ha comprising the proposed WWTP, more than 40% of the area would be reinstated with permeable surfaces, comprising grass cover and stone chippings, through which some infiltration to the aquifer could still occur. Infiltration and runoff rates may also vary locally in the vicinity of the earth banks surrounding the proposed WWTP. In addition, there could be changes to infiltration and groundwater conditions as a result of the land

use (meadow) proposed in the landscape masterplan area and drainage retention features included in the drainage strategy.

4.2.76 The drainage system in areas of the proposed WWTP, comprising permeable surfaces, will be connected by buried pipeline to an attenuation pond. Outflow from the pond will discharge to a drain linked to Black Ditch. The base of the trench, excavated for installation of the pipeline, is likely to be below the water table at times of higher groundwater levels in winter/spring periods and, possibly, at other times of year along some sections of the trench. The trench could therefore act as a groundwater drain and affect groundwater conditions locally. However, it is assumed that, when installing the pipeline, additional measures would be considered to prevent any resultant groundwater drainage. These measures might include the use of clay plugs or partitions (also referred to as clay stanks) installed across the trench at suitable locations to prevent groundwater drainage along the pipeline length.

4.2.77 It is not possible to quantify precisely the changes in infiltration and aquifer recharge which might take place. However, taking into account the relatively small area of the impermeable surfaces in the proposed WWTP, the earth banks and drainage features in the area surrounding the proposed WWTP, as compared to the extent of the West Melbury Marly Chalk Formation in the project area and the region, then the effect on overall aquifer recharge should be localised and very limited. Changes to infiltration as a result of the landscape masterplan would also be very limited in the regional context. The change to infiltration would be comparable to any change occurring when land is converted from agricultural usage to meadow.

4.2.78 The impact resulting from the redirection of groundwater flows and shallower groundwater levels in the area of the proposed WWTP, together with potential changes to recharge, will have a negligible impact on aquifer conditions in the West Melbury Marly Chalk Formation. Any localised changes would have no impact on the status of the Principal aquifer of which the West Melbury Marly Chalk Formation forms a part. As a result, these impacts on the aquifer are assessed as **negligible.**

4.2.79 The localised changes in groundwater recharge and infiltration might however, lead to limited changes to base flow in local watercourses, notably Black Ditch. The impact is discussed in the following assessment.

*Sensitivity of receptor*

4.2.80 The Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, is classified by the Environment Agency as a Principal aquifer and is therefore assigned **high** sensitivity.

*Significance of effect*

4.2.81 The impact of the localised changes in groundwater recharge, redirection of groundwater flows and discharge to surface water drainage in high groundwater level

conditions on the Principal aquifer of which the West Melbury Marly Chalk Formation forms a part, is **negligible** in terms of magnitude. The effect on the aquifer, which is assigned **high** sensitivity, is **slight adverse**, which is **not significant**.

4.2.82 The assessment of a **slight adverse**, and **not significant**, effect is a reflection of the very limited, localised effect of the proposed development on the aquifer.

*Secondary mitigation or enhancement*

4.2.83 No significant adverse effect is predicted, and no secondary mitigation is required.

4.2.84 It is unlikely that any impact would be evident in changes in groundwater levels in the area of the landscape masterplan, although monitoring of groundwater levels will continue throughout construction and into the operational period. The monitoring data will be assessed and compared with records for groundwater levels elsewhere in the aquifer during operation.

*Residual effect*

4.2.85 On the basis that no significant adverse effect is predicted, or further mitigation proposed, the residual effect remains **not significant**.

***Operation of proposed WWTP structures, foundations and areas of hardstanding – land drainage and Black Ditch flows***

4.2.86 This assessment considers the impact on flows in Black Ditch and agricultural abstraction from Black Ditch due to:

- drainage within the proposed WWTP;
- the reduction in aquifer recharge as a result of the installation of below-ground structures, foundations and areas of hardstanding; and,
- changes in infiltration and groundwater conditions due to changes in land use in the area of the landscape masterplan and drainage retention features included in the drainage strategy.

*Magnitude of impact*

4.2.87 The drainage network within the proposed WWTP will be designed taking into account the proposed reduction in ground level and the presence of below-ground structures, foundations and areas of hardstanding. The drainage strategy includes dedicated drainage for areas of the proposed WWTP which present a contamination risk. Potentially contaminated runoff will be returned to the head of the proposed WWTP for treatment. The area at risk of contamination is approximately 36% of the proposed WWTP area.

4.2.88 Runoff from uncontaminated hard surfaces will be attenuated by the drainage system. Permeable surfaces comprising grass cover and gravel chippings will be included in

uncontaminated areas, through which infiltration could still occur. The total area of these permeable surfaces should comprise more than 40% of the proposed WWTP area. The drainage system will be connected by buried pipeline to an attenuation pond, with an outflow, restricted to greenfield runoff rate, discharging to a drain linked to Black Ditch.

4.2.89 The drainage network and changes to infiltration could result in a change in contributions to base flows in local drains connected to Black Ditch. Much of the change would be a result of drainage from areas at risk of contamination being returned for treatment. In addition, there could be some change to infiltration and groundwater conditions in the area around the proposed WWTP as a result of the land use (meadow) proposed in the landscape masterplan area and the drainage retention features included in the drainage strategy. These changes could also affect base flow in Black Ditch, which may in turn impact agricultural abstractions from Black Ditch. However, the changes associated with the landscape masterplan would be comparable to any change occurring when land is converted from agricultural usage to meadow.

4.2.90 Taking into account the extent of the Black Ditch drainage network within the project area, these changes in infiltration and drainage may be expected to have, at most, a **minor adverse** impact on:

- the flow regime in Black Ditch; and
- the agricultural abstraction from Black Ditch.

*Sensitivity of receptor*

4.2.91 Black Ditch is not a WFD water body and is considered to have **medium** sensitivity in terms of flows.

4.2.92 As indicated in Section 3.1 Current baseline, there is a surface water abstraction from Black Ditch for agricultural use to the northeast of the land required for the construction of the proposed WWTP. Agricultural abstractions are considered **medium** sensitivity.

*Significance of effect*

4.2.93 The impact of drainage for the proposed WWTP and changes to infiltration on Black Ditch is assessed, at most, as **minor adverse** in terms of magnitude. Combined with **medium** sensitivity for Black Ditch and the agricultural abstraction, there would be a **slight adverse** effect on both Black Ditch and the abstraction, which is **not significant.**

*Secondary mitigation or enhancement*

4.2.94 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

On the basis that no significant adverse effect is predicted, or further mitigation proposed, the residual effect remains **not significant**.

***Operation of proposed WWTP – surface water flood risk***

4.2.95 This assessment considers the surface water flood risk to residential receptors and surface drains which discharge to Black Ditch due to runoff from hard surfaces within the proposed WWTP.

*Magnitude of impact*

4.2.96 The surface water flood risk on the land required for the construction of the proposed WWTP is considered very low (Appendix 20.1, App Doc Ref 5.4.20.1 Flood Risk Assessment).

4.2.97 The proposed WWTP will be located in an excavated area slightly below external ground level and will be surrounded by a system of earth banks. Therefore, it is expected that surface water runoff will be contained within the perimeter of the proposed WWTP.

4.2.98 Surface water runoff within the proposed WWTP and access roads will be managed through a Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12 Drainage strategy). Surface water runoff from the proposed WWTP will be restricted to greenfield runoff rates. Any potential change to surface water flood risk associated with the proposed WWTP is therefore considered to be mitigated by drainage design. The resulting impact to residential receptors, surface drains and Black Ditch would be **negligible**.

*Sensitivity of receptor*

4.2.99 In relation to flood risk, the sensitivity considered is for the potential receptors affected by surface water flooding, including residential dwellings and surface drains which discharge to Black Ditch.

4.2.100 Surface drains are considered **low** sensitivity. Black Ditch is not a WFD water body and is considered to have **medium** sensitivity.

4.2.101 There is a residential dwelling east of and downgradient of the proposed WWTP. Residential dwellings are classified as 'more vulnerable' or 'highly vulnerable' according to flood risk vulnerability classification within the NPPF (Department for Levelling Up, Housing and Communities, 2021). The residential dwelling is therefore considered to have **high** sensitivity.

*Significance of effect*

4.2.102 Any potential change to surface water flood risk for the residential dwelling, drains and Black Ditch, associated with the proposed WWTP, is **negligible** in terms of magnitude. Combined with the **low to medium** sensitivity of drains and Black Ditch, the local effect is **neutral** and **not significant.** Combined with **high** sensitivity for the residential dwelling, the effect is **slight adverse** and **not significant**.

*Secondary mitigation or enhancement*

4.2.103 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

4.2.104 On the basis that no significant adverse effect is predicted, or further mitigation proposed, the residual effect remains **not significant**.

***Stormwater discharges (abnormal operations) – water quality***

4.2.105 This assessment considers the impact of stormwater discharges on River Cam water quality.

*Magnitude of impact*

4.2.106 The proposed WWTP will have increased flow to full treatment (FFT) compared to the existing Cambridge WWTP. Preliminary stormwater modelling (Appendix 20.10, App Doc Ref 5.4.20.10 Storm Model Report) indicates that, in a ten-year simulation, increased treated flows would result in fewer stormwater discharge incidents to the River Cam; no stormwater discharge incidents were predicted from modelling exercises that considered a ten year period.

4.2.107 The impact of increased treated flows on CSO discharges has not been modelled. However, improved throughflow of storm water to storm tanks is expected to reduce CSO discharge frequency.

4.2.108 Decreased frequency of stormwater discharge to the River Cam will benefit water quality in some periods when these stormwater discharges currently occur. The magnitude of impact to water quality due to the modelled and likely reduction in stormwater discharges to the River Cam in some periods is considered **minor beneficial**.

*Sensitivity of receptor*

4.2.109 The River Cam is a WFD water body. River flows recorded at Bottisham Lock indicate a $Q_{95}$ flow (flow exceeded 95% of the time) of 0.906$m^3$/s. As the $Q_{95}$ is less than 1.0$m^3$/s, the River Cam is considered to have **high** sensitivity.

*Significance of effect*

4.2.110 The impact of reduced frequency of stormwater discharges on water quality in the River Cam is **minor beneficial** in terms of magnitude. The effect on the River Cam, which is a **high** sensitivity receptor, in periods of stormwater discharge is **moderate beneficial**, which is **significant.**

*Secondary mitigation or enhancement*

4.2.111 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

4.2.112 On the basis that no significant adverse effect is predicted or further mitigation is proposed, the residual effect remains **significant**.

***Accidental spills and leaks within the proposed WWTP***

4.2.113 This assessment considers the impact of contamination from spills or leaks migrating in groundwater through the West Melbury Marly Chalk Formation, or through sub-surface drainage at the proposed WWTP, to surface drains connected to Black Ditch and to nature conservation sites.

*Magnitude of impact*

4.2.114 A contaminant transport model (ConSim) was used to better understand the risks from the proposed WWTP to water quality in Black Ditch and the nearby environmental receptors, Stow-cum-Quy Fen SSSI and Allicky Farm Pond CWS (App Doc Ref 5.4.20.8 Contaminant Transport Note).

4.2.115 The modelling was originally undertaken as part of the HIA during site selection (App Doc Ref 5.4.20.9 Hydrogeological impact assessment (Site Selection Stage)). It was updated using results from the analysis of test pumping data obtained during the ground investigation at the site of the proposed WWTP in 2021 (Appendix 20.8, App Doc Ref 5.4.20.8 Contaminant Transport Note). The analysis indicated a range of permeability values for the aquifer in the West Melbury Marly Chalk Formation which was substantially higher than the permeability indicated by data available from limited testing of a single borehole in 2020, as used in the previous version of the modelling.

4.2.116 The assessment and results for the revised contaminant transport modelling are summarised as follows:

- The model is inherently a conservative over-simplification of the actual conditions present; outputs provide an approximation of potential scenarios only, together with an understanding of the order of magnitude of travel times through the aquifer or concentration for potential contaminants. Nonetheless, the model is considered to be appropriate for this assessment, taking into account the availability of data and the nature of the concern.
- Significant leaks from the TPS shaft or below-ground tanks at the proposed WWTP are not considered in the modelling. Construction of the proposed WWTP will be supervised to ensure that all structures are fit for purpose and compliant with the relevant industry specifications and standards. The below-ground tanks will be at an early stage in their design life for many years during operation and the risk of defects in the tanks, giving rise to leaks, should be low.
- The most likely pathways through which contaminants from the proposed WWTP could enter the ground would include an accidental spill of a substance directly onto permeable ground, or weeping from above ground tanks. Potentially contaminated runoff from areas with closed drainage, which comprise approximately 36% of the proposed WWTP, will be returned to the head of the proposed WWTP for treatment. However, contamination of groundwater might

also arise by a leak within the closed drainage systems, or ingress through small cracks in hardstanding in these areas.

- The higher permeability values for the West Melbury Marly Chalk Formation used in the updated modelling led to a reduction in the travel times in the aquifer for all modelled contaminants. The results from the updated modelling indicate that, if contaminants reach the groundwater in the West Melbury Marly Chalk Formation, downgradient migration of contaminants is likely to occur in the fractures which provide preferential pathways in the strata. Nonetheless, the retarded travel time for most potential inorganic contaminants of concern, comprising metals which include cadmium and mercury, still exceeds 1,000 years with fracture flow. These retarded travel times of more than 1,000 years for potential contaminants are considered insignificant. The retardation of contaminants occurs through subsurface geochemical and biological processes which cause the contaminants to sorb or degrade or to produce a change in the oxidation-reduction condition (the redox state) of the contaminant.
- Ammoniacal nitrogen and hydrocarbons were the modelled contaminants considered to present the highest potential risk from the presence of the proposed WWTP. Ammoniacal nitrogen is a potential contaminant that may be sourced from the WWTP. However, the source would be contained and controlled within the WWTP infrastructure, but with potential access to the water resources environment as a result of a leak of the drainage system around the sludge treatment centre, or from minimal weeping of the digesters. For ammoniacal nitrogen, the retarded travel time to a drain closest to the proposed WWTP, leading to Black Ditch, was modelled as a minimum of 480 years, taking into account fracture flow.
- For hydrocarbons, retarded travel time to the drain leading to Black Ditch was modelled to be between 10 and 24 years when fractures were included in the assessment. The modelling of fractures in the aquifer is based on the assumption that preferential flow pathways are linear, continuous and aligned in the Chalk in the direction of the surface water receptor drainage across the full saturated thickness of the aquifer. Taking into account the nature of the bedrock, any fractures in the West Melbury Marly Chalk Formation are, however, more likely to be limited in extent and continuity, and not all aligned in the direction of drains linked to Black Ditch. The retarded travel times increased to between 33 and 51 years for hydrocarbons when flow through the Chalk matrix only was modelled.
- The contaminant transport model also assumes an infinite source of the contaminants. In reality, however, any contaminant spill is more likely to comprise an isolated occurrence with limited volume or mobilisation, rather than an ongoing, continuous source.

- Concentrations would also be reduced further in the event that contaminants were discharged from groundwater to surface water in drains connected to Black Ditch. This further reduction would be due to the dilution and greater sorption that would occur in the surface water, compared to that indicated by modelling in the Chalk groundwater. The increased sorption would result from the prevalence of organic material in surface water which could take up and retain the contaminants.
- The Allicky Farm Pond CWS, located adjacent to Black Ditch, is connected with Black Ditch under high flow conditions, as discussed in Section 3.1 (Current baseline). Some grassland areas of Stow-cum-Quy Fen SSSI, and water bodies within these areas, are also connected with Black Ditch under high flow conditions. Further substantial dilution of any residual contaminants would occur in the event that the contaminants were able to discharge to these features. However, any contamination reaching Black Ditch could affect water quality in the sections of Black Ditch located within Stow-cum-Quy Fen SSSI. This would include water quality in the pond in the northern corner of the SSSI through which flow in Black Ditch passes.
- Any contamination in groundwater is unlikely to migrate over longer periods beyond the drainage network connected on the western side to Black Ditch. As the drains and Black Ditch are located down-gradient of the proposed WWTP, groundwater underlying the site would be expected to discharge within this surface water network.
- Nitrate was not included in the model, although nitrate is a potential contaminant from a WWTP. This is due to the complexities and interactions of denitrifying bacteria which cannot be quantified for modelling; it was therefore considered that modelling nitrate could be unrepresentative. As discussed, however, ammoniacal nitrogen, which is a precursor to other forms of nitrogen in sewage, was included in modelling.

4.2.117 Based on the results of the ConSim modelling, there could be a risk of a localised **moderate adverse** impact on groundwater quality resulting from accidental spills and leaks. In addition, there might be a risk of a **minor adverse** impact on water quality in Black Ditch. The risk of an impact on groundwater resources in the Allicky Farm Pond CWS and Stow-cum-Quy Fen SSSI should be **negligible**.

4.2.118 The drainage strategy includes dedicated closed drainage with impermeable surfaces in areas of the proposed WWTP which present a contamination risk. Potentially contaminated runoff from these areas will be returned to the head of the proposed WWTP for treatment. For the remaining areas of the proposed WWTP, however, a sub-surface drainage network will be connected by buried pipeline to a pond located in the landscape masterplan area, with controlled outflow to a drain linked to Black Ditch. In the event of any contamination occurring in the area of the sub-surface drainage

network, there would be a risk that the contamination could be intercepted by the drainage. Contaminants could then be transferred much more rapidly to the pond and the drain linked to Black Ditch than would occur through groundwater. The presence of the drainage network in some areas of the proposed WWTP might therefore present a greater risk to water quality in Black Ditch. This risk to water quality in Black Ditch is assigned a **moderate adverse** impact.

*Sensitivity of receptor*

4.2.119 The Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, is classified by the Environment Agency as a Principal aquifer and is therefore assigned **high** sensitivity.

4.2.120 Black Ditch is not a WFD water body and is considered to have **medium** sensitivity.

4.2.121 The sensitivity of receptors is not determined for nature conservation sites as part of the water resources assessment but is considered in Chapter 8: Biodiversity.

*Significance of effect*

4.2.122 Without mitigation, there could be a risk of a localised **moderate** impact due to potential contamination from the proposed WWTP on groundwater quality in the aquifer in the West Melbury Marly Chalk Formation. The effect on the West Melbury Marly Chalk Formation, which is a **high** sensitivity receptor, would be **moderate adverse**, which is **significant**.

4.2.123 Without mitigation, there could be a risk of a **minor** impact on Black Ditch due to potential contamination from the proposed WWTP on groundwater quality in the aquifer in the West Melbury Marly Chalk Formation. Combined with **medium** sensitivity for Black Ditch, there would be a **slight adverse** effect, which is **not significant**. However, there would also be a risk of a **moderate** impact on Black Ditch from contamination in the sub-surface drainage network in some areas of the proposed WWTP. Combined with **medium** sensitivity for Black Ditch, there would be a **moderate adverse** effect, which is **significant**.

