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

# Appendix 20.3
# WFD Assessment Report

Application Document Reference: 5.4.20.3
PINS Project Reference: WW010003
APFP Regulation No. 5(2)l

**Revision No. 01**
April 2023

## Document Control

| | |
|---|---|
| **Document title** | WFD Assessment Report |
| **Version No.** | 01 |
| **Date Approved** | 28.01.23 |
| **Date 1st Issued** | 30.01.23 |

## Version History

| Version | Date | Author | Description of change |
|---|---|---|---|
| 01 | 30.01.23 | - | DCO Submission |
| | | | |
| | | | |

# Contents



# Tables

# Summary

The Proposed Development is a Nationally Significant Infrastructure Project (NSIP) as defined in the Planning Act 2008 and requires a Development Consent Order (DCO).

This report is a Stage 2 - WFD Scoping assessment. The previous stage of the WFD assessment (Stage 1 – WFD screening, appended to this report, identified the following water bodies as requiring further assessment:

- Cam (Surface water body; river);
- Cam and Ely Ouse Chalk (Groundwater body); and
- Cam and Ely Ouse Woburn Sands (Groundwater body).

Construction risks to the WFD water bodies are considered in the Environmental Statement for the Proposed Development, which are expected to be temporary and local in impact. It has been agreed in principle with the Environment Agency that temporary impacts may be excluded from this WFD assessment. Therefore, this assessment considers only operational WFD compliance risks to the above three water bodies.

With regards to the Cam surface water body, Environment Agency discharge permitting will ensure no deterioration to the water body in terms of consented physico-chemical quality elements. Indicative pre-application consented discharge limits indicate a moderate beneficial effect on water quality relating to reductions in phosphate and, to a lesser extent, ammonia, compared to the existing Cambridge WWTP discharge. Phosphate may improve in WFD class from 'Poor' to 'Moderate'. Ammonia is likely to remain at 'High' status. The overall physico-chemical WFD status is unlikely to change from its current status of 'Moderate'. No adverse water body scale WFD hydromorphological or ecological impacts are anticipated for the Cam water body, following the application of the discharge permits and good practice outfall design.

The screening assessment considered the potential for physico-chemical and hydromorphological impacts to Black Ditch, which is not a WFD water body, but is the closest downgradient watercourse east of the proposed WWTP. The Swaffham Internal Drainage Board (IDB) has confirmed there is no direct hydraulic connection between Black Ditch and Bottisham Lode - Quy Water, which is a WFD water body. Therefore, impacts to Bottisham Lode - Quy Water WFD surface water body have been screened out.

For the Cam and Ely Ouse Chalk groundwater body, the assessment considered chemical WFD elements such as impacts to the aquifer in the event of accidental spills, and also quantitative elements, such as the impact of below-ground structures on groundwater levels and flows. The WFD quantitative and chemical impacts to the Cam and Ely Ouse Chalk groundwater body are considered negligible.

For the Cam and Ely Ouse Woburn Sands groundwater body, the assessment considered the potential for deep structures with finished depths within the Gault Formation to affect the

underlying Woburn Sands Formation. The formation level of the deepest subsurface structure is expected to be approximately 10m above the Woburn Sands Formation and therefore the impact to the WFD Cam and Ely Ouse Woburn Sands groundwater body is considered negligible.

# 1 Introduction

## 1.1 Background and context

1.1.1 The Proposed Development is a Nationally Significant Infrastructure Project (NSIP) as defined in the Planning Act Section 29, (legislation.gov.uk, 2008) and requires a Development Consent Order (DCO).

1.1.2 This WFD Scoping assessment follows, and should be read in conjunction with, the Stage 1 – WFD screening assessment (Appendix A of this document). The aim of scoping is to determine whether detailed assessment is required to ensure that the Proposed Development is compliant with WFD objectives.

1.1.3 The Environment Agency has confirmed[1] the following:

- 2019 WFD classification data to be used as a baseline;
- the WFD assessment is to consider surface water quality, flow and localised morphological impact of the outfall, together with any subsequent impacts to ecology;
- only operational impacts are to be considered – temporary construction impacts can be excluded from the WFD assessment as they are considered in the Environmental Statement; and
- Environment Agency modelling to set discharge permit limits will follow 'no deterioration' requirements in the receiving surface water body.

1.1.4 As the Environment Agency has confirmed that regulatory permitting will prevent deterioration in River Cam water quality as a result of discharge from the proposed WWTP, this WFD Scoping assessment does not assess water quality deterioration from that source. For completeness, information on indicative permitted discharge concentrations is summarised in this assessment.

## 1.2 Location and Description

1.2.1 The Proposed Development is located north-east of Cambridge near the villages of Fen Ditton and Horningsea (Appendix B).

1.2.2 The Proposed Development involves the construction of a new integrated waste water treatment plant (WWTP) together with associated waste water transfer infrastructure comprising; waste water transfer tunnel, sewer rising main diversions, treated effluent and storm water transfer pipelines, and a new outfall to the River Cam. The Proposed Development also includes a waste water transfer pipeline corridor from Waterbeach water recycling centre (WRC).

[1] Email from Environment Agency Planning Specialist 27 April 2022.

## 1.3 Water Framework Directive legislation

1.3.1 The Water Framework Directive (WFD) 2000/60/EC (European Commission, 2000) was transposed into UK law for England and Wales as The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (UK Government, 2017).

1.3.2 The regulations provide a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater.

1.3.3 The regulations set out a requirement to establish river basin districts and, for each district, a river basin management plan (RBMP) which is revised, implemented and reviewed every six years. The period from 2015 to 2021 formed Cycle 2 of the RBMP. The Cycle 3 (2022-2027) draft River Basin Management Plans (RBMPs) in England were issued for consultation in 2021, and at the time of writing in October 2022 were still due to be finalised, which may bring about changes in the baseline status and objectives for water bodies. The Environment Agency has advised that the 2019 classification data available on Catchment Data Explorer should be used as the baseline.

1.3.4 The Environment Agency has a statutory duty to ensure WFD compliance.

## 1.4 Purpose of scoping assessment

1.4.1 The previous stage of the assessment (Stage 1 – WFD screening assessment) identified several water bodies that should be considered for further assessment. A summary of the WFD Screening Assessment is provided in Appendix A: Stage 01 WFD Screening.

# 2 WFD Screening Summary

2.1.1 This report should be read in conjunction with the Stage 1 – WFD screening assessment (Appendix A: Stage 01 WFD Screening).

2.1.2 The screened-in surface water bodies (Table 2-1), groundwater bodies (Table 2-2) and their associated Protected Areas are included in this section.

2.1.3 Appendix B displays the surface water and groundwater bodies which have been screened in from Stage 1 – WFD screening assessment (Appendix A: Stage 01 WFD Screening).

**Table 2-1: Screened-in surface water bodies**

| Name | WFD ID | Approximate distance from scheme | Length (km) | Hydromorphological designation | Overall Status (2019) | Chemical Status (2019) | Ecological Status (2019) | Hydrological Regime (2019) | Protected Areas | Justification for screening in |
|---|---|---|---|---|---|---|---|---|---|---|
| Cam | GB105033042750 | 0.0km. Crossed by scheme | 28.62 | Heavily Modified | Moderate | Fail | Moderate | Supports Good | Urban Waste Water Treatment Directive: *River Cam (Cambridge-shire)*<br><br>Nitrates Directive: *Huntingdon River Gravels, Ely Ouse and Cut-off channel NVZ* | Discharge consent conditions for the proposed WWTP differ from those of the existing Cambridge WWTP and may therefore affect the physico-chemical and ecological status of the water body. The existing and proposed outfalls are both located within this water body. The new proposed outfall has potential to impact the hydromorphological status of the water body. |

**Table 2-2: Screened-in groundwater bodies**

| Name | WFD ID | Approximate distance from scheme | Area ($km^2$) | Water body category | Overall Status (2019) | Chemical Status (2019) | Quantitative Status (2019) | Protected Areas | Justification for screening in |
|---|---|---|---|---|---|---|---|---|---|
| Cam and Ely Ouse Chalk | GB40501G400500 | 0.0 km. Intersected by Scheme. | 2996 | Groundwater | Poor | Poor | Poor | Drinking Water Protected Area: *Cam and Ely Ouse Chalk*<br><br>Nitrates Directive: *Anglian Chalk* | The operational area of the Proposed Development is partially within this groundwater body and includes deep sub-surface structures with potential to affect groundwater levels and flows within the groundwater body, as well as potentially affecting groundwater quality as a result of contamination. |
| Cam and Ely Ouse Woburn Sands | GB40501G445700 | 6 km 'downstream' (along River Cam) from northern extent of Scheme Order Limits. | 95 | Groundwater | Good | Good | Good | Drinking Water Protected Area: *Cam and Ely Ouse Woburn Sands*<br><br>Nitrates Directive: *Great Ouse NVZ, Ely Ouse and Cut-off channel NVZ, Huntingdon River Gravels, Woburn Sands, Sandringham Sands South, Relief Channel/Polver drain NVZ* | The spatial extent of this groundwater body corresponds to the outcrop of the Woburn Sands Formation. However, the formation dips to the south-east, underlying and confined by the Gault Formation below the Proposed Development.<br><br>Deep sub-surface structures and foundations associated with the Proposed Development will terminate within the Gault Formation and will not penetrate the underlying Woburn Sands Formation. There is, however, potential for deep below-ground structures to approach and affect the Woburn Sands Formation. Included on a precautionary basis following consultation with the Environment Agency. |

