Cambridge Waste Water Treatment Plant Relocation Project

Anglian Water Services Limited

Chapter 2 Project Description

Application Document Reference: 5.2.2
PINS Project Reference: WW010003
APFP Regulation No. 5(2) a

Revision No. 03
20 November 2023

Document Control

Document title	Project Description
Version No.	03
Date Approved	30.01.23
Date 1st Issued	30.01.23

Version History

Version	Date	Author	Description of change
01	30.01.23	-	DCO Submission
02	26.04.23		Updated to reflect s.51 letter
03	14.11.23		Adjustments to 1.10.2 to align the size of the gateway building to the size that was assessed. Clarification on what is included in top sild strip on 2.1.4, 3.3.1, 3.3.2, 3.3.53, 3.3.77, 3.3.78, 3.3.79 and table 31

Contents

Tables

Figures

Summary

The proposed Waste Water Treatment Plant (hereafter "proposed WWTP") involves the construction of a new waste water treatment plant and sludge treatment centre together with the associated waste water and final effluent transfer infrastructure, comprising a waste water transfer tunnel from the existing Cambridge WWTP to the proposed WWTP, final effluent and storm pipeline with an outfall to the River Cam, and two new pipelines (rising mains) from the Waterbeach New Town development area off Bannold Drove (Waterbeach) to the proposed WWTP, either via the existing works or direct. Other ancillary development includes a new access road connecting the proposed WWTP to the local road network at Horningsea Road and the interception and diversion of several rising mains at the site of the existing Cambridge WWTP to relocate their discharge point from the existing Inlet Works to the new waste water transfer tunnel. Collectively, all elements are referred to as the 'Proposed Development'.

The relocation will enable the delivery of South Cambridgeshire District and Cambridge City Councils' Area Action Plan for a new low carbon city district in North East Cambridge, which could create 8,350 homes and 15,000 jobs over the next 20 years.

The purpose of the proposed WWTP will be to treat all waste water from the Cambridge catchment and wet sludge from the wider region, as the existing Cambridge WWTP currently does. It will also have the capacity to treat the waste water from the Waterbeach catchment and anticipated housing growth in the combined Cambridge and Waterbeach catchment area.

A high-level summary of the Proposed Development is provided below:

- An integrated waste water and sludge treatment plant.
- A shaft to intercept waste water at the existing WWTP and a tunnel/ pipeline to transfer it to the proposed WWTP and Terminal Pumping Station. Temporary intermediate shafts to launch and recover the micro-tunnel boring machine.
- A gravity pipeline transferring treated waste water from the proposed WWTP to a discharge point on the River Cam and a pipeline for storm water overflows.
- A twin pipeline transferring waste water from Waterbeach to the existing Cambridge WWTP, with the option of a connection direct in to the proposed WWTP when the existing works is decommissioned.
- Ancillary on-site buildings, including a Gateway Building with incorporated Discovery Centre, substation building, workshop, vehicle parking including electrical vehicle charging points, fencing and lighting.
- Environmental mitigation and enhancements including substantial biodiversity net gain, improved habitats for wildlife, extensive landscaping over

approximately 70 ha, a landscaped earth bank enclosing the proposed WWTP, climate resilient drainage system and improved recreational access and connectivity.

- Renewable energy generation via anaerobic digestion which is part of the sludge treatment process that produces biogas designed to be able to feed directly into the local gas network to heat homes, or to be used on site.
- Renewable energy generation via solar photovoltaic systems and associated battery energy storage.
- Other ancillary development such as internal site access, utilities, including gas, electricity and communications and connection to the site drainage system.
- A new vehicle access from Horningsea Road for Heavy Goods Vehicles bringing sludge onto the site for treatment and other site traffic.

1 Project Description

1.1 Introduction

1.1.1 This chapter of the Environmental Statement provides a description and details of the proposed Cambridge Waste Water Treatment Plant Relocation Project (CWWTRP).

1.1.2 The Applicant is seeking development consent for the construction of a waste water treatment plant ("WWTP") on land south of the village of Horningsea in Cambridgeshire and associated development.

1.1.3 The purpose of the Cambridge Waste Water Treatment Plant Relocation Project (CWWTPRP) is to relocate the WWTP currently operating at Milton ("the existing WWTP"), on the north-east edge of Cambridge, by building a new WWTP ("the proposed WWTP") and decommissioning the existing WWTP. Connecting infrastructure (tunnels and pipelines) would also be built together with a new outfall on the River Cam. A new access to the proposed WWTP will be constructed from Horningsea Road, south of Horningsea.

1.1.4 The relocation will enable the delivery of South Cambridgeshire District and Cambridge City Councils' Area Action Plan for a new low carbon city district in North East Cambridge, alongside the new Cambridge North railway station, which could create 8,350 homes and 15,000 jobs over the next 20 years.

1.1.5 The proposed WWTP will treat all waste water from the Cambridge catchment and wet sludge from the wider region, as the existing Cambridge WWTP currently does. It will also have the capacity to treat the waste water from the Waterbeach catchment and anticipated housing growth in the combined Cambridge and Waterbeach catchment area.

1.1.6 The structure of this chapter is as follows:

- Section 1.2 summarises the response to the Planning Inspectorate's scoping opinion relevant to this Project Description
- Section 1.3 describes the location of the proposed WWTP
- Section 1.4 provides an overview of the features of the proposed WWTP
- Section 1.5 outlines the approach to design flexibility adopted by the Applicant (the "Rochdale Envelope"
- Section 1.6 provides an introduction to the operation of the proposed WWTP and outlines the proposed phasing of the project to allow expansion of the project in the 2030s or 2040s and beyond.

- Sections 1.7- 1.9 provides further details on those processes, together with associated buildings and structures.
- Section 2 describes the connecting infrastructure and associated development outside of the proposed WWTP site
- Section 3 describes the construction and decommissioning techniques and methodologies which are intended to be used for the proposed project
- Section 4 outlines the operation and maintenance processes for the proposed project, following its construction.
- Section 5 in accordance with the EIA Regulations, outlines the potential risks of major accidents or disasters which might arise in respect of the proposed WWTP if not appropriately managed.