*Secondary mitigation or enhancement*

4.2.124 Any defects in below-ground tanks will be identified through regular inspections to ensure the correct functioning of the tanks. Repairs will be undertaken promptly, if required. This will ensure that the risk of failure of the tanks, due to ageing and unidentified defects, is minimised, although some minor leakage from tanks may still be possible. Leaks detected in drainage systems during maintenance activities will also be repaired promptly.

4.2.125 The potential for hydrocarbons to enter the water environment at the proposed WWTP would be limited as a result of management systems and suitable operational and emergency procedures. There would be regular inspections of bunds around fuel tanks,

and hardstanding over which fuel pipelines are located, to ensure that any fuel spills would be contained on site. Therefore, the likelihood of hydrocarbons reaching ground into which contaminants could infiltrate would be low.

4.2.126 During the operation of the proposed WWTP, water quality monitoring should be undertaken in the pond receiving the discharge from the sub-surface drainage network, the drain connected to Black Ditch which receives the discharge from the pond, and also Black Ditch. The monitoring would provide an indication of the general quality of drainage water routinely discharging from the proposed WWTP and the impact of the discharge on surface water quality.

*Residual effect*

4.2.127 The implementation of regular inspection and maintenance of below-ground tanks and drainage systems, and rigorous groundwater protection measures, would reduce the potential impact on groundwater quality in the aquifer in the West Melbury Marly Chalk Formation, and on surface water in the Black Ditch drainage network, to **negligible**. Combined with **high** sensitivity for the West Melbury Marly Chalk Formation, there would be a **slight adverse** residual effect, which is **not significant**. Combined with **medium** sensitivity for Black Ditch, there would be a **neutral** residual effect, which is **not significant**.

4.2.128 The inspection, maintenance and groundwater protection measures should also reduce the potential impact on Black Ditch due to the possibility of contamination of the sub-surface drainage network in the proposed WWTP. However, a low risk of infiltration of contaminants to the drainage network, which could then transfer rapidly to the pond and drain linked to Black Ditch, would remain. Therefore, the impact on Black Ditch is assessed as **minor**. Combined with **medium** sensitivity for Black Ditch, there would be a **slight adverse** residual effect, which is **not significant**.

## Waterbeach pipelines

4.2.129 This section sets out the assessment of effects in relation to the Waterbeach pipelines comprising the following:

- the pipeline route transfer section from the north near Waterbeach to Low Fen Drove Way;
- the route section crossing the area of land required for the construction of the proposed WWTP; and
- the route section south of the A14, connecting to the area of land where the existing Cambridge WWTP is located.

4.2.130 It is expected that once the proposed WWTP is constructed, the southernmost section of the pipelines, south of the A14, will become redundant.

***Normal operations – pipeline leakage and groundwater quality***

4.2.131 This assessment considers the impact of leakage from the Waterbeach pipelines on groundwater quality in the following formations:

- Superficial deposits comprising peat, alluvium and river terrace deposits;
- Gault Formation; and
- West Melbury Marly Chalk Formation.

*Magnitude of impact*

4.2.132 The robust design, construction, pressure testing and monitoring of the Waterbeach pipelines will prevent undetected losses during operation. The pipe to be used for the Waterbeach pipelines would be made from polyethylene. Pipe sections are heat-welded together, and the welds should be stronger than the pipe itself. As the Waterbeach pipelines will be pressurised during operation, in order to pump the waste water to the proposed WWTP, pressure testing will be undertaken on completion of installation. The test pressure will exceed the normal working pressure of the pipelines. As a result, the risk of leakage or losses from failure of the pipeline materials or welds, leading to contamination of groundwater in the vicinity of the pipelines, would be extremely low. In addition, pressure in the pipelines will be monitored during operation to ensure that the pipelines continue to function correctly.

4.2.133 The magnitude of impact of leakage from the Waterbeach pipelines to groundwater quality is therefore considered **negligible**.

*Sensitivity of receptor*

4.2.134 The Chalk aquifer, of which the West Melbury Marly Chalk Formation forms a part, is classified by the Environment Agency as a Principal aquifer and is therefore assigned **high** sensitivity.

4.2.135 River terrace deposits and alluvium are classified by the Environment Agency as Secondary A aquifers and have **medium** sensitivity.

4.2.136 Peat and Gault Formation are classified as unproductive aquifers and have **low** sensitivity.

*Significance of effect*

4.2.137 The impact of Waterbeach pipeline leakages on groundwater quality is **negligible** in terms of magnitude. The effect on the West Melbury Marly Chalk Formation, which is a **high** sensitivity receptor, is **slight adverse**, which is **not significant**. However, no leakage is expected from the pipelines to the West Melbury Marly Chalk Formation.

4.2.138 The effect on river terrace deposits, alluvium, peat and Gault Formation, which are **medium** and **low** sensitivity receptors, is **neutral** and **not significant.**

*Secondary mitigation or enhancement*

4.2.139 No significant adverse effect is predicted and no secondary mitigation is required.

*Residual effect*

4.2.140 On the basis that no significant adverse effect is predicted or further mitigation is proposed, the residual effect remains **not significant**.

### Monitoring

4.2.141 During the operational phase, regulatory compliance monitoring (UK Government, 2021) and Environment Agency ongoing assessment of permit conditions will prevent deterioration of water quality within the River Cam, as compared to the proposed indicative permitted scenario (Table 3-1).

4.2.142 Post-construction water level and water quality monitoring should continue at all boreholes which are identified in Section 4.1 Construction phase: Monitoring, and which are expected to remain after construction (Figure 20.4 : Monitoring boreholes (Book of Figures – Water Resources App Doc Ref 5.3.20)).

4.2.143 For pre-construction water quality monitoring, it is expected that a monthly comprehensive groundwater suite is used, as indicated in Section 4.1 Construction phase. Thereafter, during construction and operation, a reduced suite may be used with reduced frequency, dependent on the outcome of previous monitoring rounds.

4.2.144 Post-construction water level and water quality monitoring should continue at the two additional monitoring borehole locations identified in Section 4.1 Construction phase: Monitoring. These are:

- Location 1: between BH_STW_025 and BH_STW_026; and
- Location 2: between BH_STW_026 and BH_STW_024.

4.2.145 Post-construction water level and water quality monitoring should be undertaken in:

- Black Ditch;
- the northernmost land drain connecting to Black Ditch (within the land required for the landscape masterplan); and
- The attenuation pond in the landscape masterplan area receiving the discharge from the sub-surface drainage network in the proposed WWTP.

## 4.3 Decommissioning

4.3.1 This section sets out the assessment of effects in relation the decommissioning activities completed in order to surrender the environmental permit at the existing Cambridge WWTP. Demolition activities and intrusive works to decommission the

existing Cambridge WWTP are considered within Chapter 22: Cumulative Effects. Decommissioning of the existing Waterbeach WRC is also considered within Chapter 22: Cumulative Effects (App Doc Ref 5.2.22).

4.3.2 No further assessment is included in this section relating to the decommissioning of the redundant section of the Waterbeach pipeline. The redundant section of the Waterbeach pipeline would be left in situ and decommissioned using isolating valves or an equivalent technique to close off the pipeline section at each end. The pipeline section decommissioning works, and the long-term presence of the redundant section of the Waterbeach pipeline, would have no additional impact on water resources.

4.3.3 No further assessment is included in this section relating to the decommissioning of the existing tanks and pipework at the existing Cambridge WWTP. Tank contents would be tankered away for treatment and disposal offsite. The redundant cleaned tanks will be punctured to prevent rainfall accumulation. Any percolating rainwater from the redundant tanks is expected to have no additional impact on water resources.

***Removal of existing outfall – surface water***

4.3.4 This assessment considers the impact of cessation of discharge of treated effluent from the outfall from the existing Cambridge WWTP on the 90m reach of the River Cam between the outfalls of the existing Cambridge WWTP and the proposed WWTP.

*Magnitude of impact*

4.3.5 There will be a reduction in flow in a 90m reach of the River Cam between the outfall from the existing Cambridge WWTP and the proposed WWTP. The flow could be reduced by an estimated 40% in this reach of the river in $Q_{95}$ flow conditions, based on:

- records for the River Cam at Jesus Lock, located approximately 5.5km upstream of the existing outfall; and
- the currently permitted DWF for the existing Cambridge WWTP.

4.3.6 As water levels in this section of the river are controlled by the weir at Baits Bite Lock, approximately 500m downstream of the outfall for the proposed WWTP, the change in water level in the 90m reach of the river should be negligible. However, the average velocity of the flow would reduce by about 40%.

4.3.7 In contrast, there should be an improvement in water quality in this 90m reach of the river as a result of the cessation of final effluent discharge from the outfall for the existing Cambridge WWTP. It is not possible to assess the difference between the adverse impact of loss of flow against the beneficial impact of improvement in water quality, although the benefit to water quality might be expected to outweigh the impact of loss in flow. In addition, these impacts only apply over a 90m section of the river. As a result, the impact is considered to be **negligible**.

*Sensitivity of receptor*

4.3.8 The River Cam is a WFD water body and is considered to have **high** sensitivity.

*Significance of effect*

4.3.9 The impact of cessation of discharge from the existing Cambridge WWTP on the 90m reach between the existing and proposed outfall locations on the River Cam is **negligible** in terms of magnitude. The effect on the River Cam, which is a **high** sensitivity receptor, is **slight adverse** and **not significant.**

*Secondary mitigation or enhancement*

4.3.10 No significant adverse effect is predicted, and no secondary mitigation is required.

*Residual effect*

4.3.11 On the basis that no significant adverse effect is predicted or further mitigation proposed, the residual effect remains **not significant**.

### Monitoring

4.3.12 Decommissioning monitoring with respect to contaminated land risk for the existing Cambridge WWTP is considered in Chapter 14: Land Quality (App Doc Ref 5.2.14).

4.3.13 Decommissioning of the existing Cambridge WWTP will include cessation of discharge from the existing outfall. The outfall from the existing Cambridge WWTP is subject to regulatory compliance monitoring in accordance with Environment Agency discharge permitting. The proposed outfall will also be regulated by the Environment Agency with further stringent requirements under the Environment Act (UK Government, 2021). Additional monitoring with respect to the cessation of discharge from the existing Cambridge WWTP to the River Cam is not required.

## 4.4 Cumulative effects

4.4.1 Cumulative effects are those arising from impacts of the proposed development in combination with impacts of other proposed or consented development projects that are not yet built or operational. An assessment of cumulative effects for water resources has been completed and is reported in Chapter 22: Cumulative Effects Assessment.

4.4.2 For water resources there are no residual cumulative effects.

4.4.3 For the aspect of water, all developments are required to comply with the NPPF, development plans and other legislation and guidance. As such, any future developments should have a neutral effect on water resources and flood risk.

4.4.4 Developments considered with respect to cumulative effects on water resources are:

- S/2075/18/OL: Up to 4,500 dwellings, business, retail, community, education and leisure uses, Waterbeach New Town East;
- S/0791/18/FL: Relocated railway station comprising platforms, pedestrian bridges, access route, cycle routes, Waterbeach New Town;
- S/0559/17/OL: Up to 6,500 dwellings, business, retail, community, leisure, education and sports use, Waterbeach New Town;
- S/2682/13/OL: Up to 1,300 dwellings, school, food store, community and open spaces, Marleigh;
- 18/0481/OUT: Up to 1,200 dwellings, retail, education and community facilities on land north of Cherry Hinton; and
- 20/04010/FUL: One and two storey building containing offices, custody suite and associated facilities South of Milton Park and Ride.

## 4.5 Inter-related effects

4.5.1 Inter-related effects are the impacts and associated effects of different aspects of the Proposed Development during construction, operation or decommissioning upon the same receptor. The assessment of inter-related effects for water resources has been completed and is reported in Chapter 22 Cumulative Effects Assessment.

4.5.2 For water resources there are no residual inter-related effects.

# 5 Conclusion

## Assessment and supporting studies

5.1.1 This chapter of the ES presents the findings of the EIA completed in relation to the potential construction and operational impacts of the Proposed Development on water resources. The main water resources under consideration comprise:

- Surface water features, including the River Cam, Black Ditch, Quy Water and Bottisham Lode. Licensed and deregulated surface water abstractions are also considered, based on information provided by the Environment Agency (2020).
- Groundwater features, including bedrock aquifers within the West Melbury Marly Chalk Formation and the Woburn Sands Formation, and superficial aquifers associated with river terrace deposits and alluvium. Licensed, deregulated and private groundwater abstractions are also considered, based on information provided by the Environment Agency (2020).
- Flood risk as a result of the construction works and future operation of the proposed WWTP is considered in Appendix 20.1 (App Doc Ref 5.4.20.1) Flood Risk Assessment and is summarised within this chapter.
- Nature conservation sites in the project area which are associated with, or dependent on, surface water or groundwater. These include Stow-cum-Quy Fen SSSI, the River Cam CWS and Allicky Farm Pond CWS.

5.1.2 This assessment uses information from supporting studies and technical reports, which include:

- Appendix 20.9 (App Doc Ref 5.4.20.9) Hydrogeological impact assessment (Site Selection Stage). The HIA considers groundwater impacts at each of three potential sites for the Proposed Development. The study included preliminary contaminant transport modelling using available aquifer characteristics for the West Melbury Marly Chalk Formation.
- Appendix 20.4 (App Doc Ref 5.4.20.4) Dewatering/Pump Test Technical Note. Pumping tests were undertaken in 2021 at the location of the TPS. Results of the pumping tests led to revised estimates of aquifer transmissivity compared to those used in the HIA.
- Appendix 20.8 (App Doc Ref 5.4.20.8) Contaminant Transport Note. Updated contaminant transport modelling based on revised West Melbury Marly Chalk Formation transmissivities from the 2021 pumping tests.
- Appendix 20.3 (App Doc Ref 5.4.20.3) Water Framework Directive Assessment Report. WFD screening and scoping assessments of WFD groundwater and surface water bodies with potential for impact by the Proposed Development.

- Appendix 20.1 (App Doc Ref 5.4.20.1) Flood Risk Assessment. Considers flood risk from fluvial, surface water, groundwater and sewer sources, together with residual risk from reservoir, drainage or IDB pumping station failure. Flood risk is considered both to and from the Proposed Development during construction works and future operation.
- Appendix 20.10 (App Doc Ref 5.4.20.10) Storm Model Report. Urban Pollution Management (UPM) modelling of proposed storm management design components, comparing frequency of stormwater discharges of the existing Cambridge WWTP with that of the proposed WWTP.
- Appendix 20.5 (App Doc Ref 5.4.20.5) Fluvial Model Report. Modelling of the River Cam to assess fluvial flood levels and the relative impact of discharge from the proposed WWTP compared to that from the existing Cambridge WWTP.
- Appendix 20.6 (App Doc Ref 5.4.20.6) 3D velocity/mixing model. Modelling of local impacts from the treated effluent discharge on a short reach of the River Cam, from just downstream of the A14 bridge to 100m downstream of the proposed outfall.
- Appendix 20.7 (App Doc Ref 5.4.20.7) Outfall CFD report. Modelling of the impact of outfall discharge on flow dynamics along a 1km reach of the River Cam , extending approximately 600m upstream and 400m downstream of the proposed outfall

## Effects during construction

5.1.3 Impacts to water resources during construction would be temporary. In many cases these impacts would be subject to further mitigation, comprising rigorous surface water and groundwater protection measures as outlined in CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1), resulting in no significant residual effects. These protection measures are standard practice in the construction industry.

5.1.4 The following significant adverse, temporary effects for which no further mitigation is possible are, however, identified for construction:

- A cofferdam will be required in the River Cam to create dry conditions for the construction of the proposed outfall and riverbed scour protection. Installation and removal of the cofferdam may have a temporary effect on riverbed sediments over a reach of the river downstream of the outfall. There would be a moderate adverse temporary effect, which is significant. Any unacceptable levels of sediment in water pumped from the cofferdam during construction of the outfall would be removed by settlement before the water was discharged back into the river.

- The cofferdam will reduce the cross-sectional area of the river, potentially leading to increased river velocity and water levels. Outfall construction will be planned for what is generally a dry time of year, when fluvial flood risk is relatively low. Construction planning would also include a programme to minimise the time in which the cofferdam is in place. However, while the cofferdam is in place there would be a moderate adverse temporary effect on fluvial flood risk, which is significant.
- Assessments have been made of the potential temporary impact of dewatering on groundwater levels and flows in the West Melbury Marly Chalk Formation during excavation for the large diameter TPS shaft at the proposed WWTP. Test pumping and water level monitoring results for boreholes located in and around the shaft site (Appendix 20.4, App Doc Ref 5.4.20.4 Dewatering/Pump Test Technical Note) indicate that the aquifer characteristics of the formation, including low permeability, should result in only modest rates of dewatering during shaft excavation. There could be a temporary moderate and localised adverse effect on groundwater levels, which is significant. No permanent change to the integrity of the aquifer is expected, however, as groundwater levels would recover once dewatering ceases.
- Dewatering is also likely to be required during installation of other below-ground structures. Below-ground structures exceeding 5m in depth, and comprising tanks for various operations, will be installed to a maximum depth of 8m and cover a total area of approximately 27,000m$^2$. However, dewatering associated with the installation of these structures will take place intermittently over an extended period during the construction programme, spreading out the impact on local groundwater levels. As a result, there will be temporary moderate and localised adverse effect on groundwater levels, which is significant. No permanent change to the integrity of the aquifer is expected as groundwater levels would recover once dewatering ceases.

5.1.5 The assessments of the potential impact of dewatering during excavation for the TPS shaft indicate that dewatering should have a negligible impact on groundwater levels at water-dependent nature conservation sites, and on a private groundwater supply source in the area around the proposed WWTP. Taking into account these findings, dewatering associated with the installation of other below-ground structures is also assessed to have negligible impacts.

5.1.6 Monitoring of groundwater levels around the proposed WWTP, as well as monitoring of water levels in Black Ditch, Allicky Farm Pond CWS and Stow-cum-Quy Fen SSSI, will be carried out prior to, during and following all dewatering activities for construction at the proposed WWTP. A no-derogation agreement will also be made with the owner of a private groundwater source in the vicinity of the proposed WWTP. The agreement will ensure that, in the unlikely event that the private supply from the groundwater source

could be significantly affected, measures would be taken to maintain a supply to the property.

5.1.7 In addition, a possible temporary, but at most, minor adverse impact might occur to a private groundwater abstraction as a result of dewatering during installation of the Waterbeach pipelines. A no-derogation agreement will also be made with the owner of this private supply source. It will ensure that, in the unlikely event that the private supply from the groundwater source could be significantly affected by the dewatering, measures would also be taken to maintain a supply to the property.

5.1.8 Construction could increase surface water flood risk to a local residence in the vicinity of the Proposed Development by increasing surface water runoff during periods of heavy rainfall. However, an Emergency Preparedness Plan and a Construction Water Quality Management Plan will be incorporated into the CEMP. These plans will set out requirements in construction areas to prevent any significant effects on the existing flood risk in the surrounding area.

## Effects during operation

5.1.9 A number of potential impacts on water resources resulting from the operation of the Proposed Development were considered in the EIA. Several of these were found to give rise to effects which were not significant. The effects which were assessed as significant, or were considered initially to be of potential concern, are summarised below.