# 3 Surface Water

## 3.1 Cam

### Baseline Data

3.1.1 A summary of the latest (2019) WFD status and objectives for the Cam surface water body is shown in Table 3-1.

**Table 3-1: River Cam WFD summary**

| Classification Type | Classification Item | 2019 Status | Objective | Objective Year |
|---|---|---|---|---|
| **Ecological** | Ecological | Moderate | Moderate | 2015 |
| | Biological quality elements | Good | Good | 2015 |
| | *Invertebrates* | *Good* | *Good* | *2015* |
| | *Macrophytes* | *Poor* | *Not provided* | *2015* |
| | Physico-chemical quality elements | Moderate | Moderate | 2015 |
| | *Acid Neutralising Capacity* | *High* | *Not provided* | *Not provided* |
| | *Ammonia (Phys-Chem)* | *High* | *Good* | *2015* |
| | *Dissolved oxygen* | *High* | *Good* | *2015* |
| | *Phosphate* | *Poor* | *Moderate* | *2027* |
| | *Temperature* | *High* | *Good* | *2015* |
| | *pH* | *High* | *Good* | *2015* |
| | Hydromorphological Supporting Elements | Heavily Modified. Supports Good | Supports Good | 2015 |
| | Supporting elements (Surface Water) | Moderate | Good | 2027 |
| | Specific pollutants | High | High | 2015 |
| **Chemical** | Chemical | Fail | Good | 2063 |
| | Priority hazardous substances | Fail | Good | 2063 |
| | Priority substances | Good | Good | 2015 |
| | Other Pollutants | Does not require assessment | Does not require assessment | 2015 |

*Source: Catchment Data Explorer GB105033042750*

3.1.2 The Cam water body is classified as heavily modified with 'Moderate' ecological potential.

3.1.3 Since 2009, the Cam water body has achieved 'Good' or 'High' status for all physico-chemical parameters, except phosphate. Phosphate has been classified at 'Poor' status from 2009 to 2019 and is the key reason for the physico-chemical status of the river not achieving a higher status. The Cam is currently classified as having 'Moderate' physico-chemical status. The 'Reasons for not achieving good' (RNAGs) for the Cam water body highlight pressures in the catchment such as point source discharges (including storm overflows in extreme weather) and physical modifications associated with agriculture, rural land management, urban and transport sectors.

3.1.4 The following sections consider the impacts of the proposed WWTP on physico-chemical, hydromorphological and ecology WFD elements for the Cam surface water body.

## Physico-chemical quality elements

***'No deterioration' requirements***

3.1.5 Discharge limits for biochemical oxygen demand (BOD), ammoniacal nitrogen as N, total phosphorus, total suspended solids (TSS) will be agreed with the Environment Agency through ongoing consultation for the Proposed Development. It is assumed that discharge limits for total iron as Fe and chloride as Cl (which are used in the existing Cambridge WWTP for treatment processes) will, if required for the proposed WWTP, be agreed with the Environment Agency.

3.1.6 The Environment Agency has confirmed[2] that modelling to set discharge permit limits will follow 'no deterioration' requirements in the receiving water body. This assessment therefore assumes that environmental permitting of final effluent discharge will ensure no deterioration of the Cam water body for consented quality elements.

***Stormwater discharge***

3.1.7 Storm modelling (Appendix 20.10, Application Document Reference 5.4.20.10 Storm Model Report) indicates that there will be a reduced frequency of stormwater discharges to the River Cam from the proposed WWTP compared to the existing Cambridge WWTP, which will improve water quality compared to periods where these stormwater discharges currently occur.

***Assessed elements***

3.1.8 As indicated above, discharge limits for biochemical oxygen demand (BOD), ammoniacal nitrogen as N, total phosphorus, total suspended solids (TSS), iron and chloride will be agreed with the Environment Agency.

3.1.9 Of the consented water quality elements, only phosphate and ammonia are classed as WFD physico-chemical quality elements for the River Cam. Phosphate and ammonia are therefore considered in more detail below, based on the pre-application indicative consent limits (Table 3-2) for the Proposed Development.

[2] In response to consultation on WFD screening and scoping approach (email 29 April 2022).

**Table 3-2 Discharge consent limits: concentrations and dry weather flow (DWF)**

| Discharge and water quality parameter/determinand | Existing | Proposed (Indicative)* |
|---|---|---|
| Dry Weather Flow ($m^3/d$) | 37,330 | 55,000 |
| Total Phosphorus (as P) (mg/l) | 1 | 0.4 |
| ATU-Biochemical Oxygen Demand (as $O_2$) (mg/l) | 15 | 11 |
| Ammoniacal nitrogen (as N) (mg/l) | 5 | 3 |
| Total Suspended Solids (mg/l) | 20 | 14 |
| 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 are subject to change, but are unlikely to be lower than the existing permit.*

*Phosphate*

3.1.10 Since 2009, the Cam water body has been continuously classified as 'Poor' WFD status for phosphate.

3.1.11 The discharge limit for total phosphorus at the existing Cambridge WWTP is 1mg/l for a dry weather flow of 37,330$m^3$/d. The indicative consent limit for total phosphorus at the proposed WWTP is 0.4mg/l for a dry weather flow of 55,000$m^3$/d.

3.1.12 The total phosphorus effluent load (dry weather flow multiplied by concentration of determinand) at the indicative dry weather flow of 55,000 $m^3$/d would be 41% less than the effluent load indicated by the current consent conditions (Table 3-2). Hence, there should be a decrease in the contribution of total phosphorus load to river water at the outfall in all conditions covered by the indicative discharge consent limits.

3.1.13 Catchment-wide water quality modelling of orthophosphate[3] concentrations has been undertaken (Appendix 20.11, App Doc Ref 5.4.20.11: Permit Application HRA Report (Water Quality)). While the modelling was undertaken with respect to interim permitting conditions unrelated to this DCO application, the analysis provides useful context for WFD orthophosphate concentrations. The SIMCAT model assessed a proposed total phosphate concentration in the final effluent of 0.5mg/l for a mean flow of 64,471$m^3$/d.

3.1.14 The SIMCAT model indicates that a final effluent discharge total phosphorus concentration of 0.5mg/l would be sufficient to improve the downstream WFD phosphorus status for the Cam water body from 'Poor' to 'Moderate'. It can therefore be assumed that, based on effluent load concentrations[4], the indicative phosphorus discharge limit of 0.4mg/l, would likewise be sufficient to improve the downstream WFD phosphorus status to 'Moderate'.

[3] Discharge permits are expressed as total phosphorus, which represents the concentration of all forms of phosphorus. Orthophosphate is the form of phosphorus used to determine compliance with water quality standards. For the purposes of the model, Orthophosphate = 0.7 x Total phosphorus.

[4] SIMCAT model: 64,471$m^3$/d * 0.5mg/l = 32kg/d
Indicative consent: 50,000 $m^3$/d * 0.4mg/l = 22kg/d

3.1.15 A status change for phosphate from 'Poor' to 'Moderate' would meet the WFD 2027 objective for phosphate in the River Cam. The overall physico-chemical status of the River Cam would however be unchanged from its current 'Moderate' status.

*Ammonia*

3.1.16 The River Cam has been classified at 'High' status for ammonia since 2016.

3.1.17 Due to low confidence in the ammonia baseline SIMCAT model, water quality modelling of ammonia concentrations was not undertaken (Appendix 20.11, App Doc Ref 5.4.20.11: Permit Application HRA Report (Water Quality)).

3.1.18 The discharge limit for ammoniacal nitrogen (as N) at the existing WWTP is 5mg/l (Table 3-2). The indicative discharge limit for ammoniacal nitrogen (as N) at the proposed WWTP is 3mg/l.

3.1.19 The ammoniacal nitrogen effluent load (dry weather flow multiplied by concentration of determinand) at the indicative dry weather flow of 55,000 $m^3$/d would be approximately 12% less than the effluent load indicated by the current consent conditions[5].

3.1.20 Qualitatively, the decrease in the contribution of ammoniacal nitrogen to river water at the outfall in all conditions covered by the indicative discharge consent limits will lead to an improvement in water quality and would retain it within the 'High' WFD classification for ammonia.

## Hydromorphology

***Outfall structure***

3.1.21 The WFD hydromorphological status of the River Cam currently 'Supports Good'. The River Cam is designated as a heavily modified water body. Waterbodies cannot be classified as 'High' WFD hydromorphological status if they are classed as heavily modified (UK Government, 2015).

3.1.22 Outfall design is ongoing. The Environment Agency is actively engaged with the design of the outfall and has set objectives to maximise marginal vegetation, minimise hard engineering and the associated loss of natural river bank habitat.