1.2 EIA scoping

1.2.1 In response to the Applicant's scoping request, a scoping opinion for this Environmental Statement was issued by the Planning Inspectorate in November 2021, which included overarching comments on the Project Description. Table ***1-1*** provides a summary of key points raised during scoping, together with a response, setting out how they have been addressed in the EIA process.

Table 1-1:Key points raised in Scoping Opinion

ID	Inspectorate's comments	Response
2.1.1	**Design Concept and technical capacity** Paragraph 2.4.4 of the Scoping Report explains that the existing Cambridge Waste Water Treatment Plant (WWTP) has around 45 satellite sites which send wet sludge for treatment. The design capacity of the Proposed Development is expressed as "approximately 548,000 population equivalent" with the sludge treatment centre "designed to treat indigenous sludge produced at the proposed WWTP plus imported liquid sludges arriving by road". The Sludge Treatment Centre (STC) is designed to treat up to 16,000 Tonnes Dry Solids (TDS) per year for both indigenous and imported sludge to accommodate forecast housing growth to around 2050.The ES should be clear in forecasting the growth projections from the existing WWTP to the Proposed Development including any anticipated changes to the spatial extent and the number of satellite sites it will serve if this differs from the existing WWTP (and how this has been reflected in the assessment of operational effects across the aspect chapters).	The project capacity (and the growth assumptions incorporated in it) are summarised at Sections 1.6 of this chapter. Increased flow from this growth would be treated at the existing Cambridge WWTP site if the proposed WWTP were not constructed. As discussed at paragraph 1.8.6, the proposed WWTP is intended to service a similar geographical extent and number of satellite sites as the existing WWTP does, noting that there is considerable variation in tanker movements and their origin across any given period. A worst case assessment of tanker movements, linked to the estimated import capacity of the proposed WWTP has been assessed in Chapter 19: Traffic and Transport. It should be noted that the difference in potential impact from the baseline (the continued operation of the existing WWTP) only occurs at a local level - there would be a corresponding reduction of HGV movements to and from the existing Cambridge WWTP via Junction 33 of the A14 and an increase at the proposed WWTP outside Cambridge via Junction 34 of the A14. The effect of HGV movements has been assessed in Chapter 19: Traffic and Transport.
2.1.2	**Transition between the Proposed Development and decommissioning of the existing Cambridge WWTP** Figure 2-2 shows a temporal overlap between decommissioning of the existing Cambridge WWTP and the construction of the new sewage works, and a temporal overlap between the decommissioning of the existing Cambridge WWTP and the construction of the Proposed Development. The ES should clearly set out the periods of transition between the two facilities and the assessment of any interactive effects based on evidenced worst-case assumptions in this regard and whether there are any new or different environmental effects as a result of the transition. The relevant aspect chapters should therefore consider any temporary changes or effects arising from the gradual transfer of flows from one sewage works to another. The detail of the decommissioning activities is yet to be defined but is expected to include the draining / cleaning of existing tanks (including	The proposed WWTP would be constructed, dry and wet commissioned before the existing Cambridge WWTP is decommissioned. While the proposed WWTP is being commissioned, the existing Cambridge WWTP will remain operational. This will be a gradual, phased transitional process. While both WWTPs are operational there will be more than double the current treatment capacity available to treat the incoming flow, which will be unaffected. The transitional arrangement is described at paragraph 3.1.11 below and assessed in Chapter 20: Water Resources. The decommissioning of the existing Cambridge WWTP, including draining and making safe vessels, tanks and structures is described in this chapter at section. An Outline Decommissioning Plan (Application Document Reference 5.4.2.3) has been prepared and forms an appendix to the ES, setting out the scope of the decommissioning activities to be carried out at

ID	Inspectorate's comments	Response
	waste treatment / disposal), ensuring mechanical and electrically safety and security, and prevention of rainwater storage in open top tanks. However the Applicant states that "Other decommissioning activities, including the demolition of structures and site preparation for the site's redevelopment are outside of the scope of the relocation project DCO and will be carried out by the site developer in accordance with a separate planning permission". As set out in section 2.4 of the Scoping Opinion, the key objective of the WWTP relocation is to support the delivery of South Cambridgeshire District and Cambridge City Councils' new low-carbon city district in North East Cambridge. The Inspectorate acknowledges the Applicant's intention to include consideration of demolition of structures and site preparation of the existing Cambridge WWTP as part of the cumulative effects assessment. The ES for the Proposed Development should describe the future decommissioning activities at the existing WWTP that will be required to the extent that they can be reasonably foreseeable to facilitate any future development that will be subject to a separate planning permission. This should describe the decommissioning activities involved, identify the waste arisings, and consider any temporary and permanent effects.	the existing Cambridge WWTP. A Site Waste Management Plan will be produced to identify any waste arisings from the decommissioning activities.
2.1.3	**Environmental Permitting** There is reference to the need for an Environmental Permit for water discharge and for biogas / steam boiler systems. The ES should clearly set out all other separate consents that will be required and the timescales for seeking approval, particularly where any degree of reliance is placed on such subsequent consents as mitigation for potentially significant effects of the Proposed Development set out in the ES. The Inspectorate would encourage cross reference in the ES to any separate Development Consent Order (DCO) application documents relating to other licenses and consents that would be required in the construction and operation of the Proposed Development.	The proposed WWTP has been designed to meet the anticipated discharge limits for emissions to air and water that accord with the Best Available Techniques (BAT) applicable to waste water treatment and the Medium Combustion Plant Directive (MCPD). These limits are embedded in the design., Within the technical topic chapters of this ES (chapters 6 - 20) certain mitigations are identified as being secured through the relevant Environmental Permit. Where appropriate the chapters, reference the relevant other licences and consents that would be required during construction and operation. These are listed in full in the Other Consents and Permits Register (Application Document Ref 7.1), which also sets out the timeframe for their determination.