***River water quality***

5.1.10 The assessment considered the impact of final effluent discharge from the proposed new outfall on water quality for the River Cam. It is assumed that regulatory compliance monitoring and Environment Agency ongoing assessment of permit conditions for the proposed WWTP will ensure that the quantity of each consented determinant in the final effluent discharge will never exceed the quantity indicated by the current permit conditions for the existing Cambridge WWTP. These consented determinants comprise total phosphorus, TSS, BOD and ammoniacal nitrogen. The assessment therefore assumes that environmental permitting will mitigate any risk of river water quality deterioration due to the final effluent discharge.

5.1.11 Permit conditions are likely to vary over time in response to changes in effluent discharge and river flow, including changes arising from population growth, water usage, climatic or environmental factors and phasing of development. The UK Centre for Hydrology & Ecology models (UK Centre for Ecology & Hydrology, accessed April 2022) for the 2050s indicate reductions of up to 20% in low flows in the East Anglian region for most modelled scenarios. The changes indicated by these model scenarios could cause a substantial reduction in river flow available to dilute the final effluent discharge. The proposed WWTP has, however, been designed to be flexible and to accommodate changes relating to regulatory requirements.

5.1.12 Based on a comparison of the proposed consent limits with the consent limits for the existing Cambridge WWTP, there should be a decrease in the contribution of total phosphorus and ammoniacal nitrogen to river water for all final effluent discharges from the proposed WWTP. With the transfer of waste water from the Waterbeach WRC to the proposed WWTP, there may also be a small improvement in river water quality downstream of Bottisham Lock in some periods. As a result, the overall magnitude of impact on water quality in the River Cam is assessed as minor beneficial. Combined with high sensitivity for the water body, there would be a moderate and, therefore, significant beneficial effect on the River Cam. Future benefits to river water quality would, however, also be dependent on the actual impact of climate change on low flows.

5.1.13 A decreased frequency of stormwater discharge to the River Cam from the proposed WWTP, as compared to the existing Cambridge WWTP, will also improve water quality in periods when these stormwater discharges currently occur. The magnitude of impact to water quality is also considered to be minor beneficial, giving rise to a moderate beneficial effect in periods of stormwater discharge to the River Cam.

***Outfall discharge – impacts of scour on the River Cam***

5.1.14 Modelling was undertaken to examine the impacts from the treated effluent discharge on a short reach of the River Cam in the vicinity of the proposed outfall (Appendix 20.7, App Doc Ref 5.4.20.7: Outfall CFD report), and also from treated effluent velocities and mixing over a 1km reach of the River Cam (Appendix 20.6, App Doc Ref 5.4.20.6: 3D velocity/mixing model). The objectives of modelling were to identify an outfall configuration which should minimise potential impacts to river users, the riverbed and riverbank.

5.1.15 There is existing sheet piling on the west riverbank, opposite the proposed outfall. Rip-rap riverbed protection and sheet piling riverbank protection will be used in the vicinity of the outfall to prevent local riverbed scour impacts. Under normal operating conditions the magnitude of impact of final effluent discharge on riverbed and riverbank sediments is considered negligible, giving rise to an effect which is not significant.

5.1.16 Under abnormal operating conditions, including infrequent and extreme events of stormwater discharge, the magnitude of impact of final effluent and stormwater discharge on riverbed and riverbank sediments may be considered minor adverse, giving rise to an effect which is significant. However, recommendations from the assessment include further outfall design to be assessed by modelling (Appendix 20.7, App Doc Ref 5.4.20.7), to reduce potential riverbank and riverbed impacts relating to maximum stormwater discharges. Any risk relating to infrequent stormwater discharge and erosion will be further mitigated through the routine visual inspection of both riverbanks downstream of the proposed outfall following a stormwater discharge event. Maintenance or repair of eroded sections of riverbank would be undertaken if needed.

As a result, there would remain, at most, a low residual scour risk, albeit still assessed as giving rise to a significant, residual adverse effect.

***Drainage and aquifer recharge***

5.1.17 A number of components of the proposed WWTP, including the TPS shaft, storm tanks, primary settlement tanks, activated sludge plant tanks, final settlement tanks and the filtration plant will be installed at depths of between 5m and 8m below ground level. At these depths, the water table in the West Melbury Marly Chalk Formation is likely to be above the base of many, or possibly all, of the tanks throughout the year. Foundations for many above-ground structures are also likely to penetrate well below the water table.

5.1.18 Analysis of data from monitoring boreholes indicates that groundwater levels in the vicinity of the proposed WWTP could rise towards ground level in some winter/spring periods. However, in current conditions, land drains in the area of the proposed WWTP could intercept groundwater as it rises and direct it away to drainage ditches.

5.1.19 Excavation to form the base for the proposed WWTP increases the likelihood that groundwater levels could reach, or rise above, ground level in some winter/spring periods. In addition, assuming existing land drainage within the proposed WWTP is removed during construction, the risk of regular shallow groundwater table conditions, or inundation of the area by groundwater flooding in some years, could increase significantly. Groundwater flows will also be affected locally by the presence of below-ground structures and foundations in all groundwater level conditions. As a result, the risk of groundwater flooding in some parts of the proposed WWTP in winter/spring periods could be increased further.

5.1.20 The possibility of groundwater flooding within the proposed WWTP will, however, be taken into account in the detailed drainage design for the proposed WWTP. The drainage design will incorporate and develop further the proposals set out in Appendix 20.12 (App Doc Ref 5.4.20.12) Drainage strategy. Any emergent groundwater within the proposed WWTP will be managed by surface water drainage. This may lead to a very limited and localised loss to groundwater. However, groundwater may already currently discharge to surface water through the existing land drainage when groundwater levels are high.

5.1.21 Infiltration to the West Melbury Marly Chalk Formation in the area of the proposed WWTP is likely to be reduced as a result of the impermeable structures and areas of hardstanding installed as components of the WWTP. Infiltration and runoff rates may also vary locally in the vicinity of the earth banks surrounding the proposed WWTP. In addition, there could be changes to infiltration and groundwater conditions as a result of the land use (meadow) proposed in the landscape masterplan area and drainage retention features included in the drainage strategy.

5.1.22 It is not possible to quantify precisely the changes in infiltration and aquifer recharge which might take place. However, taking into account the relatively small area required for the proposed WWTP and the Landscape Masterplan, compared to the regional extent of the West Melbury Marly Chalk Formation, the effect on overall aquifer recharge should be localised and very limited. Changes to infiltration as a result of the landscape masterplan would also be very limited in the regional context. In this case it would be comparable to any change occurring when land is converted from agricultural usage to meadow.

5.1.23 The redirection of groundwater flows and shallower groundwater levels in the area of the proposed WWTP, together with potential changes to recharge, will have a negligible impact on aquifer conditions in the West Melbury Marly Chalk Formation. As a result, the effect on the aquifer is assessed as slight adverse and not significant.

5.1.24 The drainage network and changes to infiltration could result in a change in contributions to base flows in local drains connected to Black Ditch. Much of the change would be a result of drainage from areas of the proposed WWTP, at risk of contamination, being redirected for treatment. These changes in infiltration and drainage may be expected to have a minor adverse impact on the overall flow regime in Black Ditch and an agricultural abstraction from Black Ditch. As a result, the effect on Black Ditch and the abstraction is also assessed as slight adverse and not significant.

***Accidental spills and leaks within the proposed WWTP***

5.1.25 The assessment considers the risk to groundwater from leakage or accidental spills during operation of the proposed WWTP. Significant leaks from the TPS shaft or below-ground tanks at the proposed WWTP are unlikely to occur, assuming best practice construction methods. The most likely sources of leakage to groundwater are considered to be from accidental spills onto permeable ground, minor leaks from drainage systems or weeping from above-ground tanks.

5.1.26 Approximate mathematical modelling (Appendix 20.8, App Doc Ref 5.4.20.8 Contaminant Transport Note ) of contaminant pathways and travel times in groundwater for these leakage sources includes conservative assumptions of:

- an infinite source of contaminants from the proposed WWTP; and
- flow through aligned, continuous fractures within the West Melbury Marly Chalk Formation.

5.1.27 With these assumptions, the retarded travel times for most inorganic contaminants in groundwater to the Black Ditch drainage network exceed 1,000 years, although some potential contaminants are modelled as reaching the drainage system in substantially less time (480 years for ammoniacal nitrogen, 10 to 24 years for hydrocarbons). However, as already indicated, the assumptions used for the model are conservative.

Accidental spills or leakages would be limited in volume. Fractures are unlikely to be continuous or aligned in the West Melbury Marly Chalk Formation.

5.1.28 Without mitigation, there could be a risk of a localised moderate adverse effect which is significant due to potential contamination from the proposed WWTP on groundwater quality in the West Melbury Marly Chalk Formation. There would be a slight effect on water quality in Black Ditch, which is not significant.

5.1.29 The drainage strategy includes dedicated closed drainage with impermeable surfaces in areas of the proposed WWTP which present a contamination risk. Potentially contaminated runoff from these areas will be returned to the head of the proposed WWTP for treatment. For the remaining areas of the proposed WWTP, however, a sub-surface drainage network will be connected by buried pipeline to a pond in the landscape masterplan area, with controlled outflow to a drain linked to Black Ditch. In the event of any contamination occurring in the area of the sub-surface drainage network, there would be a risk that the contamination could be intercepted by the drainage. Contaminants could then be transferred much more rapidly to the pond and the drain linked to Black Ditch than would occur through groundwater. Therefore, the presence of this drainage network in some areas of the proposed WWTP might present a greater risk to water quality in Black Ditch. This risk is assigned a moderate impact. Combined with medium sensitivity for Black Ditch, there would be a moderate adverse effect, which is significant.

5.1.30 The design and operation of the proposed WWTP will include rigorous mitigation measures, set out in the CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1), to prevent major pollution incidents and, more generally, to minimise the generation and mobilisation of contamination. The potential for hydrocarbons to enter the water environment at the proposed WWTP would be limited as a result of embedded measures in site design, management systems and suitable operational and emergency procedures. Any fuel spills would be contained on site by tank bunds or hardstanding over which the fuel pipelines would be located. Therefore, the likelihood of hydrocarbons reaching ground into which contaminants could infiltrate would be low. Any defects in below-ground tanks will be identified through regular inspections. Repairs will be undertaken promptly, if required. This will ensure that the risks of failure of the tanks are minimized, although some minor leakage from tanks may still be possible. Leaks detected in drainage systems during maintenance activities will also be repaired promptly.

5.1.31 With this mitigation, the impact of potential contamination from the proposed WWTP on groundwater quality in the aquifer in the West Melbury Marly Chalk Formation should be negligible. The residual effect on the West Melbury Marly Chalk Formation would be slight adverse, which is not significant.

5.1.32 The inspection, maintenance and groundwater protection measures should reduce to minor the potential impact on Black Ditch due to the low risk of contamination of the

sub-surface drainage network in the proposed WWTP. There would be a slight adverse residual effect on Black Ditch, which is also not significant.

***Flood risk***

5.1.33 Fluvial flood modelling of the River Cam water levels has been undertaken (Appendix 20.5, App Doc Ref 5.4.20.5 Fluvial Model Report) to determine the impact of final effluent and stormwater discharges to the river upon flood levels. The model indicates that in a 1 in 100 year flood event, with a 20% allowance for climate change, there would be a less than 7mm increase in water levels in the River Cam, leading to a negligible change in the potential area of inundation across the floodplain. Therefore, the magnitude of impact to fluvial flood risk due to final effluent and stormwater discharges from the proposed WWTP is considered negligible. The effect on potential receptors, which could include properties, dwellings and infrastructure of high sensitivity, is assessed as slight adverse and therefore not significant.

## Effects during decommissioning

5.1.34 Decommissioning of the existing Cambridge WWTP involves diversion of rising mains and gravity sewers and cessation of discharge at the existing outfall. It is assumed that rigorous groundwater protection measures, which are standard practice to prevent contamination, will be implemented during the diversion works.

5.1.35 Potential impacts on water resources resulting from decommissioning activities should not give rise to any effects which are significant.

## Overall assessment

5.1.36 In conclusion, therefore, the following impacts have been identified for construction which could have significant, temporary adverse effects. These effects relate to:

- the temporary increased sediment content of water in the River Cam due to impacts on the riverbed from installation and removal of the cofferdam;
- a temporary increase in fluvial flood risk due to the restriction in the River Cam during the outfall construction behind the cofferdam;
- a temporary lowering of groundwater levels during dewatering of the excavation for the deepest below-ground structure, the TPS shaft; and
- a temporary lowering of groundwater levels during dewatering of excavations for other below-ground structures within the land required for the proposed WWTP.

5.1.37 During operation of the Proposed Development, there would be impacts resulting from changes in final effluent and stormwater discharges which are expected to have a significant beneficial effect on water quality in the River Cam.

5.1.38 Following implementation of best practice design for the proposed final effluent and stormwater discharge outfall, there would remain a low residual risk of erosion to riverbanks and the riverbed in the event of an infrequent stormwater discharge, giving rise to a residual significant adverse effect. This low risk will be mitigated through routine visual inspection of both riverbanks downstream of the proposed outfall following a stormwater discharge event. Maintenance or repair of eroded sections of riverbank would be undertaken if needed.

5.1.39 A summary of potential impacts on water resources resulting from construction, operation and decommissioning activities is provided in Table 5-1.