3.1.23 The proposed recessed outfall will require excavation of approximately 150$m^3$ of currently undisturbed river bank. The system of discharge outlets and flow deflectors within the new outfall structure will be below the typical river water level (3.9mAOD) and will not be visible under normal river level conditions.

3.1.24 Current plans include permanent supporting structures (sheet piling) for the river bank either side of the proposed outfall, extending the river bank modification to a total length of approximately 70m. The sheet piling will be capped with either concrete, timber or steel.

[5] Existing Conditions effluent load ammonia: 37,300$m^3$/d * 5mg/l = 187kg/d
Indicative Conditions effluent load ammonia: 55,000$m^3$/d * 3mg/l= 165 kg/d

3.1.25 The design of the outfall will ensure that it aligns with existing ground levels. The roof of the outfall chamber will be slightly below existing ground levels and will be covered in soil and seeded with grass seed. Design includes a reed/sedge bed either side of the outfall for the full length of the new sheet piled section to enhance the natural bank at this location and reduce the impact of the hard bank protection on the channel margin.

3.1.26 Rip-rap river bed protection will be placed in the vicinity of the outfall (potentially extending up to 4m into the river from the toe of the outfall) to prevent local river bed scour impacts. The final extent of rip-rap protection will be determined at detailed design. This is proposed as mitigation following the assessment of potential scour risk at the outfall (App Doc Ref 5.4.20: Chapter 20 Water Resources).

3.1.27 Initial hydrodynamic modelling of outfall discharges from the treated effluent 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). The hydrodynamic models inform an outfall design configuration which minimises potential impacts to river users, the river bed and river banks by dissipating treated effluent flow energy and adequately mixing treated effluent with river water. The hydrodynamic models will inform final design of the outfall.

3.1.28 As rip-rap river bed protection will be used in the vicinity of the outfall to prevent local scour impacts, and as the river bank opposite the outfall is already sheet piled, scour impacts during normal operating conditions are expected to be negligible at water body scale.

3.1.29 Following implementation of best practice design of the outfall structure to reduce scour risks associated with discharges from the outfall, there remains a low residual risk of scour in the event of infrequent stormwater discharge, which is expected to occur less than once every ten years. This low risk will be mitigated through routine visual inspection of the river downstream of the proposed outfall following a storm discharge event, with maintenance or repair of eroded sections as necessary. Further details of the scour assessment and hydrodynamic modelling results are provided within App Doc Ref 5.4.20: Chapter 20 Water Resources.

3.1.30 The potential impacts of the new outfall structure on the river bank and bed will continue to be minimised and mitigated by design, with active Environment Agency engagement. Any impacts will be local in scale and will not impact the hydromorphology of the wider Cam waterbody.

3.1.31 The existing outfall structure for the existing Cambridge WWTP will remain in place at decommissioning and will be capped once discharges cease.

***Quantity and dynamics***

3.1.32 The permitted treated effluent dry weather flow ($Q_{95}$, the flow which is exceeded for 95% of the time) for the existing outfall is 37,330$m^3$/d (0.43$m^3$/s) (Table 3-2). The indicative dry weather flow for the proposed outfall is 55,000$m^3$/d (0.64$m^3$/s), to accommodate population growth to the year 2041. The permitted and indicative dry

weather flows are for treated effluent only and do not include storm water discharge.

3.1.33 Fluvial flood modelling[6] of the River Cam water levels and flow has been undertaken (Appendix 20.5, App Doc Ref 5.4.20.5: Fluvial Model Report) to understand the combined impact of treated effluent and storm water discharges from the Proposed Development to the river.

3.1.34 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), although the records may not be fully representative of current flow conditions. Over this period, river flows ranged generally between about 0.9$m^3$/s (78,000$m^3$/d) ($Q_{95}$) in low flow conditions, and 10$m^3$/s (864,000$m^3$/d) ($Q_5$, the flow which is exceeded for only 5% of the time) at high flows. The mean (average) flow was about 3.6$m^3$/s (311,000$m^3$/d).

3.1.35 Fluvial modelling (Appendix 20.5, App Doc Ref 5.4.20.5: Fluvial Model Report) indicates that in a design flood event, including allowance for climate change[7], peak flows at Bottisham Lock in existing conditions (i.e., including discharge from the existing outfall) would be about 74.5$m^3$/s. With the new outfall, peak flows in the design flood event (including climate change) would be 74.6$m^3$/s at Bottisham Lock. This represents a negligible increase of 0.1%. At all modelled node locations, the maximum increase in flow in a design flood event, including climate change, is less than 0.5%

3.1.36 The fluvial model indicates that the relative impact to flow is larger for low magnitude storm events, because the WWTP discharge makes up a larger proportion of the total River Cam flow. For example, the maximum increase in peak flow in the 1 in 2 year event is observed at Baits Bite Lock, where flows may increase by 3% from 23.0$m^3$/s (existing outfall) to 23.7$m^3$/s (new outfall). At all modelled node locations downstream of Baits Bite Lock, the maximum increase in flow in a 1 in 2 year event would be less than 3%.

3.1.37 At the location of the proposed outfall, the river is 24m wide and on average 2m deep. A 3% increase in peak flow from 23.0$m^3$/s to 23.7$m^3$/s at this location, for example, would result in a very minor velocity increase from 0.48m/s to 0.49m/s, assuming a constant cross-sectional area of river[8]. Therefore, in the worst case of a 3% increase in peak flow, the impact on water velocity of the River Cam would be in the order of 0.01m/s, which is considered to be insignificant.

[6] In the model, fluvial floods on the River Cam are implemented as fourteen inflows representing a catchment-wide 61-hour storm. Outfall storm discharges are modelled as a 4-hour storm event, which begins at an offset of 30 hours, to coincide with the peak of the catchment-wide fluvial flood.
[7] 1 in 100 year event & 20% climate change.
[8] Constant cross-sectional area of river is used for mathematical convenience. In a flood event, river levels would increase, which would in turn increase the river cross-sectional area slightly, potentially reducing velocities. However stage level increases are insignificant for all modelled scenarios. Velocity estimates are not sensitive to very small changes in stage level.

3.1.38 Climate change projections by the UK Centre for Hydrology and 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. Increased discharges from the Proposed Development may be considered to supplement low flows in the River Cam, which may be of increasing benefit in future low flow scenarios.

3.1.39 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. From 2017 to present, 90% of the time river levels at Baits Bite Lock range between 3.82mAOD and 3.88mAOD (Baits Bite Lock Sluice Automation Dual Comms Monitoring Station, 2022), a range of approximately 60mm.

3.1.40 Fluvial flood modelling (Appendix 20.5, App Doc Ref 5.4.20.5: Fluvial Model Report) demonstrates that the maximum difference in River Cam stage levels from discharge at the proposed outfall compared to the existing outfall, in any storm event, would be a negligible 2cm.

3.1.41 The hydromorphological impact on peak or low River Cam flows, velocities and levels due to treated effluent and storm discharges from the new outfall is considered negligible compared to that from the existing Cambridge WWTP.

***Current outfall cessation***

3.1.42 There will be a reduction in flow in a 90m reach of the River Cam between the outfalls from the existing Cambridge WWTP and the proposed WWTP. The flow could reduce by an estimated 40% in this short 90m 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 dry weather flow for the existing Cambridge WWTP.

3.1.43 Water levels in this reach of the river are controlled by the weir at Baits Bite Lock, approximately 500m downstream of the outfall for the proposed WWTP. Therefore, the change in water level in the reach is likely to be negligible. However, the average velocity of the river flow may decrease by up to 40% in $Q_{95}$ low flow conditions.

3.1.44 The change in flows and velocities in the 90m reach of the river between the existing and proposed WWTP outfall locations is considered a local impact and is not of significance at WFD water body scale.

3.1.45 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 quantitively assess the difference between the adverse local impact of loss of flow against the beneficial impact of improvement in water quality, although the benefit to water quality for the entire watercourse downstream might be expected to outweigh the impact of lower flow through a short section of river.

## Biological quality elements

***WFD biological status***

3.1.46 The biological status for the Cam water body is assessed on invertebrate and macrophyte status. The impact on fish (not currently an assessed WFD biological quality element) is also considered where relevant.

***Outfall structure***

3.1.47 The physical impacts of the new outfall structure are considered to be local in scale and therefore unlikely to have any significant impact on invertebrate, fish or macrophyte communities, as discussed in App Doc Ref 5.4.8: Chapter 8 Biodiversity. Therefore, no significant effects on aquatic ecology or biological WFD status is expected.

***Quantity and dynamics***

3.1.48 The expected 3% increase in flow in a 1 in 2 year event, is considered minor and unlikely to significantly alter the aquatic invertebrate community which is currently indicative of heavily sedimented habitats experienced during normal flow conditions. Therefore, no WFD ecological impact is expected due to alteration of flow. Similarly, this small increase in flow is considered unlikely to adversely affect the fish and macrophyte communities, as this deviation from current baseline would be expected within normal flow variation and therefore the ecological communities would be adapted to such conditions. As levels are controlled by weir structures and predicted changes in levels are considered to be negligible, no effect on the ecology is expected – such as alteration of macrophyte habitats or fish passage ability.