ID	Inspectorate's comments	Response
2.1.4	**Enabling works** Limited reference is made to enabling works. The ES should include specific details of the proposed 'enabling works', particularly if / where there are substantive works required under separate consents or as part of separate work packages but that are necessary in connection with the Proposed Development.	There are no substantive works required under separate consents. An enabling phase of works (Enabling Phase 1) comprising the early works to construct the access road and construction compound for the main works site at the proposed WWTP, including fencing and temporary car parking is described at section 3.1. This phase of activity is authorised by an enabling works phase under the DCO.
2.1.5	**Concrete batching plant** There are separate references to both the establishing of a concrete batching plant, and to HGV movements which appear to assume off site concrete batching. The ES should clearly present the location and duration concrete batching plant operations. The Inspectorate is unclear whether during peak construction periods, the on-site plant will not be able to meet the demand and an additional supply would be required, or whether flexibility remains as to the need for such a plant on site. Worst case assumptions should be presented in the relevant aspect chapters in this regard. Aside from Chapter 7 of the Scoping Report (Air Quality) there are minimal references to an assessment of effects of demand for concrete for the construction of the Proposed Development.	As discussed at Section 3.3, the proposed concrete batching plant would be installed during the second phase of the preparatory works, within the temporary site establishment area (Work 21). As discussed at section 1.5 (Design Envelope) below, optionality and flexibility in respect of the use or potential use of a concrete batching plant is sought to allow commercial and delivery flexibility. It is highly likely that a concrete batching plant would be utilised, but assessments have also been carried out on the possibility that no plant is installed or that additional vehicle movements would take place in the event of batching plant unavailability or to augment supplies.
2.1.6	**Offsite export of Rag and Grit** Paragraph 2.7.37 states that 'Enhanced Treated Biosolids' cake would be transported off-site and used as bio-fertiliser, "which are taken account of in the operational vehicle movements", but the same is not said in respect of rag and grit. The ES should quantify worst case assumptions around HGV movements during operation, and potential end uses or disposal methods for these rag and grit products.	The export of rag and grit is taken account of in the operational vehicle movements. There is no end use for these materials, which require disposal in landfill or recovery of energy from waste (for rag).

ID	Inspectorate's comments	Response
2.1.7	**Heat generation, gas utilisation and storage** The Inspectorate considers there could be substantial differences in environmental effects of a biogas upgrading plant as opposed to a combined heat and power (CHP) engine solution. The Applicant should make every effort to promote a single option as part of the DCO application. Where flexibility in this regard is intended to be retained, the ES should clearly set out the differences by aspect chapter between each of the options and justification provided as to the need for this optionality as well as factors that will influence the final solution (and at what point that would be confirmed).	The Applicant's preference is to install the Gas to Grid option, however commercially it will not be possible to commit to the design until after DCO grant. This is because of the uncertain economic, regulatory and policy environment in respect of the future of domestic and industrial gas use in the UK. The use of the biogas in efficient CHP engines would give rise to different environmental effects than exporting the gas to the grid (most notably in respect of carbon emissions and local air quality). The approach to optionality and the Rochdale Envelope in respect of the gas utilisation is discussed at Section 1.5 below.
2.1.8	**LNG Anglian Water tanker fleet** The tanker fleet is proposed to be converted to LNG fuel "during the construction of the proposed WWTP". The ES should explain any assumptions around the timeframe during the construction phase when the conversion will be complete and how that is reflected in any worst case assumption(s). Where construction or operational vehicles are not part of the Anglian Water fleet (e.g. contractor vehicles or "wet sludge" deliveries from satellite plants), the ES should explain the extent to which LNG has been assumed as part of those fleet compositions where this is relied upon in the assessment of effects across the aspect chapters.	The worst-case assessment for air quality assumes that the Anglian Water operational fleet is not converted to LNG and so assumptions on the conversion rate are not required. Assessments of the impact of construction vehicle traffic, which will not form part of the Anglian vehicle fleet, are also based on conventional (diesel) technology. The relevant assessment criteria are listed in detail in each relevant technical chapter.

ID	Inspectorate's comments	Response
2.1.9	**Renewables Infrastructure** Solar power generation (including battery storage) is stated as "likely" being included, but limited information is provided as to the spatial extent of this with reference to figures provided, and how this would integrate / compete with landscaping and ecological mitigation aspirations. Where solar technologies are to be included, the ES should explain the installed capacity that has been assumed for the purposes of the worst-case assessment across the aspect chapters. Battery storage should be considered as part of the assessment of the potential for significant effects from major accidents and disasters.	As described in this project description, the Applicant is proposing to install solar power generation as part of the proposals. The proposed WWTP has been designed around the twin principles of net energy neutrality and operational carbon neutrality. The maximum capacity of the solar elements of the project are dependent upon its energy demand. The DCO seeks flexibility for the, highly unlikely, need for no solar generation up to a maximum of 7 hectares of photovoltaic panels. If the gas to grid option is not adopted, the amount of solar power required would be significantly reduced as the efficient combined heat and power (CHP) engines would largely deliver the electricity requirements of the project. The optimal mix of technologies (gas-to-grid, solar, battery storage, CHP) will be determined at the detailed design phase in accordance with the DCO Requirements. The worst-case assessment for carbon assumes that a CHP option with no solar would be built, potentially resulting in net positive operational carbon emissions from the operation of the plant. To ensure that operational carbon neutrality is maintained under all build scenarios the DCO includes a requirement for a Carbon Management Plan (CMP) to be agreed prior to the operation of the plant (see ES Chapter 10: Carbon (Application Document reference 5.2.10). Solar generation would not compete with the landscaping or ecological aspirations. Solar panels will only be installed within the main works site, meaning that, other than in respect of those installed on the roof of the Gateway Building, their visibility outside of the earth work bank would be extremely limited. When appropriately managed and maintained, battery storage is unlikely to present a risk of major accident or disaster. This is discussed at the Major Accident and Disasters section of this chapter (see section 0 below).