**Table 5-1: Summary of water resources effects**

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
|---|---|---|---|---|---|---|---|
| **Construction** | | | | | | | |
| **Proposed WWTP** | | | | | | | |
| Impact of deep excavations for the tunnel and associated shafts on groundwater flows, groundwater levels and groundwater quality within the Lower Greensand (Woburn Sands Formation) aquifer | Impacts from deep excavations will be avoided through the design which places the deepest elements of below ground structures so that will not penetrate the Lower Greensand. | Negligible | High | Slight adverse. Not Significant. | None | Slight adverse. Not Significant. | None |
| Impact to River Cam levels and flows close to and downstream of the crossing of the proposed waste water transfer tunnel from the existing WWTP to the proposed WWTP, and associated access shafts. | Impacts to river levels will be managed by:<br>• the use of trenchless techniques to install structures below the river-bed<br>• the setting of equipment launch and recovery equipment outside of the main river byelaw margin. | Negligible | High | Slight adverse. Not Significant. | None | Slight adverse. Not Significant. | None |
| Impact to superficial and bedrock groundwater flows and levels, due to dewatering of open-cut trenches during the FE and stormwater pipeline installation | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• Minimising run-off and the risk of runoff reaching ditches and watercourses such as through the siting of launch and recovery pits associated with trenchless construction methods to be located a minimum of 8m from top of bank<br>• The application of measures to prevent run-off from construction such as the use of cut off drains, avoiding vegetation removal right up to the banks of watercourses, minimising the areas of land that are disturbed/cleared, avoiding stockpiling of material close to the banks of watercourses, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff.<br>• Management of dewatering to meet requirements of the Environment Agency regulatory position statement (RPS) 'Temporary dewatering from excavations to surface water' or Environmental Permit, whichever applies to the activity. Including | Negligible | Superficial deposits: Medium<br><br>West Melbury Marly Chalk aquifer: High | Superficial deposits: Neutral. Not significant<br><br>West Melbury Marly Chalk aquifer: Slight adverse. Not Significant. | None | Superficial deposits: Neutral. Not significant<br><br>West Melbury Marly Chalk aquifer: Slight adverse. Not Significant. | None |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
|---|---|---|---|---|---|---|---|
| | treating dewatering effluent prior to discharge and control of dewatering discharges to prevent scour<br>• .Measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• Requirement for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• Requirement for refuelling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained | | | | | | |
| Impact to groundwater abstractions due to dewatering of open-cut trenches during the FE and stormwater pipeline installation | As above | Negligible | High | Slight adverse. Not significant. | None | Slight adverse. Not significant. | None |
| Impact to flow in large ditches due to dewatering of open-cut trenches during the FE and stormwater pipeline installation | None | Moderate adverse | Low | Slight adverse. Not significant. | None | Slight adverse. Not significant. | None |
| Impact of excavation and backfill of final effluent and storm pipeline trenches on land drains and groundwater flow | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement the following measures in relation to groundwater flow:<br>• Infill of trenches with suitable materials, with use of clay plugs or partitions if necessary to prevent preferential flow. | Major adverse. | Land drains: High | Land drains: Major adverse. Significant | Provision / reinstatement of land drainage through implementation of Section 5.14 of the CoCP Part A (Other watercourses / Drainage channels / Land drains). | Land drains: Slight adverse. Not significant | None |
| Impact of dewatering during outfall construction on groundwater and surface water flows and levels | • Management of construction activities as described within the CoCP Part A and B Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 of Part A which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works | Negligible | River Cam: High<br><br>Alluvium: Medium | River Cam: Slight adverse. Not significant.<br><br>Alluvium: | None | River Cam: Slight adverse. Not significant.<br><br>Alluvium: | None |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
|---|---|---|---|---|---|---|---|
| | commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practise measures in relation to management of dewatering effects on groundwater including:<br>• Management of dewatering activities in accordance with Environment Agency specifications including rates and durations<br>• Measures to control dewatering (such as ceasing, changing of pump rates) to be put in place if impacts on water flows/levels are identified | | | Neutral. Not significant. | | Neutral. Not significant. | |
| Impact of cofferdam, used to maintain dry conditions during outfall construction, on water quality of the River Cam | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• Management of dewatering activities in accordance with Environment Agency specifications including treating dewatering effluent prior to discharge and control of dewatering discharge rates to prevent scour.<br>• Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular Part A section 4.4 which required the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into CEMP(s). These plans will include the requirement to implement best practise measures in relation to management of dewatering activities including:<br>• Management of dewatering activities in accordance with Environment Agency specifications including treating dewatering effluent prior to discharge and control of dewatering discharge rates to prevent scour<br>• The application of measures to prevent run-off from construction to the landside draining to the cofferdam such as the use of cut off drains, avoiding vegetation removal right up to the bank, minimising the areas at the bank that are disturbed/cleared, avoiding stockpiling of material | Dewatering: Minor adverse<br><br>Cofferdam installation and removal: Moderate adverse. | High | Dewatering: Moderate adverse. Not significant<br><br>Cofferdam installation and removal: Moderate adverse. Significant. | The management of water resources and flood risk as set out within Section 7.5 of the CoCP Part A, Water resources and flood risk, sets out a framework for the control of flood risk during construction, identifying a number of 'standard' mitigation measures which will be implemented whilst construction work takes place. These will be reflected in an appended plan to/as part of the CEMP. This will include the following:<br>• requirement to mminimise construction period for sections identified within the flood zone<br>• the timing of river crossing works in summer months if possible<br>• requirement for a flood management plan for construction works within areas at risk of flooding<br>• Inclusion of dry access/egress routes for pedestrians from compounds<br>• requirement for any soil temporarily stored within the flood zone, to include gaps to allow flood water to run through<br>• requirement to secure or relocation loose items within compounds, laydown or storage areas within flood zone 2 and 3 to prevent them | Dewatering: Slight adverse. Not significant<br><br>Cofferdam installation and removal: Moderate adverse. Significant. | None |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
|---|---|---|---|---|---|---|---|
| | close to the banks, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff. | | | | becoming a debris hazard in a flood event or where practical removed from the flood zone if high rainfall within the catchment is predicted | | |
| Impact to fluvial flood risk due to construction of the outfall. | The management of water resources and flood risk as set out within Section 7.5 of the CoCP Part A, Water resources and flood risk, which sets out a framework for the control of flood risk during construction, identifying a number of 'standard' mitigation measures which will be implemented whilst construction work takes place. These will be reflected in an appended plan to/as part of the CEMP. This will include the following:<br>• requirement to minimise construction period (for river works)<br>• requirement for the cofferdam to be designed to maintain the flood protection levels currently provided by the riverbank.<br>• the timing of river works in summer months<br>• requirement for a flood management plan for construction works within areas at risk of flooding<br>• requirement to secure or relocation loose items within compounds, laydown or storage areas within flood zone 2 and 3 to prevent them becoming a debris hazard in a flood event or where practical removed from the flood zone if high rainfall within the catchment is predicted<br>• requirement for the Principal Contractor(s) to consult with the Environment Agency, IDB, Lead Local Flood Authority and any other relevant risk management authorities in respect of the flood risks in the preparation of the Emergency Preparedness Plan and Pollution Incident Control Plan. This will include use of the Environment Agency's Floodline flood warning service for works within areas at risk of flooding | Moderate adverse | Medium | Moderate adverse. Significant. | Requirement for a flood management plan for construction works within areas at risk of flooding<br>Requirement to secure or relocation loose items within compounds, laydown or storage areas within flood zone 2 and 3 to prevent them becoming a debris hazard in a flood event or where practical removed from the flood zone if high rainfall within the catchment is predicted<br>Requirement for the Principal Contractor(s) to consult with the Environment Agency, IDB, Lead Local Flood Authority and any other relevant risk management authorities in respect of the flood risks in the preparation of the Emergency Preparedness Plan and Pollution Incident Control Plan. This will include use of the Environment Agency's Floodline flood warning service for works within areas at risk of flooding. | Moderate adverse. Significant. | None |
| Impact of dewatering of the West Melbury Marly Chalk Formation to watercourses including the River Cam, Black Ditch and Quy Water, during construction of the TPS shaft. | • None | River Cam & Quy Water: Negligible<br><br>Black Ditch: Minor adverse | River Cam & Quy Water: High<br><br>Black Ditch: Medium | River Cam & Quy Water: Slight adverse. Not significant<br><br>Black Ditch: Slight adverse. Not significant. | Monitoring of water levels water levels in Black Ditch for a period prior to, during and following construction activities at the proposed WWTP in order to amend operational management activities in the event water quality decline is attributed to operational surface water drainage arrangements | River Cam & Quy Water: Slight adverse. Not significant<br><br>Black Ditch: Slight adverse. Not significant. | Monitoring of water levels in Black Ditch would be undertaken for a period prior to, during and following dewatering during excavation of the shaft |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
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| Impact of dewatering of West Melbury Marly Chalk Formation on a surface water abstraction for agriculture (spray irrigation) in Black Ditch | Management of dewatering on the changes to groundwater through:<br>• maintaining regular contact with the owner of a nearby private borehole during construction and putting in place measures to maintain supply to the property if required. These will be outlined in the CEMP.<br>• the monitoring of water levels in available monitoring boreholes within the land required for proposed WWTP and landscape masterplan, would be undertaken for a period prior to, during and following all dewatering activities during construction at the proposed WWTP in order to inform management response should monitoring indicate a change in groundwater flows as a result of dewatering. Management responses may include but not be limited to reducing or ceasing dewatering or amending dewatering points and would be agreed through consultation with the Environment Agency.<br>• there will not be any dewatering to the Black Ditch itself.<br>• the scope of the monitoring including its duration will be agreed with all relevant stakeholders before commencement of works which could potentially impact the ditch. | Minor adverse | Agricultural abstraction: Medium | Slight adverse. Not significant. | Monitoring of water levels water levels in Black Ditch for a period prior to, during and following construction activities at the proposed WWTP in order to amend operational management activities in the event water quality decline is attributed to operational surface water drainage arrangements | Slight adverse. Not significant. | Monitoring of water levels in Black Ditch would be undertaken for a period prior to, during and following dewatering during excavation of the shaft |
| Impact of dewatering of the West Melbury Marly Chalk Formation on groundwater levels during construction of the TPS shaft | Management of dewatering on the availability of groundwater through the monitoring of water levels in available monitoring boreholes within the land required for proposed WWTP and landscape masterplan, for a period prior to, during and following all dewatering activities during construction at the proposed WWTP in order to inform management response should monitoring indicate a change in groundwater flows as a result of dewatering. Management responses may include but not be limited to reducing or ceasing dewatering, or amending dewatering points and would be agreed through consultation with the Environment Agency. | West Melbury Marly Chalk Formation aquifer: Minor adverse<br><br>Private drinking water source: Negligible | West Melbury Marly Chalk Formation aquifer: High<br><br>Private drinking water source: High | West Melbury Marly Chalk Formation aquifer: Moderate adverse. Significant.<br><br>Private drinking water source: Slight adverse. Not significant. | A no-derogation agreement will be made with the owner of the private groundwater source.<br>Monitoring will also be undertaken as specified in “Proposed Monitoring“ column. | West Melbury Marly Chalk Formation aquifer: Moderate adverse. Significant.<br><br>Private drinking water source: Slight adverse. Not significant. | Monitoring of water levels in available monitoring boreholes within the land required for the landscape masterplan, would be undertaken for a period prior to, during and following all dewatering activities during construction at the proposed WWTP. |
| Impact of dewatering during construction of the TPS shaft on groundwater levels at nature conservation sites. | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 of Part A which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to | Nature Conservation Sites: Negligible<br><br>Black Ditch: Minor adverse | Sensitivity of receptors at nature conservation sites is considered within Chapter 08 Biodiversity | Significance of effects at nature conservation sites is considered within Chapter 08: Biodiversity | Monitoring of water levels water levels in Black Ditch, Allicky Farm Pond CSW, Quy Fen SSSI, and The Cut water body within Quy Fen SSSI, for a period prior to, during and following construction activities at the proposed WWTP in order to amend operational management activities in | Significance of effects at nature conservation sites is considered within | Monitoring of water levels in Black Ditch, Allicky Farm Pond CSW, Quy Fen SSSI, and The Cut water body within Quy Fen SSSI, would be undertaken for a period prior to, during and following dewatering of the shaft |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
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| | implement best practise measures in relation to management of groundwater including:<br>• Management of dewatering activities in accordance with Environment Agency specifications including rates and durations<br>• Measures to control dewatering (such as ceasing, changing of pump rates) to be put in place if monitoring of water levels in Black Ditch indicates adverse changes as result of dewatering during the TPS construction leads to significant effects to surface water bodies | | | | the event water quality decline is attributed to operational surface water drainage arrangements . | Chapter 08: Biodiversity | |
| Reduction in groundwater and surface water flows and levels due to dewatering in the West Melbury Marly Chalk Formation during dewatering associated with the construction of below-ground structures and foundations, plus associated groundwater impact on nature conservation sites. | Impacts to groundwater levels and surface water flows will be managed through the implementation of measures to maintain supply as required by agreement to be made with the owner of the private groundwater source.<br>The management of groundwater flows from dewatering through the requirement to complete monitoring of water levels in available monitoring boreholes within the land required for the landscape masterplan and at Black Ditch, Allicky Farm Pond CSW, and The Cut water body within Quy Fen SSSI in order to inform management response should monitoring indicate a reduction in water levels as a result of dewatering. Management responses may include but not be limited to reducing or ceasing dewatering or amending dewatering points and would be agreed through consultation with the Environment Agency. | West Melbury Marly Chalk groundwater levels: Minor adverse<br>Black Ditch flows: Minor adverse<br>Agricultural abstraction: Minor adverse<br>Private water source: Negligible<br>River Cam & Quy Water flows: Negligible<br>Nature conservation sites: Negligible | West Melbury Marly Chalk: High<br>Black Ditch flows: Medium<br>Agricultural abstraction: Medium<br>Private drinking water sources: High<br>River Cam, Quy Water: High<br>Nature conservation sites: The sensitivity of receptors is not determined for nature conservation sites as part of the water resources assessment, but is considered in Chapter 08; Biodiversity | West Melbury Marly Chalk: Moderate adverse. Significant<br>Black Ditch flows: Slight adverse. Not significant.<br>Agricultural abstraction: Slight adverse. Not significant.<br>Private drinking water sources: Slight adverse. Not significant.<br>River Cam, Quy Water: Slight adverse. Not significant.<br>Nature conservation sites: Significance of effect is not determined for nature conservation sites as part of the water resources assessment, but is considered in | A no-derogation agreement will be made with the owner of the private groundwater source. Measures would be taken to maintain a supply in the unlikely event that the source was affected by dewatering.<br>Monitoring will also be undertaken as specified in “Proposed Monitoring“ column. | West Melbury Marly Chalk: Moderate adverse. Significant<br>Black Ditch flows: Slight adverse. Not significant.<br>Agricultural abstraction: Slight adverse. Not significant.<br>Private drinking water sources: Slight adverse. Not significant.<br>River Cam, Quy Water: Slight adverse. Not significant.<br>Nature conservation sites: Significance of effect is not determined | Monitoring of water levels in available monitoring boreholes within the land required for the landscape masterplan, and at Black Ditch, Allicky Farm Pond CSW, and The Cut water body within Stow-cum- Quy Fen SSSI, would be undertaken for a period prior to, during and following all dewatering activities during construction at the proposed WWTP. |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
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| | | | | Chapter 08; Biodiversity | | for nature conservation sites as part of the water resources assessment, but is considered in Chapter 08; Biodiversity | |
| Impacts of spillages of potentially contaminating materials used in construction, and the potential for construction-related turbidity, giving rise to contamination of groundwater. | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• The application of measures to prevent run-off from construction such as the use of cut off drains, avoiding vegetation removal right up to the banks of watercourses, minimising the areas of land that are disturbed/cleared, avoiding stockpiling of material close to the banks of watercourses, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff.<br>• Management of dewatering activities in accordance with Environment Agency specifications including treating dewatering effluent prior to discharge and control of dewatering discharge rates to prevent scour.<br>• Measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• Requirement for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• Requirement for refuelling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained<br>Measures to maintain supply as required by agreement to be made with the owner of the private groundwater source. | Contaminant Spill<br>West Melbury Marly Chalk: Moderate<br><br>Private drinking water source: Moderate<br><br>Turbidity<br>Groundwater quality: Negligible<br><br>Private drinking water source: Negligible | West Melbury Marly Chalk: High<br><br>Private drinking water sources: High | Contaminant spill<br>West Melbury Marly Chalk Formation: Moderate adverse. Significant.<br><br>Private drinking water sources: Moderate adverse. Significant.<br><br>Turbidity<br>West Melbury Marly Chalk Formation: Slight adverse. Not significant.<br><br>Private drinking water sources: Slight adverse. Not significant. | CoCP Part A rigorous groundwater protection measures as implemented in CEMP.<br>No derogation agreement with owner of private groundwater source. Measures would be taken to maintain a supply in the unlikely event that the source was affected by dewatering. | Contaminant spill<br>West Melbury Marly Chalk Formation: Slight adverse. Not significant.<br><br>Private drinking water sources: Slight adverse. Not significant.<br><br>Turbidity<br>West Melbury Marly Chalk Formation: Slight adverse. Not significant.<br><br>Private drinking water sources: Slight adverse. Not significant. | Monitoring of water quality in available monitoring boreholes within the land required for the landscape masterplan, would be undertaken for a period prior to, during and following all dewatering activities during construction at the proposed WWTP. |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
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| Impacts to surface water quality from spillages of contaminants and from discharges of silt-laden water from dewatering activities. | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures in relation to the prevention of impacts to controlled waters (as defined within in Section 104 (1) of the Water Resources Act 1991 and Section 30A (d) of the Control of Pollution Act 1974' ) including:<br>• Measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• The application of measures to prevent run-off from construction such as the use of cut off drains, avoiding vegetation removal right up to the banks of watercourses, minimising the areas of land that are disturbed/cleared, avoiding stockpiling of material close to the banks of watercourses, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff.<br>• Requirement for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• Requirement for refuelling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained<br>• Requirement to have in place emergency response measures including stopping works, training of staff, use of spill response equipment<br>• The application of measures to prevent run-off from construction such as the use of cut off drains, avoiding vegetation removal right up to the banks of watercourses, minimising the areas of land that are disturbed/cleared, avoiding stockpiling of material close to the banks of watercourses, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff. | Surface water quality (contaminants): Major adverse<br><br>Surface water quality (discharges): Moderate adverse | Surface water drains: Low<br><br>Black Ditch: Medium<br><br>River Cam: High | Surface water quality (contaminants) Surface water drains: Moderate adverse. Significant<br><br>Black Ditch: Moderate adverse. Significant<br><br>River Cam: Major adverse. Significant<br><br>Surface water quality (discharges) Surface water drains: Slight adverse. Not significant<br><br>Black Ditch: Moderate adverse. Significant<br><br>River Cam: Moderate adverse. Significant | Rigorous protection measures as outlined in CoCP Part A and implemented through the CEMP.<br><br>Monitoring of water quality at Black Ditch for a period prior to, during and following construction activities at the proposed WWTP in order to amend operational management activities in the event water quality decline is attributed to operational surface water drainage arrangements . | Surface water quality (contaminants) Surface water drains: Neutral. Not significant<br><br>Black Ditch: Neutral. Not significant<br><br>River Cam: Slight adverse. Not significant<br><br>Surface water quality (discharges) Surface water drains: Neutral. Not significant<br><br>Black Ditch: Neutral. Not significant<br><br>River Cam: Slight adverse. Not significant | Monitoring of water quality at Black Ditch would be undertaken for a period prior to, during and following construction activities at the proposed WWTP |
| Impact of construction sites increasing surface water | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref | Surface water drains: | Surface water drains: Low | Surface water drains: Slight | An Emergency Preparedness Plan and Construction Water Quality | Surface water drains: | None |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
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| flood risk by increasing surface water runoff during periods of heavy rainfall | 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• The application of measures to prevent run-off from construction such as the use of cut off drains, avoiding vegetation removal right up to the banks of watercourses, minimising the areas of land that are disturbed/cleared, avoiding stockpiling of material close to the banks of watercourses, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff.<br>The management of water resources and flood risk as set out within Section 7.5 of the CoCP Part A, Water resources and flood risk, sets out a framework for the control of flood risk during construction, identifying a number of 'standard' mitigation measures which will be implemented whilst construction work takes place. These will be reflected in an appended plan to/as part of CEMP. This will include the following:<br>• Requirement to minimise the construction period for sections identified within the flood zone<br>• The timing of river crossing works in summer months if possible<br>• Requirements for a flood management plan for construction plan for construction works within areas at risk of flooding<br>• Inclusion of dry access/egress routes for pedestrians from compounds<br>• Requirement for any soil temporary stored within the flood zone, to include gaps to allow flood water to run through<br>• The application of measures to prevent run-off from construction on the landslide draining to the cofferdam such as the use of cut off drains, avoiding vegetation removal right up to the bank, minimising the areas at the bank that are disturbed/cleared, avoiding stockpiling of material close to the banks, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff | Moderate adverse.<br><br>Black Ditch catchment: Minor adverse.<br><br>River Cam catchment: Negligible<br><br>Residential receptor: Minor adverse. | Black Ditch: Medium<br><br>River Cam: High<br><br>Residential dwelling: High | adverse. Not significant.<br><br>Black Ditch catchment: Slight adverse. Not significant.<br><br>River Cam catchment: Slight adverse. Not significant.<br><br>Residential receptor: Moderate adverse. Significant. | Management Plan will be incorporated into the CEMP. These plans will set out requirements in construction areas to minimise impacts to the works and surrounding area from flooding and prevent any significant effects on the existing flood risk in the surrounding area. | Slight adverse. Not significant.<br><br>Black Ditch catchment: Slight adverse. Not significant.<br><br>River Cam catchment: Slight adverse. Not significant.<br><br>Residential receptor: Slight adverse. Not significant. | |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