***Current outfall cessation***

3.1.49 Between the existing outfall and the planned outfall 90m downstream, the expected reductions in flow in this stretch are predicted to have a highly localised impact on the invertebrate ecology. The removal of the discharge from the existing outfall would be expected to improve the water quality in this stretch, causing a localised improvement in the invertebrate ecology.

3.1.50 Reduced flow velocity in this section would be expected to alter the invertebrate communities in this stretch of the river. However, as indicated in Appendix 8.1 (App Doc Ref 5.4.8.1) Baseline Aquatics, the existing invertebrate community is characteristic of a heavily sedimented (and presumably slow-flowing habitat), therefore community changes would be expected to be limited. Given that these impacts would occur over a short stretch of river, it would not be expected that these impacts would affect biological quality element status in the water body overall.

3.1.51 The fish community in this section is likely to benefit from the improved water quality and be able to adapt to the short length with reduced flow velocity. Fish are able to move to find favoured micro-habitats within a stretch of river, and whilst a reduced flow is not expected to benefit all species of fish, it may be that a flow reduction improves habitat availability for juvenile fish in certain areas. Overall,

reduction in flows over a short stretch of river would not be expected to negatively impact the fish community as a whole. Similarly, the macrophyte community has been shown to be tolerant of sedimentation and slow flows; such a community would not be expected to alter significantly due to the highly localised reduction in flow.

***Water Quality***

3.1.52 The predicted improvement in water quality through reduced ammonia and BOD would be expected to have a net benefit on aquatic invertebrates by reducing water quality stresses on the invertebrate community – this could help to improve the invertebrate WFD status classification element to "High" status, or help prevent any decline in WFD status. These more stringent standards will likely also benefit the fish community through improvement of water quality, especially for sensitive protected species such as bullhead (*Cottus gobio*). Similarly, a reduction of overall phosphate levels would likely benefit the macrophyte ecology, which is currently a community associated with elevated nutrient levels and at Poor WFD status (see Appendix 8.1 (App Doc Ref 5.4.8.1) Baseline Aquatics.

## Heavily Modified water body mitigation measures

3.1.53 The Cam water body is a designated Heavily Modified water body (HMWB). For this reason, the water body has specific WFD HMWB mitigation measures that need to be met to achieve Good Ecological Potential (GEP).

3.1.54 A summary of the outstanding mitigation measures for the Cam water body is provided in Table 3-3. 40 measures noted as 'not applicable' for the Cam water body have not been included in the assessment. The remaining 10 measures are currently assessed by the EA as being 'not in place'. The Proposed Development must not prevent these measures from being delivered in future.

3.1.55 No measures associated with the Proposed Development are considered to prevent future delivery of any of the HMWB mitigation measures.

**Table 3-3: HMWB Mitigation Measures for Cam Water Body**

| No. | Mitigation Measure | Status | Potential impacts of the Proposed Development on future delivery? |
|---|---|---|---|
| 4 | Removal/softening of hard engineering structures that modify natural bank profile | Not in place | A new hard engineering structure will be constructed at the new discharge outfall location; potentially conflict with this measure. However, the design will ensure minimal impact on the river bank and this will not impact at the scale of the water body. The existing outfall is planned to be retained. The Proposed Development will not prevent future delivery of this measure. |

| No. | Mitigation Measure | Status | Potential impacts of the Proposed Development on future delivery? |
|---|---|---|---|
| 6 | Restore or increase in-channel morphological diversity e.g. riffle and pool creation and bar creation etc. | Not in place | Not applicable |
| 12 | Restoration of lateral connectivity with the water bodies surrounding floodplain e.g. flood plain spillways | Not in place | Not applicable |
| 16 | Installation of structures designed to facilitate and improve the passage of migratory (e.g. salmon and sea trout) and non-migratory fish where structures cannot be removed | Not in place | Not applicable |
| 36 | Action(s) to reduce the extent and spread of invasive non-native species, including actions on our own assets | Not in place | The works will follow agreed measures (App Doc Ref 5.4.2.1: Code of Construction Practice Part A) to prevent the spread of invasive species, and wherever possible, to reduce their presence. |
| 38 | Implement an active sediment management strategy (develop and revise) e.g. substrate reinstatement; sediment traps; allow natural recovery; riffle construction; reduce management in flood risk areas | Not in place | Not directly applicable. Any in-channel construction works will follow an appropriate method statement to minimise sediment disturbance. |
| 39 | Ensure best practice techniques are applied when undertaking maintenance activities to minimise impacts to the habitat | Not in place | Any in-channel construction or maintenance works will follow an appropriate method statement to minimise sediment disturbance. |
| 40 | Ensure best practice is applied when undertaking maintenance works e.g. coffer dam placement, working during appropriate flow conditions | Not in place | Any in-channel construction or maintenance works will follow an appropriate method statement to minimise sediment disturbance. |
| 43, 47 | Implement a downstream flow regime that does not impact the ecology (applies to rivers and reservoirs) | Not in place | Not applicable |
| 54 | Raise public awareness of the impacts and responsibilities of landowners | Not in place | Not applicable |

*Source: WFD HMWB Mitigation Measures for Cam water body – internal spreadsheet Environment Agency (data provided August 2022)*

# 4 Groundwater

## 4.1 Cam and Ely Ouse Chalk

### Baseline Data

4.1.1 The Cam and Ely Ouse Chalk groundwater body includes the West Melbury Marly Chalk Formation, which is the bedrock underlying the land required for the construction of the proposed WWTP.

4.1.2 A summary of the 2019 WFD status and objectives for the Cam and Ely Ouse Chalk groundwater body is shown Table 4-1.

**Table 4-1: Cam and Ely Ouse Chalk baseline data**

| Classification Type | 2019 Status | Objective | Objective Year |
|---|---|---|---|
| **Overall water body** | Poor | Poor | 2015 |
| **Quantitative** | Poor | Good | 2027 |
| **Chemical** | Poor | Poor | 2015 |

*Source: Catchment Data Explorer GB40501G400500*

4.1.3 The Cam and Ely Ouse Chalk groundwater body has been continuously classified as having 'Poor' overall status since 2013.

4.1.4 The chemical WFD status of the Cam and Ely Ouse Chalk groundwater body has been designated 'Poor' since 2013, attributed to several RNAGs in the groundwater body. These include point-source discharges from the water industry and domestic sources, as well as diffuse pollution from agriculture and urban/transport drainage.

4.1.5 The quantitative WFD status of the Cam and Ely Ouse Chalk groundwater body has also been designated 'Poor' since 2013 due to abstraction for the water industry, agriculture and industrial use.

4.1.6 The following sections consider the impacts of the proposed WWTP on quantitative and chemical WFD elements for the Cam and Ely Ouse Chalk groundwater body.

### Quantitative elements

4.1.7 A number of components of the proposed WWTP, including the terminal pumping station shaft, storm tanks, primary settlement tanks, activated sludge plant tanks, final settlement tanks and the filtration plant will be installed below ground level.

4.1.8 Groundwater levels at monitoring locations within the area of the proposed WWTP ranged between approximately 2m and 5m below ground level between August 2021 and May 2022. 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.

4.1.9 Groundwater levels will be locally affected by below-ground structures and may rise upgradient of the structures. However, groundwater flow would be expected to adjust and move along pathways in the aquifer around the structures. In the event that groundwater levels rise at any time towards ground surface in the area of the

proposed WWTP, the groundwater will be intercepted by the surface water drainage system and directed towards an attenuation storage pond located within the land required for the landscape masterplan. Discharge from the attenuation pond to a drain linked to Black Ditch (not a WFD surface water body) will be restricted to greenfield run off rates. The drainage scheme for the Proposed Development is outlined in Appendix 20.12 (App Doc Ref 5.4.20.12) Drainage Strategy.

4.1.10 The local impact on groundwater levels and flow is insignificant at water body scale, as there would be no change to the overall integrity of the aquifer. The quantitative groundwater impact of the Proposed Development on the Cam and Ely Ouse groundwater body is considered negligible.

### Chemical elements

4.1.11 There is potential for waste water leakage from below-ground structures to impact groundwater quality in the Cam and Ely Ouse Chalk groundwater body. Leakage from below-ground structures will, however, be mitigated by robust design and best construction practices.

4.1.12 The drainage strategy (Appendix 20.12, App Doc Ref 5.4.20.12: Drainage Strategy) includes dedicated closed drainage with impermeable surfaces in any 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.

4.1.13 A contaminant transport model (Appendix 20.8, App Doc Ref 5.4.20.8 Contaminant Transport Note) has been used to assess the migration of contaminants from accidental spills within the proposed WWTP. For modelling purposes, it is assumed that accidental spills on the surface may vertically infiltrate into groundwater within the West Melbury Marly Chalk Formation. The model, which conservatively assumes an infinite source of contaminants, indicates a retarded travel time towards the Black Ditch in excess of 1,000 years for key inorganic contaminants. This is considered insignificant according to Environment Agency Remedial Targets Methodology (Environment Agency, 2022).