ID	Inspectorate's comments	Response
2.1.10	**Outfall(s) to the River Cam** Although the project description chapter explains the new outfall structures required, the ES should describe the detail of the existing outfalls to the River Cam and how / if these will be decommissioned as part of the Proposed Development along with an assessment of the effects of such activities across the relevant aspect chapters.	The existing outfall is described in this chapter of the ES and within the Outline Decommissioning Plan (Application Document Ref 5.4.2.3). It will be left in situ; using a stop log at the outfall without any material associated decommissioning activity.

1.3 Proposed Development Site Location and Description

1.3.1 The area around the proposed WWTP is an open landscape of large fields, separated by low hedgerows and drainage ditches, and woodland belts along field boundaries and around settlement edges. The A14 cuts through the landscape, rising to cross the River Cam over a bridge. Pylons and powerlines are prominent features in the landscape, alongside this section of the A14. The River Cam towpath, Fen Rivers Way, Harcamlow Way and the cycle path along Horningsea Road provide recreational walking and cycling routes between Cambridge and the landscape to the north-east. There are gentle undulations in the landscape which appears to be almost flat but generally slopes gently down towards the River Cam.

1.3.2 The main development site (also referred to as the site) for the proposed WWTP is located to the north-east of Cambridge and 2km to the east of the existing Cambridge WWTP, as shown on the Works Plans (Application Document Ref 4.3). It is situated on farmland immediately north of the A14 and east of the B1047 Horningsea Road in the green belt between the villages of Horningsea to the north, Stow Cum Quy to the east and Fen Ditton to the south west. Two overhead lines of pylons cross the northern and eastern edges of the main development site and come together with a third line at the north eastern corner of the site.

1.3.3 The main development site comprising the proposed WWTP and the associated landscaping required for visual and ecological mitigation, including an earth bank, which surrounds and encloses the proposed WWTP, is approximately 94ha in area. The proposed WWTP itself will occupy approximately 22ha with the remainder of the area comprising the earth bank and landscaped areas to screen the proposed WWTP, ecological mitigation and enhancement and permissive footpaths for recreational access to the landscaped areas and to improve connectivity in the area. The landscaping, ecological mitigation and permissive footpaths have been incorporated in the design, responding to consultation and internal design challenge from an early stage in the project. Landscape mitigation in the form of planting follows and strengthens the field boundaries, to provide effective screening of views close to sensitive receptors, without enclosing broader views.

1.3.4 The evolution of the design and its response to good quality design is described in the Design and Access Statement (DAS) (Application Document Ref 7.6). This describes how the proposed WWTP and its ancillary components provide a suitable design whose scale and proportionality is suitably incorporated in the local landscape by careful layout, massing, earth modelling and landscape planting. This is further considered and described in Chapter 3: Site Selection and Alternatives.

1.3.5 The main development site is bounded by the A14, Horningsea Road and Low Fen Drove Way. The area is currently accessed from Low Fen Drove Way using a single lane access track. This track is unsuitable for heavy construction traffic but will be used initially to access the site to establish the construction compound and construct the new access to Horningsea Road.

1.3.6 There are few hedges or trees within the area to be developed and its primary drainage system is through land drainage and perimeter field ditches. The topography is fairly flat with a c4m fall across the site south west to north east.

1.3.7 A new waste water transfer tunnel would be constructed to transfer flows from the existing Cambridge WWTP to the proposed WWTP and final effluent and storm pipeline would be installed beneath arable fields and rough pasture to the River Cam. The location of the proposed final effluent discharge outfall on the River Cam would be immediately north of the A14 bridge. The landscape here is open to the east, with views from the river bank towards Horningsea Road and the land required for the proposed WWTP.

1.3.8 Two new pipelines (rising mains) would be installed to transfer waste water to the proposed WWTP from Waterbeach, either via the existing works, or direct, depending on the rate of construction of new housing at Waterbeach. This would pass beneath open, arable farmland with large fields bordered by farmland tracks, tree belts and hedgerows with mature trees, crossing under the railway and River Cam east of Waterbeach, and the river again east of the existing Cambridge WWTP as well as the A14.

Figure 1.1 Architect’s sketch of Cambridge WWTP with proposed landscaping

1.4 Development Overview

1.4.1 The Proposed Development is shown in and Figure ***1.4***below and in greater detail on the Works Plans (Application Document Reference 4.3), General Arrangement Plans (Application Document Reference 4.2) and Design Plans (Application Document Reference 4.9 to 4.14), together with the other plans contained in Volume 4 of the application. It incorporates the proposed WWTP, works to intercept flows and transfer them from the existing Cambridge WWTP to the proposed WWTP, a new final effluent and storm pipeline discharging to the River Cam and two new pipelines (rising mains) to transfer flows from the existing Waterbeach Water Recycling Centre (WRC) to the new works, either directly or via the existing Cambridge WWTP.

1.4.2 The design includes a Gateway Building with incorporated Discovery Centre, parking including electrical vehicle charging points, renewable energy generation using anaerobic digestion and biogas and photovoltaics. Environmental mitigation and enhancements including substantial biodiversity net gain, improved habitats for wildlife, extensive landscaping over approximately 70ha, a landscaped earth bank enclosing the proposed WWTP, climate resilient drainage system and improved recreational access and connectivity.

1.4.3 Consent is also sought for decommissioning activities at the existing WWTP, which are described further at section 3.4 below. However, demolition activities and the re-development of the existing WWTP do not form part of the DCO application; they are not included within this project description and are not assessed as part of the Proposed Development, other than as potential cumulative effects in Chapter 21: Cumulative Effects Assessment. (Application Document reference 5.2.21).

1.5 Design Envelope

1.5.1 The Proposed Development for which consent is sought is described through the use of a design envelope, within which the necessary flexibility is sought to allow final details to evolve after consent, when construction contractors have been appointed. Seeking design flexibility within an assessment envelope reduces commercial risk (by allowing final detailed design solutions to be explored once consent has been obtained) and is intended to avoid future, time-intensive, formal variations to the DCO which might otherwise be needed to accommodate differing designs.