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| Impact of wet testing of tanks and pipes within proposed WWTP on groundwater quality. | • Completion of testing and commissioning activities in accordance with environmental permit for the proposed WWTP (wet commissioning phase)<br>Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• Requirement for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• Requirement for refuelling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained | Negligible | West Melbury Marly Chalk Formation : High | Slight adverse. Not Significant | Management of commissioning activities through application of measures within the outline Commissioning Plan (Appendix 2.4,App Doc Ref 5.4.2.4) and the CoCP Part A, Section 4.4 (Construction Environment Management Plan), and Section 7.5 (Water Resources and Flood Risk) (Appendix 2.1, App Doc Ref 5.4.2.1) which requires that the contractors to prepare a Commissioning Plan | Slight adverse. Not Significant | In line with the Commissioning Plan approved by the Environment Agency |
| Impact on water quality in the River Cam when final effluent discharge transfers from the existing to the proposed WWTP. | Completion of testing and commissioning activities in accordance with the environmental permit for the proposed WWTP (wet commissioning phase) | Minor beneficial at start of transfer period increasing to moderate beneficial at the end of the transfer period. | High | Moderate beneficial. Significant. | Management of commissioning activities through application of measures within the outline Commissioning Plan (Appendix 2.4 App Doc Ref 5.4.2.4) and the CoCP Part A, Section 4.4 (Construction Environment Management Plan), and Section 7.5 (Water Resources and Flood Risk) (Appendix 2.1, App Doc Ref 5.4.2.1) which requires that the contractors to prepare a Commissioning Plan. | Moderate beneficial. Significant. | Regulatory compliance monitoring |
| Reduction in groundwater flows and levels, due to dewatering of open-cut trenches during Waterbeach pipeline installation, within superficial deposits and | None | Negligible | West Melbury Marly Chalk: High<br><br>River Terrace Deposits & Alluvium: Medium | West Melbury Marly Chalk: Slight adverse. Not significant<br><br>River Terrace Deposits & Alluvium: Neutral. Not | None | West Melbury Marly Chalk: Slight adverse. Not significant<br><br>River Terrace Deposits & | None |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
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| West Melbury Marly Chalk Formation | | | Peat: Low | significant<br><br>Peat: Neutral. Not significant | | Alluvium: Neutral. Not significant<br><br>Peat: Neutral. Not significant | |
| **Waterbeach** | | | | | | | |
| Impact to groundwater abstractions due to dewatering of open-cut trenches during Waterbeach pipeline installation | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• The application of measures to prevent run-off from construction on the landslide draining to the cofferdam such as the use of cut off drains, avoiding vegetation removal right up to the bank, minimising the areas at the bank that are disturbed/cleared, avoiding stockpiling of material close to the banks, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff<br>• Management of dewatering activities in accordance with Environment Agency specifications including treating dewatering effluent prior to discharge and control of dewatering discharge rates to prevent scour.<br>• Measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• Requirement for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• Requirement for refuelling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained<br>• Management of excavation and backfill on drainage and groundwater through: | Minor adverse | High | Moderate adverse. Significant. | Sections 4.4 Construction Environment Management Plan, Section 7.5 Water resources and flood risk (dewatering) and 5.7, Pollution Incident Control Plan, (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1).<br><br>No derogation agreement with the owner of the private groundwater abstraction. In the unlikely event that the private supply from the groundwater source could be significantly affected, if required, measures would be taken to maintain a supply to the property. | Slight adverse. Not significant. | None |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
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| | • Robust design, construction and pressure testing of the Waterbeach pipeline which will mitigate against pipeline leakage during operation<br>• A requirement within the CoCP Part B in relation to a borehole approximately 210 metres from the pipeline, to maintain regular contact with the owner during construction and a requirement to maintain supply to the property if required. These will be outlined in the CEMP. A non-derogation agreement will be entered into with the owners at their request. | | | | | | |
| Impact of excavation and backfill of Waterbeach pipeline trench on land drains and groundwater flow | Management of excavation and backfill on drainage and groundwater through:<br>• a requirement within the CoCP Part A, section 5.14 (Watercourses/drainage channels) which requires the identification of land drains potentially affected by construction works and the reinstatement of a post works drainage system to the satisfaction of the land owner.<br>• a requirement within the CoCP Part B, section 3.4 which requires the backfilling of trenches with suitable materials, including the use of clay plugs or partitions if necessary to prevent preferential groundwater flow in backfilled trenches. | Major adverse. | Land drains: High | Land drains: Major adverse. Significant | Provision / reinstatement of land drainage through implementation of Section 5.14 of the CoCP Part A (Other watercourses / Drainage channels / Land drains).. | Land drains: Slight adverse. Not significant | None |
| Impact of the Waterbeach transfer pipeline river crossings to the River Cam water quality and flow | Impacts to river levels will be managed by:<br>• the use of trenchless techniques to install structures below the river-bed<br>• the setting of equipment launch and recovery equipment outside of the main river byelaw margin.<br>• Measures for continuous control of site activities during the operation and maintenance of the proposed WWTP through operational procedures in relation to inspections and repair, asset condition assessment (such as checking the integrity of tanks, bunds and hard standing), materials storage controls, spill control measures, and emergency responses. Operational procedures will be developed further during the life of the Proposed Development from detailed design to the proposed assets going into full operation, in compliance with the relevant Environmental Permit for the Proposed Development. Operational procedures will be developed further | Negligible | High | Slight adverse. Not significant. | | Slight adverse. Not significant. | None |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
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| | during the life of the Proposed Development from detailed design to the proposed assets going into full operation, in compliance with the relevant Environmental Permit for the Proposed Development. | | | | | | |
| Impacts to water quality in watercourses close to the Waterbeach pipeline due to discharge of fluids used for pipeline testing | • Clean water will be used for pressure testing. Chlorine will be removed prior to discharge according to Environment Agency permit conditions.<br>Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• Management of dewatering activities in accordance with Environment Agency specifications including treating dewatering effluent prior to discharge and control of dewatering discharge rates to prevent scour.<br>• The management of potential impacts associated with the disposal of pipeline testing fluids will be through:<br>• A requirement within the CoCP Part B for the use of clean water will be used for pressure testing. Chlorine will be removed prior to discharge according to associated Environmental Permit conditions<br>• Disposal to watercourse at controlled rates and locations as agreed with the Environment Agency and set out within conditions of the required Environmental Permit | Negligible | River Cam: High<br><br>Black Ditch: Medium<br><br>Bannold Drove Drain: Low | River Cam: Slight adverse. Not significant<br><br>Black Ditch: Neutral. Not significant<br><br>Bannold Drove Drain: Neutral. Not significant | None | River Cam: Slight adverse. Not significant<br><br>Black Ditch: Neutral. Not significant<br><br>Bannold Drove Drain: Neutral. Not significant | None |
| Impact to groundwater quality in the event of accidental wastewater spills during connection of the transfer tunnel to the existing Riverside tunnel. | Management of construction activities as described within the CoCP Part A (Appendix 2.1,App Doc Ref 5.4.2.1) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures in relation to the prevention of impacts | Moderate adverse | River Terrace Deposits: Medium<br><br>Gault Formation: Low | River Terrace Deposits: Moderate adverse. Significant<br><br>Gault Formation: | Work will be undertaken using best construction practices and applying rigorous groundwater protection measures as outlined in CoCP Part A | River Terrace Deposits: Neutral. Not significant<br><br>Gault Formation: Neutral. Not significant | None |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
|---|---|---|---|---|---|---|---|
| | to controlled waters as (as defined within in Section 104 (1) of the Water Resources Act 1991 and Section 30A (d) of the Control of Pollution Act 1974' ) including:<br>• Emergency response measures including stopping works, training of staff, use of spill response equipment | | | Slight adverse. Not significant | | | |
| Impact to groundwater levels due to construction of interception shaft 1 and intermediate Shafts 2 and 3 within the existing WWTP. | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• management of dewatering activities associated with shaft construction in accordance with Environment Agency specifications including control of dewatering rates. | River Terrace Deposits: Minor adverse<br><br>Gault Formation: Negligible | River Terrace Deposits: Medium<br><br>Gault Formation: Low | River Terrace Deposits: Slight adverse. Not significant<br><br>Gault Formation: Neutral. Not significant | Work will be undertaken using best construction practices and applying rigorous groundwater protection measures as outlined in CoCP Part A and implemented in the CEMP | River Terrace Deposits: Neutral. Not significant<br><br>Gault Formation: Neutral. Not significant | None |
| Impact of accidental spills to groundwater quality while relocating rising mains and gravity sewers at the existing WWTP | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures in relation to the prevention of impacts to controlled waters as (as defined within in Section 104 (1) of the Water Resources Act 1991 and Section 30A (d) of the Control of Pollution Act 1974' ) including:<br>• measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• requirement for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• requirement for refueling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained | Moderate adverse | River Terrace Deposits: Medium<br><br>Gault Clay: Low | River Terrace Deposits: Moderate adverse. Significant<br><br>Gault Formation: Slight adverse. Not significant | Rigorous groundwater protection measures as outlined in CoCP and implemented in CEMP | River Terrace Deposits: Neutral. Not significant<br><br>Gault Formation: Neutral. Not significant | None |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
|---|---|---|---|---|---|---|---|
| | • emergency response measures including stopping works, training of staff, use of spill response equipment<br>• management of dewatering to meet requirements of the Environmental Permit required for dewatering including setting the rates and duration of dewatering activity to be informed by the detailed construction methods. | | | | | | |
| **Operation** | | | | | | | |
| **Proposed WWTP** | | | | | | | |
| The impact of treated effluent discharge (comprising final effluent and stormwater flows) from the proposed outfall on River Cam hydromorphology | Direct impacts minimised by the following design measures:<br>• scour protection included in design for outfall and riverbank to prevent local riverbed scour impacts<br>• design of the outfall structure, as informed by modelling, to control flow rates from the outfall<br>• Design measures to prevent or minimise scour and impacts from operation of the outfall are:<br>• Design of the outfall to operating within the maximum volume limits which are to be similar to those from the existing outfall;<br>• Flow rates controlled to be similar to existing outfall;<br>• Design of storm storage volumes and flow rates to meet regulatory requirements;<br>• Inclusion of capacity within the proposed development to adapt to future changes in relation to storm storage provision<br>• A requirement to prepare and implement and outfall management and monitoring plan covering the operation of the outfall to include a programme of routine visual inspection of both riverbanks downstream of the proposed outfall following a stormwater discharge event to inform the need for maintenance or repair measures as agreed with the Environment Agency. | Normal operating conditions: Negligible Abnormal operating conditions (infrequent and extreme stormwater discharge): Minor adverse. Significant | High | Normal operating conditions: Slight adverse. Not significant<br>Abnormal operating conditions (infrequent and extreme storm discharge): Moderate adverse. Significant | There remains a low residual risk of erosion to riverbanks and the riverbed in the event of an infrequent stormwater discharge event, which will be mitigated through routine visual inspection of both riverbanks downstream of the proposed outfall following a stormwater discharge event, with maintenance or repair, if required, of eroded sections of riverbank as necessary. | Normal operating conditions: Slight adverse. Not significant<br>Abnormal operating conditions (infrequent and extreme storm discharge): Moderate adverse. Significant | Visual inspection of riverbanks following infrequent stormwater discharge event |
| Impact of final effluent discharge from the proposed outfall on water quality for the River Cam | The management of effluent quality and storm spill impacts through:<br>• design of the process technology and storage so that operation of the is within emission limits (stricter consented limits for treated effluent and greater storm storage than the existing Cambridge | Minor beneficial | High | Moderate beneficial. Significant. | | Moderate beneficial. Significant. | Regulatory compliance monitoring |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
|---|---|---|---|---|---|---|---|
| | WWTP) to achieve no deterioration within the River Cam<br>• design of the proposed WWTP that allows for future process changes to accommodate future emission limit changes<br>• design of storm storage volumes and flow rates to meet regulatory requirements;<br>• inclusion of capacity within the proposed development to adapt to future changes in relation to storm storage provision | | | | | | |
| Impact of the temperature of the final effluent discharge on concentrations of dissolved oxygen in the River Cam. | None | Negligible | High | Slight adverse. Not significant | None | Slight adverse. Not significant | Regulatory compliance monitoring |
| Impact of final effluent and stormwater discharges to water levels in the River Cam and the potential for increasing fluvial flood risk | Robust design informed by modelling<br>WWTP will operate in accordance with the relevant effluent volume limit values which will be specified within a site-specific Environmental Permit. | Negligible | Properties, dwellings, infrastructure: High<br>County Wildlife Site: The sensitivity of nature conservation site receptors is not determined for as part of the water resources assessment, but is considered in Chapter 08; Biodiversity | Properties, dwellings, infrastructure: Slight adverse. Not significant<br>County Wildlife Site: The significance of effect for nature conservation sites is not determined for as part of the water resources assessment, but is considered in Chapter 08; Biodiversity (App Doc Ref 5.2.8) | None | Properties, dwellings, infrastructure: Slight adverse. Not significant<br>County Wildlife Site: The significance of effect for nature conservation sites is not determined for as part of the water resources assessment, but is considered in Chapter 08; Biodiversity | Regulatory compliance monitoring |
| Impact of minor inflows of groundwater to shafts or outflow of waste water from the TPS shaft | Manged through robust design and implementation of approved construction methods for the permanent shafts including agreement of methods in relation to any required dewatering and associated regulatory requirements | Negligible | High | Slight adverse. Not significant | None | Slight adverse. Not significant | Monitoring of water levels and quality in available monitoring boreholes within the land required for the landscape masterplan, would continue throughout operation. |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
|---|---|---|---|---|---|---|---|
| Impact of below-ground structures and areas of hardstanding, on drainage in the WWTP, and recharge and groundwater in the aquifer. | Design measures to manage impacts to groundwater bodies:<br>• segregated drainage system in areas of potential contamination with the proposed WWTP. Detailed drainage design will determine area of permeable surfaces through which infiltration could occur.<br>• management of Incidences of emergent groundwater through the surface water drainage design which would then become surface water and managed within the integrated drainage solution to incorporate a storage and attenuation feature within the landscape masterplan<br>• detailed surface water drainage design will comply with the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12). This includes the requirement for drainage to accord with requirements set out within The Environment Agency's Approach to Groundwater Protection, Feb 2018 (version 1.2 or whatever guidance is current at the time of design) as well as the specific requirements for the detailed drainage design to:<br>• provision of a segregated drainage system for the proposed WWTP in areas of potential contamination.<br>• A requirement for the design to include determine and include provision for of the area of permeable surfaces within the land required for the landscape masterplan, access road and proposed WWTP through which infiltration could occur . | Negligible | High | Slight adverse. Not significant. | None | Slight adverse. Not significant. | Ongoing monitoring of groundwater levels will inform detailed drainage design |
| The impact to Black Ditch flows and abstractions due to drainage, reduction in aquifer recharge within the proposed WWTP and changes in infiltration in the area of the landscape masterplan. | Design measures to avoid or minimise impacts to groundwater / to prevent surface water run-off from the proposed WWTP:<br>• design of surface water drainage network within the proposed WWTP to include segregated drainage system in areas of potential contamination with the proposed WWTP<br>• design of access road drainage to incorporate sustainable drainage features<br>• design of the detailed surface water drainage will determine area of permeable surfaces through which infiltration could occur. | Black Ditch flow: Minor Adverse<br><br>Black Ditch abstractions: Minor Adverse | Black Ditch flow: Medium<br><br>Black Ditch abstractions: Medium | Black Ditch flow: Slight Adverse. Not Significant<br><br>Black Ditch abstractions: Slight Adverse. Not Significant | Measures to minimise contamination through detailed surface water drainage design complying with the Drainage Strategy (Appendix 20.12 App Doc Ref 5.4.20.12). This includes the requirement for drainage to accord with requirements set out within The Environment Agency's Approach to Groundwater Protection, Feb 2018 (Version 1.2 or whatever guidance is current at the time of design) as well as the specific requirements for the detailed drainage design to:<br>• Provide a segregated drainage system for the proposed WWTP in areas of | Black Ditch flow: Slight Adverse. Not Significant<br><br>Black Ditch abstractions: Slight Adverse. Not Significant | Monitoring of Black Ditch water levels would continue throughout operation. |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
|---|---|---|---|---|---|---|---|
| | | | | | potential contamination within the proposed WWTP.<br>• Detailed drainage design will determine the area of permeable surfaces within the land required for the landscape masterplan, access road and proposed WWTP through which infiltration could occur. | | |
| Impact to residential receptors and surface drains which discharge to Black Ditch, due to surface water runoff from hard surfaces within the proposed WWTP | Management of impacts to surface water through application of design measures within the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12) (secured through requirements in the DCO), which sets out design requirements for surface water drainage including measures to avoid or minimise impacts to surface water run-off from the proposed WWTP:<br>• Design of access road drainage to incorporates sustainable drainage features<br>• Inclusion of segregated drainage system in areas of potential contamination with the proposed WWTP required by the surface water drainage strategy<br>Measures for continuous control of site activities during the operation and maintenance of the proposed WWTP through operational procedures in relation to inspections and repair, asset condition assessment (such as checking the integrity of tanks, bunds and hard standing), materials storage controls, spill control measures, and emergency responses.<br>Operational procedures will be developed further during the life of the Proposed Development from detailed design to the proposed assets going into full operation, in compliance with the relevant Environmental Permit for the Proposed Development. Operational procedures will be developed further during the life of the Proposed Development from detailed design to the proposed assets going into full operation, in compliance with the relevant Environmental Permit for the Proposed Development. | Negligible | Drains: Low<br>Black Ditch :Medium<br>Residential dwelling: High | Drains: Neutral. Not significant<br>Black Ditch : Neutral. Not significant<br>Residential dwelling: Slight adverse. Not significant | Detailed surface water drainage design will comply with the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12). This includes the requirement for drainage to accord with requirements set out within The Environment Agency's Approach to Groundwater Protection, Feb 2018 (Version 1.2).<br>Detailed surface water drainage design will comply with the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12). This includes the<br>• requirement for drainage to accord with requirements set out within The Environment Agency's Approach to Groundwater Protection, Feb 2018 (Version 1.2).<br>• requirement for the drainage strategy to integrates with the LERMP (Appendix 8.14, App Doc Ref 5.4.8.14) to incorporate a storage area for surface water derived from within the land required for the proposed WWTP | Drains and Black Ditch : Neutral. Not significant<br>Residential dwelling: Slight adverse. Not significant | None |
| Impact of stormwater discharges on River Cam water quality | The management of effluent quality and storm spill impacts through:<br>• Design of the process technology and storage so that operation of the is within emission limits (stricter consented limits for treated effluent (including nutrients) and greater storm storage | Minor beneficial | High | Moderate beneficial. Significant | Operational procedures will be developed further during the life of the Proposed Development from detailed design to the proposed assets going into full operation, in compliance with the relevant Environmental Permit for the Proposed Development. Operational | Moderate beneficial. Significant. | Regulatory stormwater discharge compliance monitoring |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
|---|---|---|---|---|---|---|---|
| | than the existing Cambridge WWTP) to achieve no deterioration within the River Cam<br>• Design of the proposed WWTP that allows for future process changes to accommodate future emission limit changes<br>• Design of storm storage volumes and flow rates to meet regulatory requirements;<br>• Inclusion of capacity within the proposed development to adapt to future changes in relation to storm storage provision<br>• Design of the proposed WWTP that allows for adaption to future changes in relation to storage provision<br>• Design of the proposed WWTP provides improved stormwater management with fewer predicted stormwater and CSO discharge to the River Cam. | | | | procedures will be developed further during the life of the Proposed Development from detailed design to the proposed assets going into full operation, in compliance with the relevant Environmental Permit for the Proposed Development. | | |
| Impact of spills or leaks migrating in groundwater through the West Melbury Marly Chalk Formation to surface drains connected to the Black Ditch watercourse | Robust design will ensure that all structures are fit for purpose and compliant with the relevant industry specifications and standards<br>Operation in accordance with environmental permit for the proposed WWTP including implementation of EMS which will include materials storage controls, spill control measures, emergency response procedures<br>Management of impacts to surface water through application of design measures within the Drainage Strategy (App Doc Ref 5.4.20.12) (secured through requirements in the DCO), which sets out design requirements for surface water drainage including measures to avoid or minimise impacts to surface water run-off from the proposed WWTP:<br>• Design of access road drainage to incorporates sustainable drainage features<br>• Inclusion of segregated drainage system in areas of potential contamination with the proposed WWTP required by the surface water drainage strategy | Groundwater quality: Moderate adverse.<br>Black Ditch water quality (groundwater) : Minor adverse<br>Black Ditch water quality (drainage network): Moderate adverse<br>Nature conservation sites: Negligible | West Melbury Marly Chalk Formation: High<br>Black Ditch: Medium<br>Nature conservation sites: not considered as part of the water resources assessment but is considered in Chapter 8: Biodiversity. | West Melbury Marly Chalk Formation: Moderate adverse. Significant<br>Black Ditch water quality (groundwater): Slight adverse. Not significant<br>Black Ditch water quality (drainage network): Moderate adverse. Significant.<br>Nature conservation sites: not considered as part of the water resources assessment but is considered in | Operational procedures will be developed further during the life of the Proposed Development from detailed design to the proposed assets going into full operation, in compliance with the relevant Environmental Permit for the Proposed Development.<br>Operational procedures will be developed further during the life of the Proposed Development from detailed design to the proposed assets going into full operation, in compliance with the relevant Environmental Permit for the Proposed Development.<br>Operational Management Plan will include regular inspection and repair regime of all tanks and areas with potential for hydrocarbon contamination such as bunds around fuel tanks and hardstanding.<br>Measures to minimise contamination through detailed surface water drainage design complying with the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12). This includes the requirement for drainage to accord with requirements set out | West Melbury Marly Chalk Formation: Slight adverse. Not significant<br>Black Ditch water quality (groundwater): Neutral. Not significant<br>Black Ditch water quality (drainage network): Slight adverse. Not significant<br>Nature conservation sites: not considered as part of the water resources assessment | Monitoring of water quality at Black Ditch, the northernmost land drain connecting to Black Ditch, the attenuate pond receiving discharge from the drainage network and at available monitoring boreholes within the land required for the landscape masterplan, would continue post-construction. |