4.1.14 The model indicates a travel time towards the Black Ditch of less than 1,000 years for hydrocarbons, potassium and ammoniacal nitrogen. However:

- Potential for hydrocarbon fuel spills would be limited by site design, management systems and operational and emergency procedures. The availability of free phase hydrocarbons to enter the environment would be extremely limited.
- Potassium is not a contaminant typically associated with waste water treatment plants and therefore is not considered a significant risk to the environment from the proposed WWTP.
- Ammoniacal nitrogen could be sourced from the proposed WWTP in the event of a leak of the drainage system or weeping from the digester. The potential for leakage of ammoniacal nitrogen would be limited by appropriate design,

construction and operational management systems. It is highly unlikely that significant concentrations of potential contaminants would infiltrate from the ground surface of the proposed WWTP into groundwater.

4.1.15 The impact of contaminants on the closest downgradient groundwater receptor, Black Ditch, is considered negligible and mitigated by design and operational best practice (App Doc Ref 5.2.20: Chapter 20 Water Resources ). Black Ditch is not a WFD surface water body, nor is it directly hydraulically connected to a WFD surface water body.

## 4.2 Cam and Ely Ouse Woburn Sands

### Baseline data

4.2.1 The Cam and Ely Ouse Woburn Sands groundwater body includes the Woburn Sands Formation. The Cam and Ely Ouse Woburn Sands WFD groundwater body is located along the outcrop of the Woburn Sands Formation more than 2.5km west of the Proposed Development. The Woburn Sands Formation is overlain and confined by the Gault Formation at the proposed WWTP.

4.2.2 During construction, there is potential for deep excavations within the Gault Formation to result in aquifer de-pressurisation of the Woburn Sands Formation. Although temporary construction impacts are in general excluded from this assessment, the impact of deep excavations on the Woburn Sands Formation has been included on a precautionary basis, following consultation with the Environment Agency.

4.2.3 A summary of the 2019 WFD status and objectives for the Cam and Ely Ouse Woburn Sands groundwater body is shown Table 4-2.

**Table 4-2: Cam and Ely Ouse Woburn Sands baseline data**

| Classification Type | 2019 Status | Objective | Objective Year |
|---|---|---|---|
| **Overall water body** | Good | Good | 2021 |
| **Quantitative** | Good | Good | 2015 |
| **Chemical** | Good | Good | 2021 |

*Source: Catchment Data Explorer GB40501G445700*

4.2.4 The following sections consider the impacts of the proposed WWTP on quantitative and chemical WFD elements for the Cam and Ely Ouse Woburn Sands groundwater body.

### Quantitative elements

4.2.5 Ground investigation data within the proposed WWTP indicates that the top of the Woburn Sands Formation is at about -36mAOD (45m below ground level).

4.2.6 The deepest below-ground structure is expected to be the Terminal Pumping Station, which will have a formation level at approximately -26mAOD (35m below ground level). There will therefore be about 10m of Gault Formation between the

top of the Woburn Sands Formation and the formation level of the terminal pumping station.

4.2.7 Impacts to the Woburn Sands Formation during excavation of the 20m internal diameter structure are considered negligible, due to the presence of approximately 10m thickness of the overlaying and confining Gault Formation. Hence it is anticipated that there would be negligible temporary or permanent impact on the aquifer.

4.2.8 Piling below digesters is expected to extend to approximately -16.5mAOD (25m below ground level). There should be about 20m of Gault Formation between the piling bases and the top of the Woburn Sands Formation and therefore accidental puncturing of the aquifer during piling should not occur.

# 5 Conclusion

## 5.1 River Cam

5.1.1 A summary of the potential WFD impacts as a result of the Proposed Development is shown in Table 5-1.

**Table 5-1: River Cam WFD surface water body – scoping assessment**

| River Cam | Potential WFD effects | WFD compliance risk |
|---|---|---|
| **Physico-chemical elements** | **No potential adverse effects on WFD physico-chemical quality elements.**<br><br>**Potential phosphate improvement from 'Poor' to 'Moderate' status.**<br><br>Consented discharge limits for Biochemical Oxygen Demand, Total Suspended Solids, Ammoniacal Nitrogen as N, Total Phosphorus, Total Iron as Fe and Chloride as Cl, will ensure no deterioration at WFD scale.<br><br>Pre-application discharge limits indicate a minor beneficial effect on water quality for phosphate and ammonia. Phosphate may improve in WFD status from 'Poor' to 'Moderate'. Ammonia is likely to remain at 'High' status. | **No potential adverse effects on WFD quality elements.**<br><br>**Potential improvement from 'Poor' to 'Moderate' status for phosphate.**<br><br>**Overall physico-chemical status remains Moderate.**<br><br>**No further WFD assessment required.** |
| **Hydromorphology** | **No potential adverse effects on WFD hydromorphological supporting elements.**<br><br>Impact of new outfall on River Cam hydromorphology is negligible at a water body scale. Local impacts to the River Cam bed and banks will be mitigated by design, informed by hydrodynamic modelling (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).<br><br>Impact of outfall discharge on River Cam flows and levels in peak storm conditions is negligible compared to the existing outfall.<br><br>Local impact of cessation of existing outfall is negligible at water body scale.<br><br>Most climate change projections indicate up to 20% reduction in flows in East Anglia in the 2050s epoch. Increased final effluent discharges may be beneficial to low flows in the River Cam. | **Negligible WFD water body effects expected.**<br><br>**Increased $Q_{95}$ flows likely beneficial to low flows in River Cam.**<br><br>**No further WFD assessment required.** |

| River Cam | Potential WFD effects | WFD compliance risk |
|---|---|---|
| **Biological** | **No potential adverse effects on WFD biological quality elements.**<br><br>Impact of improved discharge standards for new outfall may mean that improved water quality downstream benefits aquatic ecology and improves WFD status resilience.<br><br>Outfall structure not expected to impact aquatic ecology communities other than minor highly localised impacts.<br><br>Minor increase in flow is not expected to significantly affect aquatic communities. | **Negligible WFD water body effects expected.**<br><br>**Invertebrate status remains at least Good and potential for Macrophyte status to improve from Poor, due to reduced Phosphate.**<br><br>**No further WFD assessment required.** |

## 5.2 Cam and Ely Ouse Chalk groundwater body

5.2.1 A summary of the potential WFD impacts on the Cam and Ely Ouse Chalk groundwater body as a result of the Proposed Development is shown in Table 5-2.

**Table 5-2: Cam and Ely Ouse Chalk WFD groundwater body – scoping assessment**

| Cam and Ely Ouse Chalk | Potential WFD effects | WFD compliance risk |
|---|---|---|
| **Quantitative** | **No potential adverse effects on WFD quantitative elements.**<br><br>Deep below-ground structures may result in localised redirection of groundwater flows and mounding of groundwater levels upgradient of the structures, which would produce no change to the integrity of the aquifer. | **Negligible WFD water body effects expected.**<br><br>**No further WFD assessment required.** |
| **Chemical** | **No potential adverse effects on WFD chemical elements.**<br><br>With appropriate design, construction practices, and operational management of the proposed WWTP, it is unlikely that significant concentrations of any potential contaminants would leak from below-ground tanks or infiltrate from the ground surface into groundwater as a result of leaks or accidental spills. | **Negligible WFD water body effects expected.**<br><br>**No further WFD assessment required.** |

## 5.3 Cam and Ely Ouse Woburn Sands groundwater body

5.3.1 A summary of the potential WFD impacts on the Cam and Ely Ouse Woburn Sands groundwater body as a result of the Proposed Development is shown in Table 5-3.

**Table 5-3: Cam and Ely Ouse Woburn Sands WFD groundwater body – scoping assessment**

| Cam and Ely Ouse Woburn Sands | Potential WFD effects | WFD compliance risk |
|---|---|---|
| **Quantitative** | **No potential adverse effects on WFD quantitative elements.**<br><br>The base of the deepest subsurface structure, the Terminal Pumping Station) will be about 10m above the top of the Woburn Sands Formation. Impacts to the Woburn Sands Formation during excavation of the structure are considered negligible, due to the presence of approximately 10m thickness of the overlaying and confining Gault Formation. Hence there should be negligible temporary or permanent impact on the aquifer<br><br>There should be about 20m of Gault Formation between the deep piling bases for digesters and the top of the Woburn Sands Formation. Therefore, accidental puncturing of the aquifer during piling should not occur. | **Negligible WFD water body effects expected.**<br><br>**No further WFD assessment required.** |

# 6 References

Anglian Water. (2022). *Cambridge Wast Water Treament Plant Relocation Environmental Statement. Biodiversity.*

Anglian Water. (2022). *Cambridge Waste Water Treatment Relocation Project Environmental Statement. Water Resources.*

*Baits Bite Lock Sluice Automation Dual Comms Monitoring Station*. (2022, 05 27). Retrieved from River Level: https://riverlevels.uk/baits-bite-lock-sluice-automation-dual-comms-cambridgeshire#.YpCy4O7MKUn

Binnies. (2022). *Cambridge WWTP River Modelling (Final) P02.*

Binnies, SWECO. (2022). *MIlton Water Recycling Centre Discharge Consent.*

Department for Environment Food & Rural Affairs, Environemnt Agency. (2022, 02 01). *Anglian River Basin District.* Retrieved from Catchment Data Explorer: https://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/5