1.5.2 The approach of assessing a design envelope (also known as a “Rochdale envelope”) is common practice, as set out in PINS Advice Note Nine.

1.5.3 The flexibility provided by the Rochdale Envelope approach enables optimisation through detailed design whilst providing the level of information sufficient to enable the likely significant effects on the environment to be assessed, and the mitigation measures to be developed and described, in accordance with the EIA Regulations.

1.5.4 The extent of flexibility in terms of area of land required temporarily or permanently is provided in the Works Plans (through limits of deviations) and within the sections and the tables of this Project Description.

1.5.5 Flexibility required in respect of the heights of buildings and structures (and for underground structures their maximum depths) is described in the parameters schedule of the Development Consent Order (Application Document reference 2.1).

1.5.6 Construction phasing and techniques are outlined in this Environmental Statement, sufficient to enable likely significant environmental effect to be identified and assessed. Flexibility in these areas is secured through the relevant DCO Requirements and the need for approval of the relevant management plans such as the Code of Construction Practice, Construction Environmental Management Plan, Construction Traffic Management Plan and Landscape, Ecology and Recreational Masterplan (LERMP), while ensuring that that adverse environmental effects cannot exceed those reported in this Environmental Statement.

1.5.7 The overall design envelope for the main development and associated development is discussed in further detail in Section 2 below. Within each ES topic chapter, design envelope parameters specific to that assessment are given (where applicable) in Section 2.6 of each chapter. The assumed realistic worst case is presented in each assessment (ES chapter), both spatially and temporally, presenting the likely significant effects of those worst cases.

Table 1-2: Main elements of the project where flexibility is sought

Item	Flexibility Sought
Numbers, heights, appearance and location of buildings and structures within the proposed WWTP	Flexibility of the location of buildings and structures is sought through the application of limits of deviation shown in the Works Plans (Application Document Reference 4.3). Flexibility of the number, height and depth of buildings and structures and their materials and finishes is sought through the Development Consent Order. The relevant parameters set out in Schedule 14 of the DCO have been assessed under the Rochdale principles; these are also set out below in this chapter from table 1-4 onwards. The DCO requires that layout, scale, design, and external appearance, as well as the materials and finishes are approved by the local planning authority.
Construction sequence and timing	The project will be delivered in sequential construction phases, described in more detail below. Except for the first enabling phases (see paragraph 3.1.2) the flexible sequencing of these construction phases is sought. The draft DCO regulates this sequencing through the requirement for a written scheme of phasing to be approved by the local planning authority prior to the commencement of construction. Flexibility is also sought in the timing of construction activities. Indicative and maximum durations of these activities are described at section 3 below, which also sets out the assessment year assumptions adopted in this Environmental Statement.

Item	Flexibility Sought
Construction techniques and methods	The project description below outlines a variety of construction techniques and methods which could be adopted by the project. These have been assessed in accordance with the Rochdale principles, as outlined in each technical chapter. For each element of the project a construction method statement must be agreed, within the limits of the EIA assessment, before construction can commence. The construction process will be managed through Code(s) of Construction Practice (CoCP) and Construction Environmental Management Plans (CEMP).
Process optionality	Optionality is sought in respect of several processes. A decision will only be reached on the optionality after grant of DCO, through the written scheme of phasing described above. Optionality has been assessed in this ES on the following processes: • Selection of gas-handling technology - gas-to-grid or combined heat and power (CHP) - see paragraph 1.8.4 • Inclusion of solar photovoltaic (PV) generation and extent of PV panels - see section 2.6 below • Inclusion of nutrient recovery facility • Selection of secondary and tertiary treatment technology - see paragraphs 1.7.25 and 1.7.31 below
Waste water transfer tunnel, effluent and storm pipeline, outfall, Waterbeach pipeline	Flexibility is sought for the placement of pipes and tunnels and the outfall, together with associated shafts and compounds, within the order limits shown in the Works Plans (Application Document Reference 4.3). Vertical limits of deviation for these works are set in Article 6 of the Development Consent Order (Application Document Reference 2.1). The outfall and tunnel "Rochdale" parameters are set out in Schedule 14 of the Development Consent Order, at Part 20 and 21 respectively.