| Description of impact | Primary and tertiary measures adopted as part of the project | Magnitude of impact | Sensitivity of receptor | Initial classification of effect | Secondary/ additional mitigation measures | Residual effect significance | Proposed monitoring |
|---|---|---|---|---|---|---|---|
| | | | | Chapter 8: Biodiversity. | within The Environment Agency's Approach to Groundwater Protection, Feb 2018 (Version 1.2 or whatever guidance is current at the time of design) as well as the specific requirements for the detailed drainage design to:<br>• Provide a segregated drainage system for the proposed WWTP in areas of potential contamination within the proposed WWTP.<br>• Detailed drainage design will determine the area of permeable surfaces within the land required for the landscape masterplan, access road and proposed WWTP through which infiltration could occur. | but is considered in Chapter 8: Biodiversity. | |
| Impact of cessation of discharge of treated effluent from the outfall from the existing WWTP on the 90m reach of the River Cam between the outfalls of the existing WWTP and the proposed WWTP | None | Negligible | High | Slight. Not significant. | None | Slight adverse. Not significant. | None |
| **Waterbeach pipelines** | | | | | | | |
| Impact of leakage from Waterbeach pipeline to groundwater quality | Management of excavation and backfill on drainage and groundwater through:<br>• robust design, construction and pressure testing of the Waterbeach pipeline which will mitigate against pipeline leakage during operation<br>• a requirement within the CoCP Part B in relation to a borehole approximately 210 metres from the pipeline, to maintain regular contact with the owner during construction and a requirement to maintain supply to the property if required. These will be outlined in the CEMP. A non-derogation agreement will be entered into with the owners at their request. | Negligible | West Melbury Marly Chalk Formation: High<br><br>River Terrace Deposits, Alluvium: Medium<br><br>Peat, Gault Clay: Low | West Melbury Marly Chalk Formation: Slight adverse. Not significant.<br><br>River Terrace Deposits, Alluvium: Neutral. Not significant.<br><br>Peat, Gault Clay: Neutral. Not significant. | None | West Melbury Marly Chalk Formation: Slight adverse. Not significant.<br><br>River Terrace Deposits, Alluvium: Neutral. Not significant.<br><br>Peat, Gault Clay: Neutral. Not significant. | None |