Department for Environment Food and Rural Affairs, Environment Agency. (2021, 09 14). *River basin districts*. Retrieved from Catchment Data Explorer: https://environment.data.gov.uk/catchment-planning

Ely Group of Internal Drainage Boards. (2022). *Swaffham.* Retrieved from Internal Drainage Boards.: http://www.elydrainageboards.co.uk/internal-drainage-boards/swaffham/swaffham-idb-map/

Environment Agency. (2022). *Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination.*

European Commission. (2000, 10 23). *DIRECTIVE 2000/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL*. Retrieved 02 2022, from https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02000L0060-20141120&from=EN

European Commission. (2006, 12 12). *DIRECTIVE 2006/118/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL*. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32006L0118&from=EN

legislation.gov.uk. (2008). *Planning Act 2008*. Retrieved from The National Archives: https://www.legislation.gov.uk/ukpga/2008/29/contents

legistlation.gov.uk. (2017). *Regulation 19.* Retrieved from The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017: https://www.legislation.gov.uk/uksi/2017/407/regulation/19/made

Mott Macdonald. (2022). *Update to HIA Contaminant Transport Model (Draft Version 01).*

National River Flow Archive. (2022). *33003 - Cam at Bottisham*. Retrieved from UK Centre for Ecology and Hydrology: https://nrfa.ceh.ac.uk/data/station/info/33003

Planning Inspectorate. (2017, 06). *Advice Note Eighteen: The Water Framework Directive*. Retrieved from https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-

18/#:~:text=Advice%20Note%20Eighteen%3A%20The%20Water%20Framework%20Directive%20Status,Planning%20Inspectorate.%20This%20is%20a%20new%20Advice%20Note.

UK Centre for Ecology & Hydrology. (Accessed April 2022). *National Changes in River Flow.* Retrieved from https://www.ceh.ac.uk/national-changes-river-flow

UK Government. (2015). *The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.* Retrieved from https://www.legislation.gov.uk/uksi/2015/1623/resources: https://www.legislation.gov.uk/uksi/2015/1623/pdfs/uksiod_20151623_en_003.pdf

UK Government. (2017). *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.* Retrieved from legislation.gov.uk: https://www.legislation.gov.uk/uksi/2017/407/made

WFD UK TAG. (2014, 07 07). *Rivers Phosphorus Calculator 20140917.* Retrieved from Rivers Phosphorus Standards: http://wfduk.org/resources/rivers-phosphorus-standards

# A. Stage 01 WFD Screening

## A.1 Summary

A.1.1 *The Proposed Development is a Nationally Significant Infrastructure Project (NSIP) (Department of Environment, Food and Rural Affairs, 2012) as defined in the Planning Act (Planning Act Section 29, 2008) and requires a Development Consent Order (DCO).*

A.1.2 *The Water Framework Directive (WFD) Screening assessment has been prepared to identify water bodies which may be affected as a result of the Proposed Development. The aim of the report is to determine if further assessment is required to ensure the Proposed Development is compliant with the WFD.*

A.1.3 *The Planning Inspectorate's Water Framework Directive assessment guidance is provided in National Infrastructure Planning Advice Note 18: The Water Framework Directive* (Planning Inspectorate, 2017). *A three-stage approach is recommended:*

- Stage 1 – WFD screening
- Stage 2 – WFD scoping
- Stage 3 – WFD impact

A.1.4 *This assessment is a 'Stage 1 – WFD screening' assessment, to determine which WFD surface water and groundwater bodies may be impacted by the Proposed Development. The screened-in water bodies resulting from this assessment are;*

- *Cam (Surface Water body; river);*
- *Cam and Ely Ouse Chalk (Groundwater body); and*
- *Cam and Ely Ouse Woburn Sands (Groundwater body).*

## A.2 Introduction

### Background and context

A.2.1 The Proposed Development is a Nationally Significant Infrastructure Project (NSIP) (Department of Environment, Food and Rural Affairs, 2012) as defined in the Planning Act (Planning Act Section 29, 2008) and requires a Development Consent Order (DCO).

A.2.2 This WFD Screening assessment has been prepared as part of the application to the Planning Inspectorate for development consent.

A.2.3 The WFD Screening assessment has been prepared to identify water bodies which may be affected as a result of the Proposed Development. The aim of the report is to determine whether further assessment is required to ensure the Proposed Development is compliant with the WFD.

A.2.4 Preliminary versions of screening tables Table App 1 and Table App 2 have been reviewed by the Environment Agency[9]. The Environment Agency agreed in principle with much of the screening approach and outcomes, requesting only that the Cam & Ely Ouse Woburn Sands groundwater body, which had been screened out, be screened in. Although the Proposed Development does not intersect this groundwater body, the precautionary screening-in relates to potential for deep below-ground structures to approach and impact the Woburn Sands Formation. Table App 2 has been updated accordingly.

A.2.5 Since the preliminary screening, Swaffham and Ely Internal Drainage Board has confirmed[10] that there is no direct hydraulic connection between Black Ditch and WFD surface water body Bottisham Lode-Quy Water. Therefore Bottisham Lode-Quy Water, which was initially screened in, has now been screened out.

## A.3 Location and description

A.3.1 The Proposed Development involves construction of a new integrated waste water treatment plant (WWTP) together with the associated waste water transfer infrastructure, comprising waste water transfer tunnel, sewer rising main diversions and treated effluent transfer with an outfall to the River Cam. The Proposed Development also includes a waste water transfer pipeline corridor from Waterbeach Water Recycling Centre (WRC). The Proposed Development is located north-east of Cambridge near the villages of Fen Ditton and Horningsea.

[9] Email from Environment Agency Planning Specialist 27 April 2022.
[10] Email from Ely Drainage Board 20/09/2022

## A.4 Purpose of WFD Screening report

A.4.1 The Planning Inspectorate's Water Framework Directive assessment guidance is provided in National Infrastructure Planning Advice Note 18: The Water Framework Directive (Planning Inspectorate, 2017). A three-stage approach is recommended:

- Stage 1 – WFD screening: to determine which WFD water bodies may be affected, and if there are any activities associated with the Proposed Development that do not require further consideration (for example activities which have been ongoing since before the current river basin management plan (RBMP) plan cycle and which have thus formed part of the baseline);
- Stage 2 – WFD scoping: to identify risks of the Proposed Development's activities to receptors based on the relevant WFD water bodies and their quality elements (including information on status, objectives, and the quality elements for each water body); and
- Stage 3 – WFD impact assessment: a detailed assessment of water bodies and their quality elements that are considered likely to be affected by the Proposed Development, identification of any areas of non-compliance, consideration of mitigation measures, enhancements, and contributions to the RBMP objectives. Where the potential for deterioration of water bodies is identified and it is not possible to mitigate the impacts to a level where deterioration can be avoided, the project would need to be assessed in the context of Regulation 19[11] of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (legislation.gov.uk, 2017). Where a derogation is necessary, Applicants will need to provide the necessary information to justify their case, bearing in mind that Applicants must always seek to avoid deterioration of the water environment. It is a matter for the Secretary of State to consider whether derogation under Regulation 19 is justified in relation to a Proposed Development.
- Applicants should note that consideration of measures to avoid, mitigate and compensate impacts identified need not be limited to stage 3 and may also be considered at stages 1 and 2 as appropriate.

A.4.2 This assessment is a 'Stage 1 – WFD screening' assessment to determine which WFD surface water and groundwater bodies may be impacted by the Proposed Development, requiring further review in 'Stage 2 – WFD scoping' and, if required, 'Stage 3 – WFD impact assessment'. The screening is split into surface water bodies and groundwater bodies in Sections A.4 and A.5 respectively.

[11] Updated reference in accordance with current legislative framework following England's departure from the European Union.

## A.5 Surface water body screening

A.5.1 Table App 1 provides a summary of the surface water bodies considered within the context of the 2019[12] WFD classifications (Department for Environment Food & Rural Affairs, Environemnt Agency, 2022), along with the screening outcome.

A.5.2 The following WFD-related surface water body was identified as requiring further assessment at 'Stage 2 – WFD scoping' or 'Stage 3 – WFD impact assessment':

- Cam GB105033042750

[12] 'Cycle 2' of the river basin management plan (RBMP) was 2015-2021 and the formal baseline was the 2015 data on Catchment Data Explorer. Cycle 3 for 2022-2027 will use the formal baseline from the 2019 data on Catchment Data Explorer. Consultation for the draft Cycle 3 RBMP finished in April 2022, and the final Cycle 3 RBMP has not yet been formally published as of October 2022.