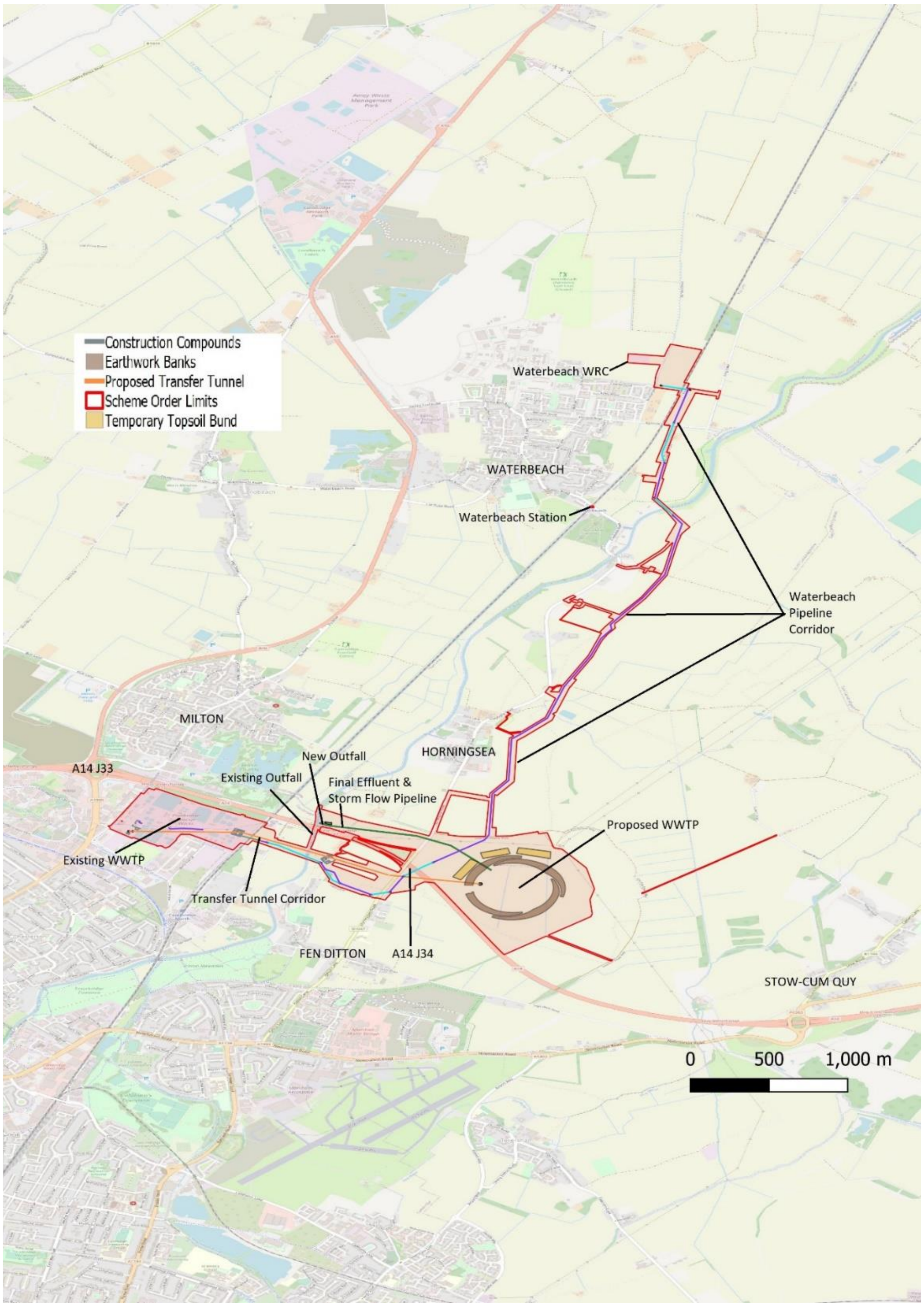


Figure 1.2: Context – site location and main components of the Proposed Development

1.6 Waste Water Treatment Plant (WWTP)

How does a waste water treatment plant work?

Stage 1 – Wastewater from people's homes and businesses flows via sewers to the pumping station.

Stage 2 – The pumping station receives the wastewater and starts the cleaning/ treatment process.

Stage 3 – Stormwater storage and settlement tanks hold any excess water during times of heavy rainfall.

Stage 4 – Any large objects and nondegradable items (such as nappies and face wipes) along with any accumulated grit is removed.

Stage 5 – The solid waste is separated from the water for sludge treatment.

Stage 6 – Once visible sludge has been removed, the wastewater is treated further to remove any harmful bacteria and bugs.

Stage 7 – After secondary treatment, the wastewater is again filtered to remove any remaining sludge, which also goes for sludge treatment.

Stage 8 - Tertiary treatment then removes additional nutrients, ammonia or solids.

Stage 9 – The treated wastewater is sent to a pumping station to be put back into the environment.

Stage 10 – The treated wastewater can then be returned to the River Cam.

Stage 11 – Sludge left as a by-product of the wastewater treatment process and from imports elsewhere, is collected in this tank.

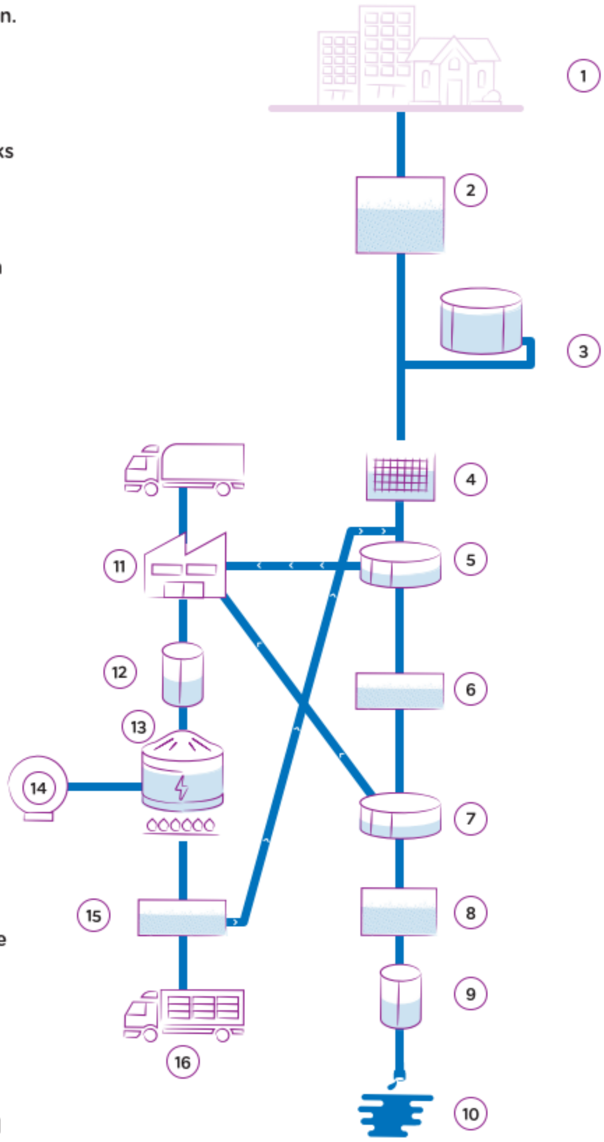
Stage 12 – The pre-digestion treatment readies the sludge to be decomposed into stable substances.

Stage 13 – The sludge now undergoes anaerobic digestion, which involves heating and breaking down the sludge.

Stage 14 – The biogas that is generated as part of the anaerobic digestion process can be harnessed and used as energy.

Stage 15 – At the post-digestion phase, the molecules are broken down and separated further. This includes removing any excess water before final disposal.

Stage 16 – After treatment is complete, the remaining sludge is stored, with part of it being used for biofertilizer to provide soil nutrients.



Fact

We use the biogas produced by anaerobic digestion to power the Cambridge Waste Water Treatment Plant. We can also export power to the grid to provide green energy for others.