## 5.2 Securing mitigation

5.2.1 The delivery of mitigation will be controlled through the 'Development Consent Order (DCO) which:

- identifies parameters within which certain works activities will be located and constructed (e.g. maximum and minimum building dimensions (including below ground), or locational zones);
- sets requirements for construction, operation and maintenance of the Proposed Development to be undertaken in accordance with 'control plans / documents' (including those that are related to compliance with environmental permits); and
- sets requirements for the control of specific issues or works (e.g. time limits around the completion of the outfall construction)

5.2.2 Table 5-2 summarises all mitigation in relation to water resources, how these measures are secured, the party responsible for the implementation of the measure, when the measure would be delivered and any mechanisms to deliver the measure.

**Table 5-2: Securing mitigation**

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
|---|---|---|---|---|---|---|---|
| **Construction** | | | | | | | |
| **Proposed WWTP** | | | | | | | |
| Impact of deep excavations for the tunnel and associated shafts on groundwater flows, groundwater levels and groundwater quality within the Lower Greensand (Woburn Sands Formation) aquifer | Slight adverse. Not Significant. | Impacts from deep excavations will be avoided through the design which places the deepest elements of below ground structures so that will not penetrate the Lower Greensand. | Primary | Conditions and approve design within Environmental Permit | Contractor | Prior to the start of construction | Approved phasing plan<br>Approved design prior to construction<br>Preparation of a construction method statement to accord with the requirements of any related Environmental Permit (Abstraction). |
| Impact to River Cam levels and flows close to and downstream of the crossing of the proposed waste water transfer tunnel from the existing WWTP to the proposed WWTP, and associated access shafts. | Slight adverse. Not Significant. | Impacts to river levels will be managed by:<br>• the use of trenchless techniques to install structures below the river-bed<br>• the setting of equipment launch and recovery equipment outside of the main river byelaw margin. | Primary | Flood Risk Activities Permit<br>Section 7.5, CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br>Section 3.1 of the CoCP Part B through a requirement of the draft DCO (App Doc Ref 2.1) | Contractor | Prior to the start of construction. | Approved phasing plan<br>Approved CEMP<br>Preparation of a construction method statement to accord with the requirements of related Environmental Permit (Flood Risk Activities). |
| Impact to superficial and bedrock groundwater flows and levels, due to dewatering of open-cut trenches during the FE and stormwater pipeline installation | Superficial deposits: Neutral. Not significant<br>West Melbury Marly Chalk aquifer: Slight | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These | Tertiary | Section 7.5, CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Approval and implementation of a CEMP secured through a | Contractor | Prior to start of construction . | Approved phasing plan<br>Implementation of approved construction method statement to accord with the requirements of related Environmental Permit or working under Regulatory Position |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
|---|---|---|---|---|---|---|---|
| | adverse. Not Significant. | plans will include the requirement to implement best practice measures including:<br>• Minimising run-off and the risk of runoff reaching ditches and watercourses such as through the siting of launch and recovery pits associated with trenchless construction methods to be located a minimum of 8m from top of bank<br>• The application of measures to prevent run-off from construction such as the use of cut off drains, avoiding vegetation removal right up to the banks of watercourses, minimising the areas of land that are disturbed/cleared, avoiding stockpiling of material close to the banks of watercourses, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff.<br>• Management of dewatering to meet requirements of the Environment Agency regulatory position statement (RPS) 'Temporary dewatering from excavations to surface water' or Environmental Permit, whichever applies to the activity. Including treating dewatering effluent prior to discharge and control of dewatering discharges to prevent scour<br>• Measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• Requirement for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• Requirement for refuelling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained | | requirement of the draft DCO (App Doc Ref 2.1).<br>Sections 4.4 CEMP, Section 7.5 Water resources and flood risk (dewatering) and 5.7, Pollution Incident Control Plan, (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1).<br>Approval of the detailed design, construction risk assessment and method statement in relation to dewatering as secured through applicable Environmental Permit or working within a Regulatory Position Statement issued by the Environment Agency | | | Statement (RPS) 261 issued by the Environment Agency<br>Approved CEMP and associated sub-plans |
| Impact to groundwater abstractions due to dewatering of open-cut trenches during the FE and stormwater pipeline installation | Slight adverse. Not significant. | As above | Tertiary | As above and<br>Approval of the detailed design, construction risk assessment and method statement in relation to dewatering as secured through applicable Environmental Permit or working within a Regulatory Position Statement issued by the Environment Agency | Contractor | Prior to start of construction | Approved phasing plan<br>Implementation of approved construction method statement to accord with the requirements of related Environmental Permit or working under RPS 261 issued by the Environment Agency<br>Approved CEMP and associated sub-plans |
| Impact of excavation and backfill of final | | Management of construction activities as described within the CoCP Part A and B (App Doc Ref 5.4.2.1) in particular | Tertiary | Section 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured | Contractor | | Approved phasing plan |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
|---|---|---|---|---|---|---|---|
| effluent and storm pipeline trenches on land drains and groundwater flow | Land drains: Slight adverse. Not significant | section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement the following measures in relation to groundwater flow:<br><br>a requirement within the CoCP Part B, section 3.4 which requires the backfilling of trenches with suitable materials, including the use of clay plugs or partitions if necessary to prevent preferential groundwater flow in backfilled trenches. | | through a requirement of the draft DCO (App Doc Ref 2.1)<br><br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br><br>Sections 4.4 CEMP, Section 7.5 Water resources and flood risk (dewatering) and 5.7, Pollution Incident Control Plan, (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1).<br><br>Section 3.1 CoCP Part B (Appendix 2.2, App Doc Ref 5.4.2.2) secured through a requirement of the draft DCO | | Prior to start of construction | Implementation of approved construction method statement to accord with the requirements of related Environmental Permit or working under RPS 261 issued by the Environment Agency<br><br>Approved CEMP and associated sub-plans |
| | | A requirement within the CoCP Part A, section 5.14 (Watercourses/drainage channels) which requires the identification of land drains potentially affected by construction works and the reinstatement of a post works drainage system to the satisfaction of the land owner. | Secondary | Section 5.14, 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1). | | | Approved phasing plan<br><br>Approved CEMP and associated sub-plans |
| Impact of dewatering during outfall construction on groundwater and surface water flows and levels | River Cam: Slight adverse. Not significant.<br><br>Alluvium: Neutral. Not significant. | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 of Part A which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practise measures in relation to management of dewatering effects on groundwater including:<br><br>• Management of dewatering activities in accordance with Environment Agency specifications including rates and durations<br><br>• Measures to control dewatering (such as ceasing, changing of pump rates) to be put in place if impacts on water flows/levels are identified | Tertiary/Secondary | Approval of the detailed design, construction risk assessment and method statement in relation to outfall construction and dewatering as secured through applicable Environmental Permit (Flood Risk Activities &Water Discharge) or in case of dewatering working within a Regulatory Position Statement issued by the Environment Agency<br><br>Section 5.13, and 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br><br>CoCP Part B (Appendix 2.2, App Doc Ref 5.4.2.2) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br><br>Approval and implementation of a CEMP secured through a | Contractor | Prior to start of Construction | Design of outfall and scour protection measures as per final design specified as part of the environmental permit (flood risk activities)<br>Preparation of a method statement to cover periodic monitoring activities to accord with the requirements of the Environmental Permit (Flood Risk Activities).<br><br>Approved CEMP<br><br>Approval and implementation of an Outfall Management and Monitoring Plan<br>Approved outfall management and monitoring plan required prior to the commencement of construction activities affecting the River Cam incorporating requirements within<br><br>• Environmental Permit (Flood Risk Activities) |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | | | | requirement of the draft DCO (App Doc Ref 2.1).<br><br>Outline OMMP (App Doc Ref 5.4.8.24) | | | • Environmental Permit (Discharge to surface water) |
| Impact of cofferdam, used to maintain dry conditions during outfall construction, on water quality of the River Cam | Dewatering: Slight adverse. Not significant<br><br>Cofferdam installation and removal: Moderate adverse. Significant. | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• Management of dewatering activities in accordance with Environment Agency specifications including treating dewatering effluent prior to discharge and control of dewatering discharge rates to prevent scour.<br>• Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular Part A section 4.4 which required the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into CEMP(s). These plans will include the requirement to implement best practise measures in relation to management of dewatering activities including:<br>• Management of dewatering activities in accordance with Environment Agency specifications including treating dewatering effluent prior to discharge and control of dewatering discharge rates to prevent scour<br>• The application of measures to prevent run-off from construction to the landside draining to the cofferdam such as the use of cut off drains, avoiding vegetation removal right up to the bank, minimising the areas at the bank that are disturbed/cleared, avoiding stockpiling of material close to the banks, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff. | Tertiary/ Secondary | As above | Contractor | Prior to start of Construction | As above |
| Impact to fluvial flood risk due to construction of the outfall and requirement for temporary in river | Moderate adverse. Significant. | The management of water resources and flood risk as set out within Section 7.5 of the CoCP Part A, Water resources and flood risk, which sets out a framework for the control of flood risk during construction, identifying a number of 'standard' mitigation measures which will be implemented whilst | Tertiary | As above plus<br><br>Section 3.1 of the CoCP Part B in relation to completion of river works in summer months when water levels are expected to be | Contractor | Prior to start of Construction | Approved phasing plan<br><br>Approved CEMP and associated flood risk management plan<br><br>Implementation of works to accord with the requirements of the |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| works and works activities in the floodplain | | construction work takes place. These will be reflected in an appended plan to/as part of the CEMP. This will include the following:<br>• requirement to minimise construction period (for river works)<br>• requirement for the cofferdam to be designed to maintain the flood protection levels currently provided by the riverbank.<br>• the timing of river works in summer months<br>• requirement for a flood management plan for construction works within areas at risk of flooding<br>• requirement to secure or relocation loose items within compounds, laydown or storage areas within flood zone 2 and 3 to prevent them becoming a debris hazard in a flood event or where practical removed from the flood zone if high rainfall within the catchment is predicted<br>• requirement for the Principal Contractor(s) to consult with the Environment Agency, IDB, Lead Local Flood Authority and any other relevant risk management authorities in respect of the flood risks in the preparation of the Emergency Preparedness Plan and Pollution Incident Control Plan. This will include use of the Environment Agency's Floodline flood warning service for works within areas at risk of flooding | | lower, secured through a requirement of the draft DCO (App Doc Ref 2.1) | | | Environmental Permit (Flood Risk Activities). |
| Impact of dewatering of the West Melbury Marly Chalk Formation to watercourses including the River Cam, Black Ditch and Quy Water, during construction of the TPS shaft | River Cam & Quy Water: Slight adverse. Not significant<br><br>Black Ditch: Slight adverse. Not significant | Management of dewatering on the availability of groundwater through the monitoring of water levels in available monitoring boreholes within the land required for proposed WWTP and landscape masterplan, for a period prior to, during and following all dewatering activities during construction at the proposed WWTP in order to inform management response should monitoring indicate a change in groundwater flows as a result of dewatering. Management responses may include but not be limited to reducing or ceasing dewatering, or amending dewatering points and would be agreed through consultation with the Environment Agency. | Secondary | Requirement for a water monitoring plan to include specific provision for water quality monitoring at the specified location through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor & Applicant | Prior to commencement of construction<br><br>Following completion of year 2 of monitoring | Approved phasing plan<br><br>Implementation of works to accord with the requirements of the Environmental Permit (Flood Risk Activities/Water Discharges) or work within RPS261 issued by the Environment Agency<br><br>Approved monitoring plan and programme prior to the start of construction<br><br>Review and updated plan after year 1 of monitoring post construction |
| Impact of dewatering of West Melbury Marly Chalk Formation on a surface water abstraction for agriculture (spray irrigation) in Black Ditch | Slight adverse. Not significant. | Management of dewatering on the changes to groundwater through:<br>• maintaining regular contact with the owner of a nearby private borehole during construction and putting in place measures to maintain supply to the property if required. These will be outlined in the CEMP. | Secondary | Approval of the detailed design, construction risk assessment and method statement in relation to outfall construction and dewatering as secured through applicable Environmental Permit (Flood Risk Activities &Water Discharge) or in case of dewatering working within a | Contractor | Prior to commencement of construction | Approved phasing plan<br><br>Approved CEMP and associated flood risk management plan<br><br>Approved CLP<br><br>Implementation of works to accord with the requirements of the Environmental Permit (Flood Risk |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | | • there will not be any dewatering to the Black Ditch itself. | | Regulatory Position Statement issued by the Environment Agency<br><br>Section 5.13, 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br><br>CoCP Part B (Appendix 2.2, App Doc Ref 5.4.2.2) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br><br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br><br>Community Liaison Plan (CLP) (App Doc Ref 7.8) which is secured through a requirement in the draft DCO (App Doc Ref 2.1) | | | Activities/Water Discharges) or work within RPS261 issued by the Environment Agency |
| | | Monitoring of water levels in available monitoring boreholes within the land required for proposed WWTP and landscape masterplan, would be undertaken for a period prior to, during and following all dewatering activities during construction at the proposed WWTP in order to inform management response should monitoring indicate a change in groundwater flows as a result of dewatering. Management responses may include but not be limited to reducing or ceasing dewatering or amending dewatering points and would be agreed through consultation with the Environment Agency.<br><br>The scope of the monitoring including its duration will be agreed with all relevant stakeholders before commencement of works which could potentially impact the ditch. | Secondary | Requirement for a water monitoring plan to include specific provision for water quality monitoring at the specified location through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor & Applicant | Prior to commencement of construction<br><br>Following completion of year 2 of monitoring | Approved phasing plan<br><br>Approved monitoring plan and programme prior to the start of construction<br><br>Review and updated plan after year 1 of monitoring post construction |
| Impact of dewatering of the West Melbury Marly Chalk Formation on groundwater levels during construction of the TPS shaft | West Melbury Marly Chalk Formation aquifer: Moderate adverse. Significant.<br><br>Private drinking water source: Slight adverse. Not significant. | Management of dewatering on the availability of groundwater through the monitoring of water levels in available monitoring boreholes within the land required for proposed WWTP and landscape masterplan, for a period prior to, during and following all dewatering activities during construction at the proposed WWTP in order to inform management response should monitoring indicate a change in groundwater flows as a result of dewatering. Management responses may include but not be limited to reducing or ceasing dewatering, or amending dewatering points and would be agreed through consultation with the Environment Agency. | Secondary | Requirement for a water monitoring plan to include specific provision for water quality monitoring at the specified location through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor & Applicant | Prior to commencement of construction<br><br>Following completion of year 2 of monitoring | Approved phasing plan<br><br>Approved monitoring plan and programme prior to the start of construction<br><br>Review and updated plan after year 1 of monitoring post construction |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | | A no-derogation agreement will be made with the owner of the private groundwater source. | Secondary | No derogation agreement<br>Community Liaison Plan (CLP) (App Doc Ref 7.8) which is secured through a requirement in the draft DCO (App Doc Ref 2.1) | Contractor | Prior to commencement of construction | No derogation agreement in place<br>Implementation of approved CLP |
| Impact of dewatering during construction of the TPS shaft on groundwater levels at nature conservation sites. | Significance of effects at nature conservation sites is considered within Chapter 08: Biodiversity | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 of Part A which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practise measures in relation to management of groundwater including:<br>• Management of dewatering activities in accordance with Environment Agency specifications including rates and durations | Tertiary/secondary | Section 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br>Section 3.1 CoCP Part B (Appendix 2.2, App Doc Ref 5.4.2.2) secured through a requirement of the draft DCO | Contractor | Prior to commencement of construction | Approved phasing plan<br>Implementation of approved construction method statement to accord with the requirements of related Environmental Permit or Regulatory Position Statement issued by the Environment Agency |
| | | • Measures to control dewatering (such as ceasing, changing of pump rates) to be put in place if monitoring of water levels in Black Ditch indicates adverse changes as result of dewatering during the TPS construction leads to significant effects to surface water bodies | Secondary | Requirement for a water monitoring plan to include specific provision for water quality monitoring at the specified location through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor & Applicant | Prior to commencement of construction<br>Following completion of year 2 of monitoring | Approved phasing plan<br>Approved monitoring plan and programme prior to the start of construction<br>Review and updated plan after year 1 of monitoring post construction |
| Reduction in groundwater and surface water flows and levels due to dewatering in the West Melbury Marly Chalk Formation during dewatering associated with the construction of below-ground structures and foundations, plus associated groundwater impact on nature conservation sites. | West Melbury Marly Chalk: Moderate adverse. Significant<br><br>Black Ditch flows: Slight adverse. Not significant.<br><br>Agricultural abstraction: Slight adverse. Not significant.<br><br>Private drinking water sources: Slight adverse. Not significant.<br><br>River Cam, Quy Water: Slight | Monitoring of water levels in available monitoring boreholes within the land required for the landscape masterplan and at Black Ditch, Allicky Farm Pond CSW, and The Cut water body within Quy Fen SSSI pre, during and post-construction in order to inform management response should monitoring indicate a reduction in water levels as a result of dewatering.<br>Management responses may include but not be limited to reducing or ceasing dewatering or amending dewatering points and would be agreed through consultation with the Environment Agency. | Secondary | Requirement water level management and monitoring plans to include specific provision for the specified locations through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor | Prior to commencement of construction of below ground structures | Approved phasing plan<br>Approved monitoring plan<br>Review and updated plan once construction has ceased |
| | | A no-derogation agreement will be made with the owner of the private groundwater source whereby Impacts to groundwater levels and surface water flows will be managed through the implementation of measures to maintain supply as required by agreement to be made with the owner of the private groundwater source. | Secondary | No derogation agreement<br>Community Liaison Plan (CLP) (App Doc Ref 7.8) which is secured through a requirement in the draft DCO (App Doc Ref 2.1) | Applicant | Prior to commencement of construction | No derogation agreement in place |
| | | | | | Contractor | Prior to commencement of construction | Implementation of approved CLP |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | adverse. Not significant.<br><br>Nature conservation sites: Significance of effect is not determined for nature conservation sites as part of the water resources assessment, but is considered in Chapter 08; Biodiversity | | | | | | |
| Impacts of spillages of potentially contaminating materials used in construction, and the potential for construction-related turbidity, giving rise to contamination of groundwater. | Contaminant spill<br>West Melbury Marly Chalk Formation: Slight adverse. Not significant.<br><br>Private drinking water sources: Slight adverse. Not significant.<br><br>Turbidity<br>West Melbury Marly Chalk Formation: Slight adverse. Not significant.<br><br>Private drinking water sources: Slight adverse. Not significant. | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• The application of measures to prevent run-off from construction such as the use of cut off drains, avoiding vegetation removal right up to the banks of watercourses, minimising the areas of land that are disturbed/cleared, avoiding stockpiling of material close to the banks of watercourses, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff.<br>• Management of dewatering activities in accordance with Environment Agency specifications including treating dewatering effluent prior to discharge and control of dewatering discharge rates to prevent scour.<br>• Measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• Requirement for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002. | Tertiary and secondary | Section 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br><br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br><br>Sections 4.4 CEMP, Section 7.5 Water resources and flood risk (dewatering) and 5.7, Pollution Incident Control Plan, (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor | Prior to start of construction | Approved phasing plan<br><br>Implementation of works to accord with the requirements of the Environmental Permit (Water Discharges) or work within RPS 261 issued by the Environment Agency |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | | • Requirement for refuelling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained | | | | | |
| | | No derogation agreement with owner of private groundwater source. Measures would be taken to maintain a supply in the unlikely event that the source was affected by dewatering.<br><br>Monitoring of water quality in available monitoring boreholes within the land required for the landscape masterplan, would be undertaken for a period prior to, during and following all dewatering activities during construction at the proposed WWTP | Secondary | No derogation agreement<br><br>Requirement for a water quality monitoring plan to include specific provision for water quality monitoring at the specified locations through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor | Prior to start of construction | No derogation agreement<br><br>Approved water quality monitoring plan |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| Impacts to surface water quality from spillages of contaminants and from discharges of silt-laden water from dewatering activities. | Surface water quality (contaminants) Surface water drains: Neutral. Not significant<br><br>Black Ditch: Neutral. Not significant<br><br>River Cam: Slight adverse. Not significant<br><br>Surface water quality (discharges) Surface water drains: Neutral. Not significant<br><br>Black Ditch: Neutral. Not significant<br><br>River Cam: Slight adverse. Not significant | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures in relation to the prevention of impacts to controlled waters (as defined within in Section 104 (1) of the Water Resources Act 1991 and Section 30A (d) of the Control of Pollution Act 1974' ) including:<br>• Measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• The application of measures to prevent run-off from construction such as the use of cut off drains, avoiding vegetation removal right up to the banks of watercourses, minimising the areas of land that are disturbed/cleared, avoiding stockpiling of material close to the banks of watercourses, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff.<br>• Requirement for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• Requirement for refuelling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained<br>• Requirement to have in place emergency response measures including stopping works, training of staff, use of spill response equipment<br>• The application of measures to prevent run-off from construction such as the use of cut off drains, avoiding vegetation removal right up to the banks of watercourses, minimising the areas of land that are disturbed/cleared, avoiding stockpiling of material close to the banks of watercourses, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff. | Tertiary | Section 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br><br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br><br>Sections 4.4 CEMP, Section 7.5 Water resources and flood risk (dewatering) and 5.7, Pollution Incident Control Plan, (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor | Prior to start of construction | Approved phasing plan<br><br>Approved CEMP incorporating requirements within Environmental Permit (Discharge to surface water) and or within RPS, and appended water quality management plan, emergency response plan<br><br>Approved construction risk assessment and method statement in relation to dewatering through applicable Environmental Permit (Water Discharge) or working within a Regulatory Position Statement issued by the Environment Agency |
| | | Monitoring of water quality at Black Ditch for a period prior to, during and following construction activities at the proposed WWTP in order to amend operational management | Secondary | Requirement for a water quality management and monitoring plan to include specific provision for | Contractor & Applicant | Prior to commencement of construction | Approved phasing plan |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | | activities in the event water quality decline is attributed to operational surface water drainage arrangements . | | water quality monitoring at the specified location through a requirement of the draft DCO (App Doc Ref 2.1). | | Following completion of year 2 of monitoring | Approved monitoring plan and programme prior to the start of construction<br>Review and updated plan after year 1 of monitoring post construction |
| Impact of construction sites increasing surface water flood risk by increasing surface water runoff during periods of heavy rainfall | Surface water drains: Slight adverse. Not significant.<br>Black Ditch catchment: Slight adverse. Not significant.<br>River Cam catchment: Slight adverse. Not significant.<br>Residential receptor: Slight adverse. Not significant. | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• The application of measures to prevent run-off from construction such as the use of cut off drains, avoiding vegetation removal right up to the banks of watercourses, minimising the areas of land that are disturbed/cleared, avoiding stockpiling of material close to the banks of watercourses, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff. | Secondary | Section 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br>Sections 4.4 CEMP, Section 7.5 Water resources and flood risk (dewatering) and 5.7, Pollution Incident Control Plan, (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor | Prior to commencement of construction | Approved phasing plan<br>Approved CEMP incorporating requirements within Environmental Permit (Flood Risk Activities ) and appended water quality management plan, flood management plan, and emergency response plan |
| | | The management of water resources and flood risk as set out within Section 7.5 of the CoCP Part A, Water resources and flood risk, sets out a framework for the control of flood risk during construction, identifying a number of 'standard' mitigation measures which will be implemented whilst construction work takes place. These will be reflected in an appended plan to/as part of CEMP. This will include the following:<br>• Requirement to minimise the construction period for sections identified within the flood zone<br>• The timing of river crossing works in summer months if possible<br>• Requirements for a flood management plan for construction plan for construction works within areas at risk of flooding<br>• Inclusion of dry access/egress routes for pedestrians from compounds<br>• Requirement for any soil temporary stored within the flood zone, to include gaps to allow flood water to run through<br>Construction Water Quality Management Plan will be incorporated into the CEMP. These plans will set out requirements in construction areas to minimise impacts to | Secondary | As above | Contractor | Prior to commencement of construction | Approved phasing plan<br>Approved CEMP incorporating requirements within Environmental Permit (Flood Risk Activities ) and appended water quality management plan, flood management plan, and emergency response plan |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | | the works and surrounding area from flooding and prevent any significant effects on the existing flood risk in the surrounding area. | | | | | |
| Impact of wet testing of tanks and pipes within proposed WWTP on groundwater quality. | Slight adverse. Not Significant | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• following industry standards in relation to testing activities /completion of visual inspections of equipment under test to check for signs of structural deficiency prior to commencement of testing activities<br>• requirement for refuelling of machinery used in testing to be completed within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained<br>• measures applied for the management of leaks and spillages such as use of drip trays under construction plant and equipment, provision of spill kits<br>• requirement for emergency response measures to be in place including stopping works, training of staff, use of spill response equipment | Tertiary and secondary | Section 7.5 CoCP Part A (Appendix 2.1 App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br>Sections 4.4 CEMP, Section 7.5 Water resources and flood risk (dewatering) and 5.7, Pollution Incident Control Plan, (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor | Prior to start of commissioning activities | Approved phasing plan<br>Approved CEMP and associated sub plans |
| | | Management of commissioning activities through application of measures within the outline Commissioning Plan (Appendix 2.4, App Doc Ref 5.4.2.4) and the CoCP Part A, Section 4.4 (Construction Environment Management Plan), and Section 7.5 (Water Resources and Flood Risk) (Appendix 2.1, App Doc Ref 5.4.2.1) which requires that the contractors to prepare a Commissioning Plan (secured through requirements in the DCO), which will collectively secure deliver appropriate mitigation of the wet commissioning activities. | | Secured through a requirement in the draft DCO (App Doc Ref 2.1) to comply with the Commissioning Plan (Appendix 2.4, App Doc Ref 5.4.2.4).<br>Conditions relating to commissioning secured through Environmental Permit | | | Approved Commissioning Plan |
| Impact on water quality in the River Cam when final effluent discharge transfers from the | Moderate beneficial. Significant. | Management of commissioning activities through application of measures within the outline Commissioning Plan (Appendix 2.4, App Doc Ref 5.4.2.4) and the CoCP Part A, Section 4.4 (Construction Environment Management Plan), and Section 7.5 (Water Resources and Flood Risk) (Appendix | Secondary | Secured through a requirement in the draft DCO (App Doc Ref 2.1) to comply with the Commissioning Plan (Appendix 2.4, App Doc Ref 5.4.2.4). | Contractor | Prior to start of commissioning activities | Approved phasing plan<br>Approved Commissioning Plan |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| existing to the proposed WWTP. | | 2.1, App Doc Ref 5.4.2.1) which requires that the contractors to prepare a Commissioning Plan. | Tertiary | Conditions relating to commissioning secured through Environmental Permit<br><br>The Environmental Permit will include conditions requiring management systems to cover emergency responses and pollution prevention. | Applicant/ Contractor | Prior to start of commissioning activities | Preparation of an operational monitoring programme as part of the written EMS to cover periodic monitoring activities to accord with the requirements of the Environmental Permit (and subsequent variations). |
| Impact of accidental spills to groundwater quality while relocating rising mains and gravity sewers at the existing Cambridge WWTP | River Terrace Deposits: Neutral. Not significant<br><br>Gault Formation: Neutral. Not significant | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• requirement for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• requirement for refueling of machinery used fort the works to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained<br>Construction Water Quality Management Plan will be incorporated into the CEMP. These plans will set out requirements in construction areas to minimise impacts to and from the works from run-off, spills and leaks and prevent any significant effects on the existing flood risk in the surrounding area. | Tertiary and Secondary | Section 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br><br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br><br>Sections 4.4 CEMP, Section 7.5 Water resources and flood risk and 5.7, Pollution Incident Control Plan, (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor | Prior to start of construction | Approved phasing plan<br><br>Approved CEMP and associated sub plans |
| Impact to groundwater levels due to construction of interception shaft 1 and intermediate Shafts 2 and 3 within the existing WWTP. | River Terrace Deposits: Neutral. Not significant<br><br>Gault Formation: Neutral. Not significant | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures in relation to the prevention of impacts to controlled waters as (as defined within in Section 104 (1) of the Water Resources Act 1991 and Section 30A (d) of the Control of Pollution Act 1974' ) including: | Tertiary and secondary | Sections 7.5, CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1).<br><br>Approval and implementation of a Construction Environmental Management Plan secured through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor | Prior to start of shaft construction | Approved phasing plan<br><br>Approved CEMP and associated sub plans<br><br>Implementation of approved construction method statement to accord with the requirements of related Environmental Permit or Regulatory Position Statement issued by the Environment Agency |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | | • Measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• Requirements for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• Requirement for refuelling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained<br>• Emergency response measures including stopping works, training of staff, use of spill response equipment<br>• Management of dewatering to meet requirements of the Environmental Permit required for dewatering including setting the rates and duration of dewatering activity to be informed by the detailed construction methods. | | Conditions set out within an Environmental Permit that may be required in relation to dewatering activities associated with the construction of intermediate shafts. Sections 7.5 CoCP Part A, Water Resources and Flood Risk, Dewatering (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1).<br>Approval of the construction risk assessment and method statement associated with the detailed design and construction approach for the shafts as secured through applicable Environmental Permit (Abstraction). | | | |
| Impact of accidental spills to groundwater quality while relocating rising mains and gravity sewers at the existing WWTP | River Terrace Deposits: Neutral. Not significant<br><br>Gault Formation: Neutral. Not significant | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• Measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• Requirement for the safe storage and handling of potentially contaminating materials including fuels and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• Requirement for refueling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained<br>• Rigorous groundwater protection measures as outlined in CoCP and implemented in CEMP | Secondary and tertiary | Section 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br>Sections 4.4 CEMP, Section 7.5 Water resources and flood risk (dewatering) and 5.7, Pollution Incident Control Plan, (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor | Prior to commencement of construction | Approved phasing plan<br>Approved CEMP and associated sub plans |
| **Waterbeach pipelines** | | | | | | | |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| Impact of excavation and backfill of Waterbeach pipeline trench on land drains and groundwater flow | Land drains: Slight adverse. Not significant | Management of excavation and backfill on drainage and groundwater through:<br>• a requirement within the CoCP Part A, section 5.14 (Watercourses/drainage channels) which requires the identification of land drains potentially affected by construction works and the reinstatement of a post works drainage system to the satisfaction of the land owner.<br>• a requirement within the CoCP Part B, section 3.4 which requires the backfilling of trenches with suitable materials, including the use of clay plugs or partitions if necessary to prevent preferential groundwater flow in backfilled trenches. | Secondary | Section 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Section 5.14 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br>Section 3.1 CoCP Part B (Appendix 2.2, App Doc Ref 5.4.2.2) secured through a requirement of the draft DCO | Contractor | Prior to commencement of construction | Approved phasing plan<br>Approved CEMP and associated sub plans |
| Impact to groundwater abstractions due to dewatering of open-cut trenches during Waterbeach pipeline installation | Slight adverse. Not significant. | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement best practice measures including:<br>• The application of measures to prevent run-off from construction on the landslide draining to the cofferdam such as the use of cut off drains, avoiding vegetation removal right up to the bank, minimising the areas at the bank that are disturbed/cleared, avoiding stockpiling of material close to the banks, use of silt fencing or coir rolls on gentle slopes installed at levelled contours to control runoff<br>• Management of dewatering activities in accordance with Environment Agency specifications including treating dewatering effluent prior to discharge and control of dewatering discharge rates to prevent scour.<br>• Measures applied for the management of leaks and spillages such as use of drip trays and provision of spill kits<br>• Requirement for the safe storage and handling of potentially contaminating materials including fuels | Tertiary and secondary | Approval of the detailed design, construction risk assessment and method statement in relation to outfall construction and dewatering as secured through applicable Environmental Permit (Flood Risk Activities &Water Discharge) or in case of dewatering working within a Regulatory Position Statement issued by the Environment Agency<br>Section 5.13, 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>CoCP Part B (Appendix 2.2, App Doc Ref 5.4.2.2) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor | Prior to commencement of construction | Approved phasing plan<br>Approved CEMP and associated sub plans |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | | and oils in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and Dangerous Substances and Explosive Atmospheres Regulations 2002.<br>• Requirement for refuelling of machinery to be undertaken within designated areas (unless expressly stated within the CEMPs) where spillage can be more easily contained<br>• Management of excavation and backfill on drainage and groundwater through:<br>• Robust design, construction and pressure testing of the Waterbeach pipeline which will mitigate against pipeline leakage during operation | | | | | |
| | | In the unlikely event that the private supply from the groundwater source could be significantly affected, if required, measures would be taken to maintain a supply to the property.<br>A requirement within the CoCP Part B in relation to a borehole approximately 210 metres from the pipeline, to maintain regular contact with the owner during construction and a requirement to maintain supply to the property if required. These will be outlined in the CEMP. A non-derogation agreement will be entered into with the owners at their request. | Secondary | No derogation agreement<br>Community Liaison Plan (CLP) (App Doc Ref 7.8) which is secured through a requirement in the draft DCO (App Doc Ref 2.1) | Contractor | Prior to start of construction | No derogation agreement in place<br>Implementation of approved CLP |
| Impact of the Waterbeach transfer pipeline river crossings to the River Cam water quality and flow during construction of river crossings | Slight adverse. Not significant. | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular Part A section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These plans will include the requirement to implement the following measures in relation to river crossings:<br>• Management of river crossings through the siting of launch and recovery pits associated with trenchless construction methods are located a minimum of 8m from top of bank or existing defence whichever is applicable.<br>• the use of trenchless techniques to install structures below the river-bed. | Secondary and tertiary | Section 7.5 CoCP Part A (Appendix 2.1 App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1).<br>Section 3.1 CoCP Part B (Appendix 2.2, App Doc Ref 5.4.2.2) secured through a requirement of the draft DCO | Contractor | Prior to start of construction | Approved phasing plan<br>Approved CEMP and associated sub plans<br>Implementation of approved construction method statement to accord with the requirements of related Environmental Permit |
| Impacts to water quality in watercourses close to the Waterbeach pipeline due to discharge of fluids used for pipeline testing | River Cam: Slight adverse. Not significant<br><br>Black Ditch: Neutral. Not significant | Management of construction activities as described within the CoCP Part A and B (Appendix 2.1 and 2.2 App Doc Ref 5.4.2.1 and 5.4.2.2) in particular section 4.4 which requires the Principal Contractor(s) to produce a Water Quality Management Plan(s), Pollution Incident Control Plan, and risk assessments before works commence on site. The plans will be appended to or incorporated into the CEMP(s). These | | Section 7.5 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br>Approval and implementation of a CEMP secured through a requirement of the draft DCO (App Doc Ref 2.1). | Contractor | Approved phasing plan | Approved phasing plan<br>Implementation of approved construction method statement to accord with the requirements of related Environmental Permit or Regulatory Position Statement issued by the Environment Agency |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | Bannold Drove Drain: Neutral. Not significant | plans will include the requirement to implement best practice measures including:<br>• Management of dewatering activities in accordance with Environment Agency specifications including treating dewatering effluent prior to discharge and control of dewatering discharge rates to prevent scour.<br>• The management of potential impacts associated with the disposal of pipeline testing fluids will be through:<br>• A requirement within the CoCP Part B for the use of clean water will be used for pressure testing. Chlorine will be removed prior to discharge according to associated Environmental Permit conditions<br>• Disposal to watercourse at controlled rates and locations as agreed with the Environment Agency and set out within conditions of the required Environmental Permit<br>• Clean water will be used for pressure testing. Chlorine will be removed prior to discharge according to Environment Agency permit conditions. | Tertiary | Section 3.1 CoCP Part B (Appendix 2.2, App Doc Ref 5.4.2.2) secured through a requirement of the draft DCO | | | |
| **Operation** | | | | | | | |
| **Proposed WWTP** | | | | | | | |
| The impact of treated effluent discharge (comprising final effluent and stormwater flows) from the proposed outfall on River Cam hydromorphology | Normal operating conditions: Slight adverse. Not significant<br>Abnormal operating conditions (infrequent and extreme storm discharge): Moderate adverse. Significant | Direct impacts minimised by the following design measures:<br>• scour protection included in design for outfall and riverbank to prevent local riverbed scour impacts<br>• design of the outfall structure, as informed by modelling, to control flow rates from the outfall<br>• Design measures to prevent or minimise scour and impacts from operation of the outfall are:<br>• Design of the outfall to operating within the maximum volume limits which are to be similar to those from the existing outfall;<br>• Flow rates controlled to be similar to existing outfall;<br>• Design of storm storage volumes and flow rates to meet regulatory requirements;<br>• Inclusion of capacity within the proposed development to adapt to future changes in relation to storm storage provision | Primary | Preparation of a method statement to cover periodic monitoring activities to accord with the requirements of the Environmental Permit (Flood Risk Activities).<br>Approval and implementation of an Outfall Management and Monitoring Plan secured through a requirement of the draft DCO (App Doc Ref 2.1).<br>The Environmental Permit will include conditions requiring management systems to cover emergency responses and pollution prevention. | Contractor | Prior to start of construction | Preparation of accepted Outfall design and construction method statement secured through the Environmental Permit (flood risk activities)<br><br>Approval and implementation of a OMMP secured through a requirement of the draft DCO (App Doc Ref 2.1). |