**Table App 1: Screening of surface water bodies**

| Name | WFD ID | Approximate distance from scheme | Length (km) | Hydrological designation | Overall Status (2019) | Chemical Status (2019) | Ecological Status (2019) | Hydrological Regime (2019) | Protected Areas | Screening summary | Justification |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cam** | GB105033042750 | 0.0km. Crossed by scheme | 28.62 | Heavily Modified | Moderate | Fail | Moderate | Supports Good | Urban Waste Water Treatment Directive: *River Cam (Cambridgeshire)*<br><br>Nitrates Directive: *Huntingdon River Gravels, Ely Ouse and Cut-off channel NVZ* | Screen IN | Discharge consent conditions for the proposed WWTP differ from those of the existing Cambridge WWTP which discharges to this water body, and may therefore impact the physico-chemical and ecological status of the waterbody. The existing and proposed outfalls are both located within this waterbody. The proposed outfall structure has potential to impact the hydromorphological status of the water body. |
| **Bottisham Lode - Quy Water** | GB105033042700 | 500 m from northern end of Scheme Order Limits; 1.5km from proposed WWTP | 13.53 | Heavily Modified | Moderate | Fail | Moderate | Not assessed | Nitrates Directive: *Anglian Chalk, Ely Ouse and Cut-off channel NVZ* | Screen OUT | This is a tributary of the River Cam with no direct hydraulic or topographic linkage to the Black Ditch or the Proposed Development. This has been confirmed by the Internal Drainage Board (IDB) (consultation with IDB 20/09/2022). There may be floodplain linkage with Black Ditch or the River Cam in a flood event. However, floodplain linkage would be temporary, localised and not significant at WFD waterbody scale. |
| **Swaffham - Bulbeck Lode** | GB105033042710 | 1.7km downstream of northern end of Scheme Order Limits | 9.81 | Heavily Modified | Moderate | Fail | Moderate | Not assessed | Nitrates Directive: *Anglian Chalk, Ely Ouse and Cut-off channel NVZ* | Screen OUT | This is a tributary of the River Cam with no direct hydraulic or topographic linkage to the Proposed Development. There may be floodplain linkage with the River Cam in a flood event. However, floodplain linkage would be temporary, localised and not significant at WFD waterbody scale. |
| **Burwell Lode** | GB105033042720 | 4.5km downstream of northern end of Scheme Order Limits | 11.11 | Heavily Modified | Moderate | Fail | Moderate | Does Not Support Good | Nitrates Directive: *Anglian Chalk, Ely Ouse and Cut-off channel NVZ*<br><br>Habitats and Species Directive: *Fenland* | Screen OUT | This is a tributary of the River Cam with no direct hydraulic or topographic linkage to the Proposed Development. There may be floodplain linkage with the River Cam in a flood event. However, floodplain linkage would be temporary, localised and not significant at WFD waterbody scale. |
| **New River** | GB105033042780 | 4.9km downstream of northern end of Scheme Order Limits | 9.49 | Heavily Modified | Moderate | Fail | Moderate | Does Not Support Good | Nitrates Directive: *Anglian Chalk, Ely Ouse and Cut-off channel NVZ*<br><br>Habitats and Species Directive: *Fenland* | Screen OUT | This is a tributary of the River Cam with no direct hydraulic or topographic linkage to the Proposed Development and therefore no impact is expected. There may be floodplain linkage with the River Cam in a flood event. However, floodplain linkage would be temporary, localised and not significant at WFD waterbody scale. |
| **Old West River** | GB205033043375 | Joins 8.3km downstream of northern end of Scheme Order Limits | 40.95 | Heavily Modified | Moderate | Fail | Moderate | Supports Good | Nitrates Directive: *Ely Ouse and Cut-off channel NVZ, Huntingdon River Gravels*<br><br>Urban Waste Water Treatment Directive: *Old West & Ely Ouse* | Screen OUT | This tributary of the River Cam joins from the west, at least 8km downstream of the northern extents of the Scheme Order Limits.<br>Ditches in the vicinity of the existing Cambridge WWTP (west of the River Cam) may drain to the Old West River catchment. Construction and decommissioning activities may occur within the vicinity of the existing Cambridge WWTP. However, no operational impacts from the Proposed Development are anticipated in water resources receptors in this area. |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ely Ouse (South Level)** | GB205033000070 | 9km downstream of northern end of Scheme Order Limits | 87.67 | Artificial | Moderate | Fail | Moderate | Not assessed | Nitrates Directive: *Relief Channel/Polver drain NVZ, Anglian Chalk, Sandringham Sands South, Ely Ouse and Cut-off channel NVZ*<br><br>Urban Waste Water Treatment Directive: *Little Ouse, River Lark, Soham Lode, Old West & Ely Ouse* | Screen OUT | The Cam water body becomes the Ely Ouse (South Level) water body approximately 9km downstream of the northern end of the Scheme Order Limits. Any local impacts to the Cam water body as a result of the Proposed Development would be expected to have dissipated to such an extent as to be negligible at such a distance downstream. |
| **Cut-off Channel** | GB205033000040 | 34km downstream | 45.21 | Artificial | Moderate | Fail | Moderate | Not assessed | Drinking Water Protected Area: *Cut-off Channel*<br><br>Nitrates Directive: *Sandringham Sands South, Ely Ouse and Cut-off channel NVZ0, Anglian Chalk,*<br><br>Urban Waste Water Treatment Directive: *Cut Off and Relief Channel* | Screen OUT | This channel joins the Ely Ouse (South Level) waterbody 34km downstream of the northern end of the Scheme Order Limits. There is no direct hydraulic or topographic linkage to the Proposed Development and therefore no impact is expected. |
| **Relief Channel** | B205033047665 | 34km downstream | 17.05 | Artificial | Poor | Fail | Poor | Does Not Support Good | Not applicable | Screen OUT | This water body, a relief channel for the River Great Ouse, is 34km downstream of the northern end of the Scheme Order Limits. Any local impacts to the River Cam water body as a result of the Proposed Development would be expected to have dissipated to such an extent as to be negligible at such a distance downstream. |

## A.6 Groundwater body screening

A.6.1 Table App 2 provides a summary of the groundwater bodies considered within the context of 2019 WFD classifications (Department for Environment Food & Rural Affairs, Environemnt Agency, 2022), along with the screening outcome. The following WFD groundwater bodies were identified as requiring further assessment at 'Stage 2 – WFD scoping' or 'Stage 3 – WFD impact assessment';

- Cam and Ely Ouse Chalk GB40501G400500; and
- Cam and Ely Ouse Woburn Sands GB40501G445700.

**Table App 2: Screening of groundwater bodies**

| Name | WFD ID | Approximate distance from scheme | Area ($km^2$) | Waterbody category | Overall Status (2019) | Chemical Status (2019) | Quantitative Status (2019) | Protected Areas | Screening summary | Justification |
|---|---|---|---|---|---|---|---|---|---|---|
| **Cam and Ely Ouse Chalk** | GB40501G400500 | 0.0 km. Intersected by scheme. | 2,996 | Groundwater | Poor | Poor | Poor | Drinking Water Protected Area: *Cam and Ely Ouse Chalk*<br><br>Nitrates Directive: *Anglian Chalk* | Screen IN | The operational area of the Proposed Development is partially within this groundwater body and includes deep subsurface structures with potential to impact groundwater levels and flows within the groundwater body, as well as potentially affecting groundwater quality as a result of contamination. |
| **Cam and Ely Ouse Woburn Sands** | GB40501G445700 | 6km down-stream (along River Cam) of northern extent of Scheme Order Limits. | 95 | Groundwater | Good | Good | Good | Drinking Water Protected Area: *Cam and Ely Ouse Woburn Sands*<br><br>Nitrates Directive: *Great Ouse NVZ, Ely Ouse and Cut-off channel NVZ, Huntingdon River Gravels, Woburn Sands, Sandringham Sands South, Relief Channel/Polver drain NVZ* | Screen IN | The spatial extent of this groundwater body corresponds to outcrop of the Woburn Sands Formation. This formation dips to the south-east, underlying and confined by the Gault Formation.<br>Deep sub-surface structures and foundations associated with the Proposed Development will terminate within the Gault Formation and will not penetrate the underlying Woburn Sands Formation. There is, however, potential for deep below-ground structures to approach and impact the Woburn Sands Formation. Included on a precautionary basis following consultation with the Environment Agency. |
| **North West Norfolk Sandringham Sands** | GB40501G400400 | 45km | 195 | Groundwater | Good | Good | Good | Drinking Water Protected Area: *North West Norfolk Sandringham Sands*<br><br>Nitrates Directive: *Anglian Chalk NVZ, Babingley River NVZ, Ely Ouse and Cut-off channel NVZ, Gaywood River NVZ, Heacham River NVZ, Ingol NVZ, Mintlyn Stream NVZ, Relief Channel/Polver drain NVZ, Sandringham Sands North, Sandringham Sands South* | Screen OUT | No area of the Proposed Development intersects this groundwater body which, at its closest point, is 45km north-east of the Proposed Development. The River Cam does not cross this waterbody. |

## A.7 References

Anglian Water. (2022). *Cambridge Wast Water Treament Plant Relocation Environmental Statement. Biodiversity.*

Anglian Water. (2022). *Cambridge Waste Water Treatment Relocation Project Environmental Statement. Water Resources.*

*Baits Bite Lock Sluice Automation Dual Comms Monitoring Station*. (2022, 05 27). Retrieved from River Level: https://riverlevels.uk/baits-bite-lock-sluice-automation-dual-comms-cambridgeshire#.YpCy4O7MKUn