Figure 1.3: An overview of the proposed WWTP main processes

1.6.1 The existing Cambridge WWTP receives waste water from the Cambridge catchment either directly from the connected sewerage network or tankered from homes and businesses that are not connected.

1. This waste water is then screened to remove solids such as grit from road run-off, and large nondegradable objects (such as nappies, face wipes and plastic bags).
2. The screened waste water then flows to primary treatment where a large proportion of the solid organic matter is separated from the water by allowing it to gravitate to the base of the primary settling tanks. The settled solids are pumped to the sludge treatment centre for further treatment and a weir near the top of the tanks then transfers the flows to the secondary treatment stage, which contains further settlement tanks.
3. Secondary treatment is the biological treatment process which relies on bacteria to further break down the solids. For the proposed WWTP it is envisaged that a Membrane Aerated Biofilm Reactor (MABR) configuration will be used to ensure low energy utilisation for maximum oxygen transfer, however other process options remain a potential.
4. Final treatment, which incorporates a tertiary treatment plant, provides the finest grade of treatment to ensure the effluent complies with discharge consent limits.
5. Both the existing Cambridge WWTP and the proposed WWTP have been designed as “integrated treatment plants” incorporating a Sludge Treatment Centre (STC). The STC treats the sludge derived from the waste water being treated at the plant and the “wet sludge” produced by other satellite plants which do not have an integrated STC. The sludge treatment process produces nutrient rich biosolids cake for use as bio-fertiliser for spreading on agricultural land and produce energy via anaerobic digestion as biogas, which is produced as a by-product. The operation of the Sludge Treatment Centre will be regulated through the by the Environment Agency through the Environmental Permit Industrial Emissions which sets atmospheric emission limits, as described further in the Other Consents and Permits Register (Application Document Reference 7.1)
6. The final effluent is discharged through an outfall into the nearby River Cam. Both the quality and quantity of this treated effluent is regulated by the Environment Agency through the Water Discharge (Final Effluent) Permit, as described further in the Other Consents and Permits Register (Application Document Reference 7.1).

1.6.2 The following paragraphs of section 1 of this Project Description describe the WWTP process from the Terminal Pumping Station (TPS) to the Inlet works, Primary Settlement Tanks (PSTs), Secondary Treatment, to the Final Settlement Tanks (FSTs) and tertiary treatment prior to discharge. Storm Tanks, sludge treatment, including import, thickening and anaerobic digestion with gas generation and export or utilisation are also described. Section 2 then describes the offsite infrastructure (including tunnels, pipes, outfall and access) with Section 3 describing the proposed construction techniques and methodologies. Section 4 sets out the proposed operation and maintenance regime and Section 5 describes, in accordance with the EIA Regulations, the potential risks of major accidents or disasters which might arise in respect of the proposed WWTP if not appropriately managed.

1.6.3 Figure 1.4 is an indicative layout of the proposed WWTP, showing the proposed location of the elements of the plant, which are described in greater detail below. It also shows the routes of the flows described in the process summary at paragraph 1.6.1 above, shown by coloured arrows. More detail is set out in the General Arrangement Plan (Application Document Reference 4.2.3), the Works Plan (Application Document Reference 4.3.11) and the Design Plans – Proposed Waste Water Treatment Plant (Application Document Reference 4.9).

1.6.4 Within the proposed WWTP, the individual Works (as described in Schedule 1 of the draft DCO, Application Document Reference 2.1) will be located within horizontal limits of deviation of 50m in each direction within the area bounded by the earth bank (except for the Inlet Works and Preliminary Treatment, Primary Treatment and Chemical Dosing Plant and Terminal Pumping Station which are subject to 5m horizontal limits of deviation). The earth bank will be located within the inner and outer extents shown on Sheet 11 of the Works Plan (Application Document Reference 4.3).

1.6.5 The location of the project elements within the limits of deviation will be finalised as part of the detailed design process, following grant of consent, in accordance with the DCO Requirements. To allow for environmental assessment of this required flexibility, realistic worst-case scenarios within the limits of deviation have been assessed in accordance with the Rochdale principles discussed at section 1.5 above.