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| | | There remains a low residual risk of erosion to riverbanks and the riverbed in the event of an infrequent stormwater discharge, which will be mitigated through routine visual inspection of both riverbanks downstream of the proposed outfall following a stormwater discharge event, with maintenance or repair, if required, of eroded sections of riverbank as necessary.<br><br>A requirement to prepare and implement and outfall management and monitoring plan covering the operation of the outfall to include a programme of routine visual inspection of both riverbanks downstream of the proposed outfall following a stormwater discharge event to inform the need for maintenance or repair measures as agreed with the Environment Agency. | Secondary | Preparation of a method statement to cover periodic monitoring activities to accord with the requirements of the Environmental Permit (Flood Risk Activities). Approval and implementation of an Outfall Management and Monitoring Plan secured through a requirement of the draft DCO (App Doc Ref 2.1). | Applicant | Prior to commencement of operation | An approved Phasing Plan.<br><br>An approved CEMP prior to the commencement of the enabling phase.<br><br>An approved Outfall management and monitoring plan prior to the commencement of the phase.<br><br>Environmental Permit for a flood risk activity granted by the Environment Agency. |
| Impact of final effluent discharge from the proposed outfall on water quality for the River Cam | Moderate beneficial. Significant. | The management of effluent quality and storm spill impacts through:<br>• design of the process technology and storage so that operation of the is within emission limits (stricter consented limits for treated effluent and greater storm storage than the existing Cambridge WWTP) to achieve no deterioration within the River Cam<br>• design of the proposed WWTP that allows for future process changes to accommodate future emission limit changes<br>• design of storm storage volumes and flow rates to meet regulatory requirements;<br>• inclusion of capacity within the proposed development to adapt to future changes in relation to storm storage provision | Tertiary | Operational limits and monitoring obligations secured through Environmental Permit<br><br>The Environmental Permit will include conditions requiring management systems to cover operational monitoring, emergency responses and pollution prevention. | Applicant | Prior to commencement of operation | Preparation of an operational monitoring programme as part of the written EMS to cover periodic monitoring activities to accord with the requirements of the Environmental Permit. |
| Impact of final effluent and stormwater discharges to water levels in the River Cam and the potential for increasing fluvial flood risk | Properties, dwellings, infrastructure: Slight adverse. Not significant<br><br>County Wildlife Site: The significance of effect for nature conservation sites is not determined for as part of the water resources assessment, but | Robust design informed by modelling<br><br>. | Tertiary<br><br>Secondary | Approval of the construction risk assessment and method statement associated with the detailed design and construction approach for the outfall as secured through applicable Environmental Permit (Flood Risk Activities).<br><br>Outfall Management and Monitoring Plan (OMMP), (secured through Section 3 of the CoCP Part B) secured through a requirement of the draft DCO (App Doc Ref 2.1) | Contractor | Prior to commencement of construction | Preparation of a detailed design and method statement to cover periodic monitoring activities to accord with the requirements of the Environmental Permit (Flood Risk Activities). Approval and<br><br>implementation of an approved Outfall Management and Monitoring Plan (OMMP) |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | is considered in Chapter 08; Biodiversity | WWTP will operate in accordance with the relevant effluent volume limit values which will be specified within a site-specific Environmental Permit | Tertiary | Operational limits and monitoring obligations secured through Environmental Permit<br>The Environmental Permit will include conditions requiring management systems to cover emergency responses and pollution prevention. | Applicant | Prior to commencement of operation | Preparation of an operational monitoring programme as part of the written EMS to cover periodic monitoring activities to accord with the requirements of the Environmental Permit (and subsequent variations). |
| Impact of minor inflows of groundwater to shafts or outflow of waste water from the TPS shaft | Slight adverse. Not significant | Manged through robust design and implementation of approved construction methods for the permanent shafts including agreement of methods in relation to any required dewatering and associated regulatory requirements | Primary/tertiary | The Environmental Permit in relation to dewatering activities will include conditions requiring management systems to cover abstraction rates and locations, emergency responses and pollution prevention. | Contractor | Prior to start of construction | Phasing plan<br>Approved detailed design and construction method statements |
| | | Monitoring of water levels and quality in available monitoring boreholes within the land required for the landscape masterplan, would continue throughout operation. | Secondary | Requirement for operational management and monitoring plans to include specific provision for monitoring available monitoring boreholes within the land required for the landscape masterplan through a requirement of the draft DCO (App Doc Ref 2.1). | Applicant | Prior to commencement of operation | Preparation of an operational monitoring programme |
| Impact of below-ground structures and areas of hardstanding, on drainage in the WWTP, and recharge and groundwater in the aquifer. | Slight adverse. Not significant. | Design measures to manage impacts to groundwater bodies:<br>• segregated drainage system in areas of potential contamination with the proposed WWTP. Detailed drainage design will determine area of permeable surfaces through which infiltration could occur.<br>• management of incidences of emergent groundwater through the surface water drainage design which would then become surface water and managed within the integrated drainage solution to incorporate a storage and attenuation feature within the landscape masterplan | Primary (design/secondary approved plans and operating measures | Detailed surface water drainage design will comply with the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12). This includes the requirement for drainage to accord with requirements set out within The Environment Agency's Approach to Groundwater Protection, Feb 2018 (Version 1.2). | Applicant | Prior to start of construction | Approved phasing plan<br>Implementation of approved surface water drainage design in consultation with the Environment Agency and Lead Local Flood Authority Preparation of an operational monitoring programme as part of the written EMS to cover emergency preparedness and response |
| | | Ongoing monitoring of groundwater levels will inform detailed drainage design | Secondary | Requirement for water level monitoring plans at the specified locations through a requirement of the draft DCO (App Doc Ref 2.1). | Applicant | Prior to commencement of detailed design | Approved water level monitoring plan and programme pre-construction |
| | | Detailed surface water drainage design will comply with the Drainage Strategy (Appendix 20.12, App Doc Ref 4.4.20.12). This includes the requirement for drainage to accord with requirements set out within The Environment Agency's Approach to Groundwater Protection, Feb 2018 (version 1.2 | Secondary | Detailed surface water drainage design will comply with the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12). This includes the requirement for | Contractor | Prior to commencement of construction | Implementation of approved surface water drainage design in consultation with the Environment |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| | | or whatever guidance is current at the time of design) as well as the specific requirements for the detailed drainage design to:<br>• provision of a segregated drainage system for the proposed WWTP in areas of potential contamination.<br>A requirement for the design to include determine and include provision for of the area of permeable surfaces within the land required for the landscape masterplan, access road and proposed WWTP through which infiltration could occur . | | drainage to accord with requirements set out within The Environment Agency's Approach to Groundwater Protection, Feb 2018 (Version 1.2). | | | Agency and Lead Local Flood Authority |
| The impact to Black Ditch flows and abstractions due to drainage, reduction in aquifer recharge within the proposed WWTP and changes in infiltration in the area of the landscape masterplan. | Black Ditch flow: Slight Adverse. Not Significant<br>Black Ditch abstractions: Slight Adverse. Not Significant | Design measures to avoid or minimise impacts to groundwater / to prevent surface water run-off from the proposed WWTP:<br>• design of surface water drainage network within the proposed WWTP to include segregated drainage system in areas of potential contamination with the proposed WWTP<br>• design of access road drainage to incorporate sustainable drainage features<br>• design of the detailed surface water drainage will determine area of permeable surfaces through which infiltration could occur. | Primary (design/secondary approved plans and operating measures | As above | Contractor | Prior to commencement of construction | Approved phasing plan<br>Implementation of approved surface water drainage design in consultation with the Environment Agency and Lead Local Flood Authority |
| | | Measures to minimise contamination through detailed surface water drainage design complying with the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12). This includes the requirement for drainage to accord with requirements set out within The Environment Agency's Approach to Groundwater Protection, Feb 2018 (Version 1.2 or whatever guidance is current at the time of design) as well as the specific requirements for the detailed drainage design to determine the area of permeable surfaces within the land required for the landscape masterplan, access road and proposed WWTP through which infiltration could occur. | Secondary | | | | |
| | | Monitoring of water quality at Black Ditch, the northernmost land drain connecting to Black Ditch, the attenuate pond receiving discharge from the drainage network and at available monitoring boreholes within the land required for the landscape masterplan post-construction in order to amend operational management activities in the event water quality decline is attributed to operational surface water drainage arrangements . | Secondary | Requirement for operational management and monitoring plans to include specific provision for water quality monitoring at the specified locations through a requirement of the draft DCO (App Doc Ref 2.1). | Applicant | Prior to commencement of operation<br>Following completion of year 2 of monitoring | Approved monitoring plan and programme prior to the start of operation<br>Review and updated plan after year 2 of monitoring |
| Impact to residential receptors and surface drains which discharge to Black Ditch, due to surface water runoff | Drains and Black Ditch : Neutral. Not significant<br>Residential | Management of impacts to surface water through application of design measures within the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12) (secured through requirements in the DCO), which sets out design requirements for surface | Primary (design/secondary approved plans and | Detailed surface water drainage design will comply with the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12). This includes the requirement for | Contractor | Prior to construction of drainage system | Implementation of approved surface water drainage design in consultation with the Environment Agency and Lead Local Flood Authority |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
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| from hard surfaces within the proposed WWTP | dwelling: Slight adverse. Not significant | water drainage including measures to avoid or minimise impacts to surface water run-off from the proposed WWTP:<br>• Design of access road drainage to incorporates sustainable drainage features<br>• Inclusion of segregated drainage system in areas of potential contamination with the proposed WWTP required by the surface water drainage strategy | operating measures | drainage to accord with requirements set out within The Environment Agency's Approach to Groundwater Protection, Feb 2018 (Version 1.2) secured through a requirement of the draft DCO (App Doc Ref 2.1) | | | |
| | | Management of impacts from leaks and spills in operation through the operational procedures in relation to materials storage controls, spill control measures, and emergency response procedures. Operational procedures will be developed further during the life of the Proposed Development from detailed design to the proposed assets going into full operation, in compliance with the relevant Environmental Permit for the Proposed Development. | Tertiary | Operational limits and monitoring obligations secured through Environmental Permit<br>The Environmental Permit will include conditions requiring management systems to cover emergency responses and pollution prevention. | Applicant | Prior to commencement of operation | Preparation of an operational monitoring programme as part of the written EMS to cover periodic monitoring activities to accord with the requirements of the Environmental Permit. |
| | | Measures for continuous control of site activities during the operation and maintenance of the proposed WWTP through operational procedures in relation to inspections and repair, asset condition assessment (such as checking the integrity of tanks, bunds and hard standing), materials storage controls, spill control measures, and emergency responses. | Tertiary | | | | |
| Impact of stormwater discharges on River Cam water quality | Moderate beneficial. Significant. | The management of effluent quality and storm spill impacts through:<br>• Design of the process technology and storage so that operation of the is within emission limits (stricter consented limits for treated effluent (including nutrients) and greater storm storage than the existing Cambridge WWTP) to achieve no deterioration within the River Cam<br>• Design of the proposed WWTP that allows for future process changes to accommodate future emission limit changes<br>• Design of storm storage volumes and flow rates to meet regulatory requirements;<br>• Inclusion of capacity within the proposed development to adapt to future changes in relation to storm storage provision<br>• Design of the proposed WWTP that allows for adaption to future changes in relation to storage provision<br>• Design of the proposed WWTP provides improved stormwater management with fewer predicted stormwater and CSO discharge to the River Cam. | Primary/Tertiary | Operational limits and monitoring obligations secured through Environmental Permit | Applicant | Prior to commencement of operation | Environmental permit secured / process technology approved |

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| | | Operational procedures will be developed further during the life of the Proposed Development from detailed design to the proposed assets going into full operation, in compliance with the relevant Environmental Permit for the Proposed Development. Operational procedures will be developed further during the life of the Proposed Development from detailed design to the proposed assets going into full operation, in compliance with the relevant Environmental Permit for the Proposed Development. | Secondary | Operational limits and monitoring obligations secured through Environmental Permit<br>The Environmental Permit will include conditions requiring management systems to cover emergency responses and pollution prevention. | Applicant | Prior to commencement of operation | Preparation of an operational monitoring programme as part of the written EMS to cover periodic monitoring activities to accord with the requirements of the Environmental Permit. |
| Impact of spills or leaks migrating in groundwater through the West Melbury Marly Chalk Formation to surface drains connected to the Black Ditch watercourse | West Melbury Marly Chalk Formation: Slight adverse. Not significant<br>Black Ditch water quality (groundwater): Neutral. Not significant<br>Black Ditch water quality (drainage network): Slight adverse. Not significant<br>Nature conservation sites: not considered as part of the water resources assessment but is considered in Chapter 8: Biodiversity. | Robust design will ensure that all structures are fit for purpose and compliant with the relevant industry specifications and standards<br>Management of impacts to surface water through application of design measures within the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12) (secured through requirements in the DCO), which sets out design requirements for surface water drainage including measures to avoid or minimise impacts to surface water run-off from the proposed WWTP:<br>• Design of access road drainage to incorporates sustainable drainage features<br>• Inclusion of segregated drainage system in areas of potential contamination with the proposed WWTP required by the surface water drainage strategy | Primary (design/secondary approved plans and operating measures | Detailed surface water drainage design will comply with the Drainage Strategy (Appendix 20.12, App Doc Ref 5.4.20.12). This includes the requirement for drainage to accord with requirements set out within The Environment Agency's Approach to Groundwater Protection, Feb 2018 (Version 1.2) secured through a requirement of the draft DCO (App Doc Ref 2.1) | Contractor | Prior to commencement of construction | Phasing plan<br>Implementation of approved detailed design<br>Implementation of approved surface water drainage design in consultation with the Environment Agency and Lead Local Flood Authority |
| | | Operation in accordance with environmental permit for the proposed WWTP including implementation of EMS which will include materials storage controls, spill control measures, emergency response procedures. Operational Management Plan will include regular inspection and repair regime of all tanks and areas with potential for hydrocarbon contamination such as bunds around fuel tanks and hardstanding. | Tertiary | Operational limits and monitoring obligations secured through Environmental Permit<br>The Environmental Permit will include conditions requiring management systems to cover emergency responses and pollution prevention. | Applicant | Prior to commencement of operation | Preparation of an operational monitoring programme as part of the written EMS to cover periodic monitoring activities to accord with the requirements of the Environmental Permit (and subsequent variations). |
| | | Monitoring of water quality at Black Ditch, the northernmost land drain connecting to Black Ditch, the attenuate pond receiving discharge from the drainage network and at available monitoring boreholes within the land required for the landscape masterplan post-construction in order to amend operational management activities in the event water quality decline is attributed to operational surface water drainage arrangements . | Secondary | Requirement for operational management and monitoring plans to include specific provision for water quality monitoring at the specified locations through a requirement of the draft DCO (App Doc Ref 2.1). | Applicant | Prior to commencement of operation<br>Following completion of year 2 of monitoring | Approved monitoring plan and programme prior to the start of operation<br>Review and updated plan after year 2 of monitoring |
| **Waterbeach pipelines** | | | | | | | |
| Impact of leakage from Waterbeach pipeline to groundwater quality | West Melbury Marly Chalk Formation: | Management of excavation and backfill on drainage and groundwater through: | | Sections 7.4, 7.5 and 7.9, 7.11, 7.12 CoCP Part A (Appendix 2.1, App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (App Doc Ref 2.1) | Contractor | Prior to the commencement of construction | Approved phasing plan<br>Approved CEMP |

| Description of impact | Residual effect | Design/mitigation measures adopted as part of the project | Type | Secured within | Responsible party | Timing on the provision of the measure | Trigger for the discharge of the measure |
|---|---|---|---|---|---|---|---|
| | Slight adverse. Not significant.<br><br>River Terrace Deposits, Alluvium: Neutral. Not significant.<br><br>Peat, Gault Clay: Neutral. Not significant. | • robust design, construction and pressure testing of the Waterbeach pipeline which will mitigate against pipeline leakage during operation<br>• a requirement within the CoCP Part B in relation to a borehole approximately 210 metres from the pipeline, to maintain regular contact with the owner during construction and a requirement to maintain supply to the property if required. These will be outlined in the CEMP. A non-derogation agreement will be entered into with the owners at their request. | | Approval and implementation of a Construction Environmental Management Plan secured through a requirement of the draft DCO (App Doc Ref 2.1).<br><br>WQMP, and (secured through Section 4.4 of the CoCP Part A) secured through a requirement of the draft DCO (App Doc Ref 2.1)<br><br>Section 3 of the CoCP Part B secured through a requirement of the draft DCO (App Doc Ref 2.1)<br><br>Measures within no derogation agreement | | | No derogation agreement If required |

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# Get in touch

**You can contact us by:**

Emailing at **info@cwwtpr.com**

Calling our Freephone information line on **0808 196 1661**

Writing to us at **Freepost: CWWTPR**

You can view all our DCO application documents and updates on the application on The Planning Inspectorate website:

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