Binnies. (2022). *Cambridge WWTP River Modelling (Final) P02.*

Binnies, SWECO. (2022). *MIlton Water Recycling Centre Discharge Consent.*

Department for Environment Food & Rural Affairs, Environemnt Agency. (2022, 02 01). *Anglian River Basin District.* Retrieved from Catchment Data Explorer: https://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/5

Department for Environment Food and Rural Affairs, Environment Agency. (2021, 09 14). *River basin districts*. Retrieved from Catchment Data Explorer: https://environment.data.gov.uk/catchment-planning

Ely Group of Internal Drainage Boards. (2022). *Swaffham.* Retrieved from Internal Drainage Boards.: http://www.elydrainageboards.co.uk/internal-drainage-boards/swaffham/swaffham-idb-map/

Environment Agency. (2022). *Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination.*

European Commission. (2000, 10 23). *DIRECTIVE 2000/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL*. Retrieved 02 2022, from https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02000L0060-20141120&from=EN

European Commission. (2006, 12 12). *DIRECTIVE 2006/118/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL*. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32006L0118&from=EN

legislation.gov.uk. (2008). *Planning Act 2008*. Retrieved from The National Archives: https://www.legislation.gov.uk/ukpga/2008/29/contents

legistlation.gov.uk. (2017). *Regulation 19.* Retrieved from The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017: https://www.legislation.gov.uk/uksi/2017/407/regulation/19/made

Mott Macdonald. (2022). *Update to HIA Contaminant Transport Model (Draft Version 01).*

National River Flow Archive. (2022). *33003 - Cam at Bottisham*. Retrieved from UK Centre for Ecology and Hydrology: https://nrfa.ceh.ac.uk/data/station/info/33003

Planning Inspectorate. (2017, 06). *Advice Note Eighteen: The Water Framework Directive*. Retrieved from https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-

18/#:~:text=Advice%20Note%20Eighteen%3A%20The%20Water%20Framework%20Directive%20Status,Planning%20Inspectorate.%20This%20is%20a%20new%20Advice%20Note.

UK Centre for Ecology & Hydrology. (Accessed April 2022). *National Changes in River Flow.* Retrieved from https://www.ceh.ac.uk/national-changes-river-flow

UK Government. (2015). *The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.* Retrieved from https://www.legislation.gov.uk/uksi/2015/1623/resources: https://www.legislation.gov.uk/uksi/2015/1623/pdfs/uksiod_20151623_en_003.pdf

UK Government. (2017). *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.* Retrieved from legislation.gov.uk: https://www.legislation.gov.uk/uksi/2017/407/made

WFD UK TAG. (2014, 07 07). *Rivers Phosphorus Calculator 20140917.* Retrieved from Rivers Phosphorus Standards: http://wfduk.org/resources/rivers-phosphorus-standards

# B. Figures

Scheme Order Limits
WFD - Surface water body
WFD - Groundwater body
Water Resources study area

Cam and Ely Ouse Woburn Sands

Cam and Ely Ouse Chalk

River Cam

Data Sources
Scheme Order Limits: Anglian Water Services @One, 2022
WFD waterbodies: Environment Agency, 2022
Basemapping: © Crown copyright and database rights 2021 OS 100022432



Metres 0 500 1,000 1,500

MOTT MACDONALD
22 Station Road
Cambridge CB1 2JD
United Kingdom

T +44 (0)20 8774 2000
F +44 (0)20 8681 5706
W mottmac.com

Client: love every drop anglianwater

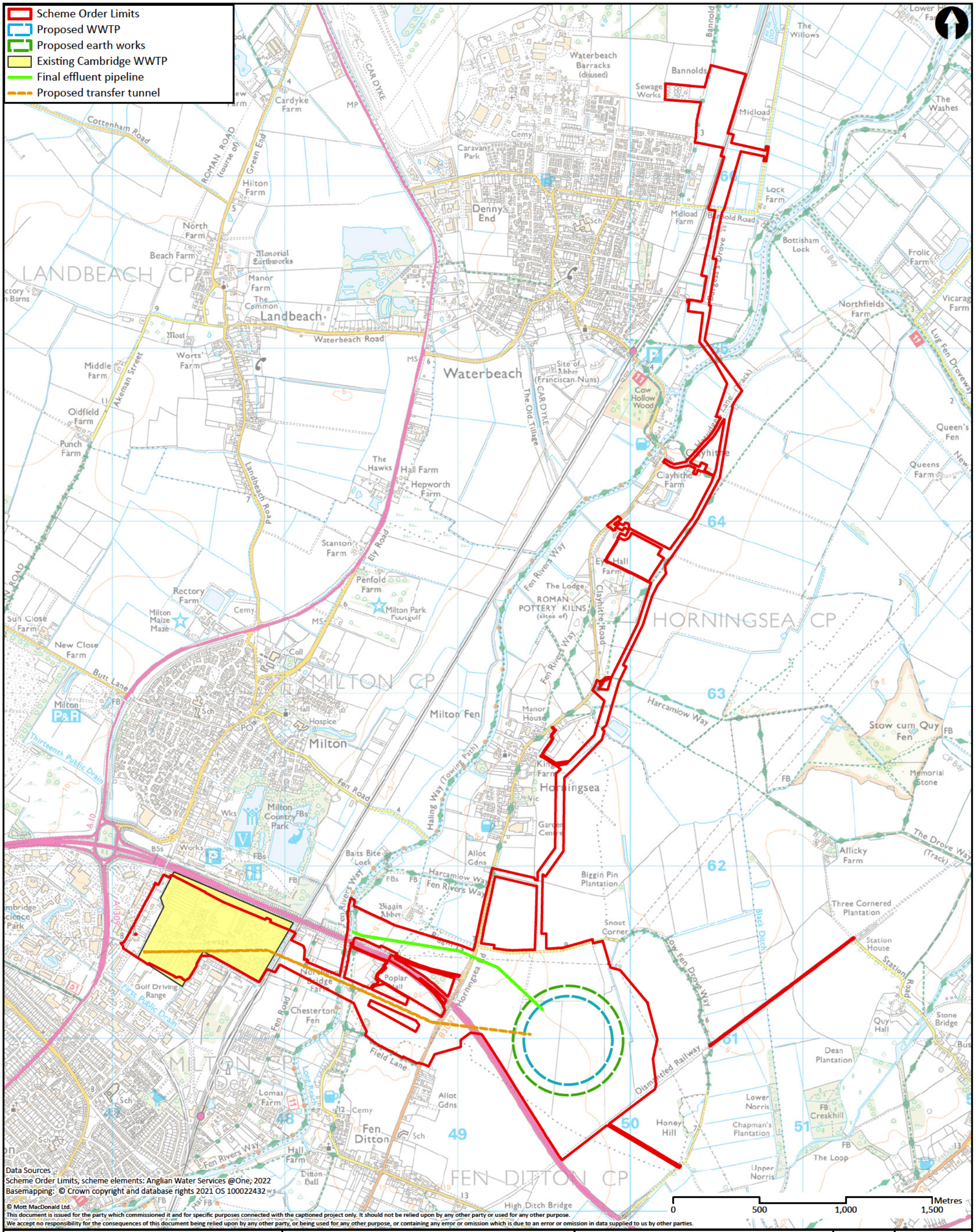
| Rev | Date | Drawn | Description | Ch'k'd | App'd |
|---|---|---|---|---|---|
| P1 | 24/10/22 | KL | First Draft | MC | CS |
| | | | | | |

Title
Cambridge Waste Water Treatment Plant Relocation Project
Water Framework Directive
Screened-in surface water and groundwater bodies

| | |
|---|---|
| Drawn | KL |
| Checked | MC |
| Approved | CS |
| Scale at A3 | 1:50,000 |

Drawing Number: WW01003-CAMEST-MOT-05-XX-DR-X-0701

| Security | Status | Rev |
|---|---|---|
| STD | PRE | P1 |




MOTT MACDONALD

22 Station Road
Cambridge CB1 2JD
United Kingdom

T +44 (0)20 8774 2000
F +44 (0)20 8681 5706
W mottmac.com

Client

love every drop anglianwater

| Rev | Date | Drawn | Description | Ch'k'd | App'd |
|---|---|---|---|---|---|
| P1 | 24/10/22 | KL | First Draft | MC | CS |
| | | | | | |

Title

Cambridge Waste Water Treatment Plant
Relocation Project
Water Framework Directive
Location overview

| | |
|---|---|
| Drawn | KL |
| Checked | MC |
| Approved | CS |
| Scale at A3 | 1:20,000 |

Drawing Number: WW01003-CAMEST-MOT-05-XX-DR-X-0700

| Security | Status | Rev |
|---|---|---|
| STD | PRE | P1 |

# 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:** [redacted]

Visiting our website at **www.cwwtpr.com**

You can view all our DCO application documents and updates on the application on The Planning Inspectorate website:

**https://infrastructure.planninginspectorate.gov.uk/projects/eastern/cambridge-waste-water-treatment-plant-relocation/**