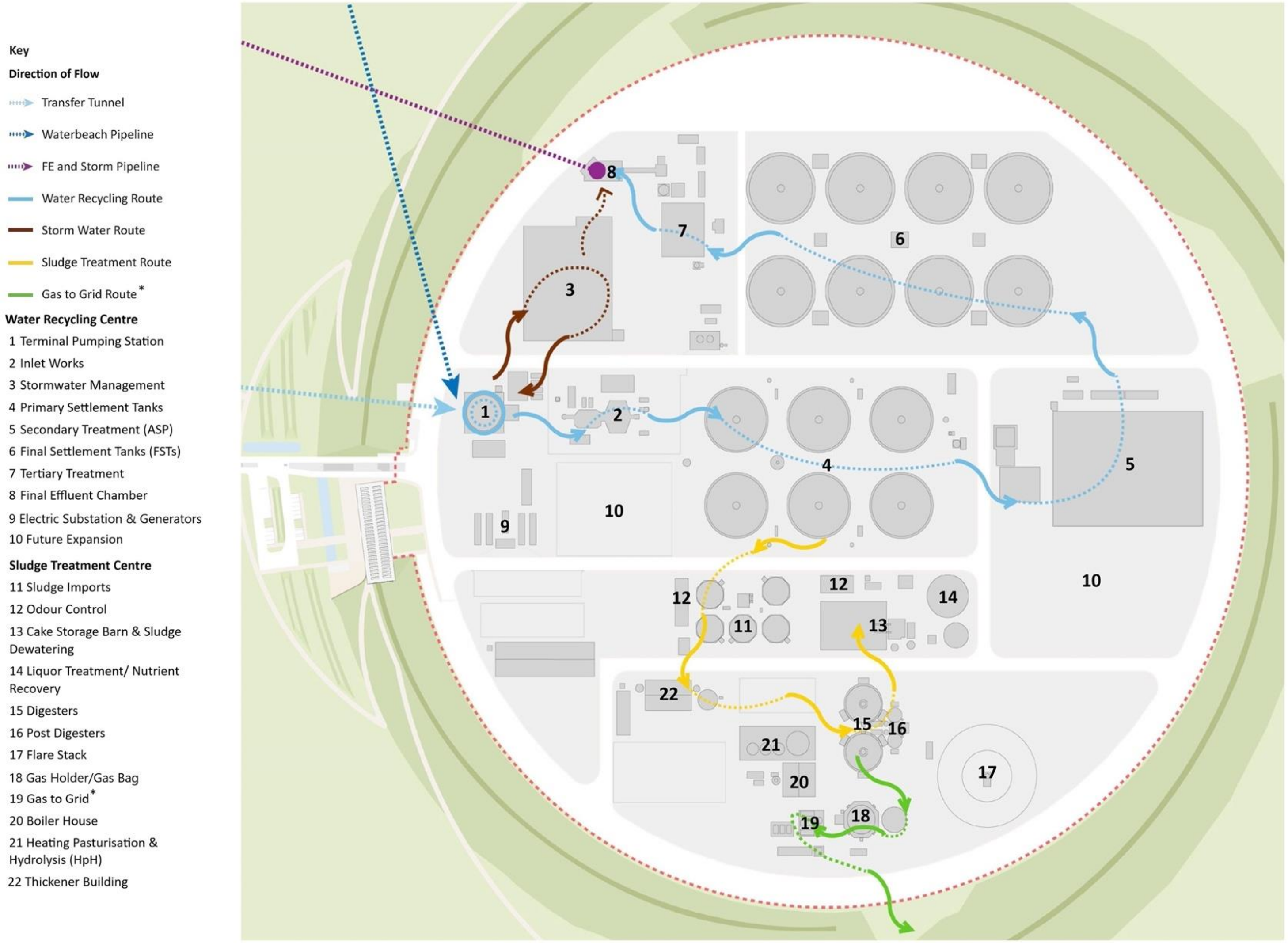


Figure 1.4: Indicative layout of the proposed WWTP showing direction of key process flows (* optionality has been retained in respect of the gas-to-grid elements - see table 1-2 above)

Phasing

Phasing of the proposed WWTP

1.6.6 The DCO application is based on a design for a population equivalent of 300,000, which is consistent with the Greater Cambridge Local Development Plan growth forecast to 2041. It also caters for trade effluent contributions from the Cambridge catchment, tankered cess received, the treatment of up to approximately 16,000 tonnes dry solids of waste water sludge from the proposed WWTP and imported liquid sludge from the surrounding area, as the existing Cambridge WWTP currently does.

1.6.7 This DCO application and the proposed WWTP final effluent discharge consent application to the Environment Agency is designed to address predicted population growth in two phases, namely:

- A first phase of building will deliver the replacement capacity for the existing Cambridge WWTP, providing treatment of flows equivalent to a population of c. 275,000, enough to meet growth predicted in the Greater Cambridge Local Plan to the mid-2030s. It would include all the elements of the design for 300,000 population equivalent (PE), apart from the installation of an additional Primary Settlement Tank (PST) and Final Settlement Tank (FST) which would be installed later as required by population growth within the catchment of the WWTP. All the ancillary electrical and mechanical ducting and services would be laid during Phase 1 in readiness for installation of the PST and FST in Phase Two.

- The first phase of building will also deliver the replacement for the existing Cambridge sludge treatment centre and the growth included with increased sludge treatment to the capacity of 16,000 tonnes dry solids, sufficient for a population equivalent of 300,000.

- The second phase, to extend the capacity of the proposed WWTP from 275,000 PE to 300,000 PE, would take place over a 12 month period between 2036 and 2050 (and likely before 2041), as described in the summary of assessment years at section 3.1.21 below. The installation of the additional PST and FST in this period has been assessed and would give rise to effects broadly similar to some of the major maintenance and asset replacement activities described in Section 4 (operation and maintenance) below. These impacts have been assessed in the technical chapters of the Environmental Statement including Chapter 19: Traffic and Transport (Application Document reference 5.2.19) which concludes at paragraph 2.4.12 that the relatively small increases or variations in associated vehicle movements would not result in different effects or new significant noise, air, traffic, odour, landscape, or water effects.

- The delivery and timing of the second phase would be regulated by the provisions of the Development Consent Order, including Requirement 3 (agreement of scheme of phasing) and Requirement 7, 8 and 9 (approval of detailed design, Code of Construction Practice and Construction Environmental Management Plan) (Application Document reference 2.1).
- As discussed in the Consents and Permits Register (Application Document reference 7.1) a new or revised Environmental Permit for the final effluent discharge would be required for the Phase 2 extension. This phased permitting approach has been discussed and agreed with the Environment Agency.

Table 1-3: Phased Design Capacity

Phase	Dry Weather Flow (m^3/day)	Full Flow to Treatment (l/s)	Approximate Date
1	53,862	1729	From commencement of operation
2	57,280	1840	Between 2036 and 2050, depending on realised population growth

1.6.8 The proposed WWTP also includes sufficient space to accommodate expansion beyond the 2041 horizon for housing and population growth covered by the local plan period. This growth would be planned, consented and funded through the usual regulated business processes of Anglian Water Services Limited.

1.6.9 Additionally, as described in Chapter 9 Climate Resilience (Application Document reference 5.2.9), the proposed WWTP has been designed to be resilient under the UKCIP 2018 extreme weather scenarios, including those under the 2090s scenarios for storm events.

1.6.10 The proposed WWTP is therefore designed for a lifespan well into the 2090s under a spectrum of future climate, effluent quality and growth scenarios. This expansion could all be accommodated within the earth bank without the need for additional land take.

1.7 Waste Water Treatment Plant design

1.7.1 The following section describes the principal components of the proposed WWTP.

Inlet Works and Terminal Pumping Station

1.7.2 An on-site Terminal Pumping Station (TPS) (see above) at the end of the waste water transfer tunnel will lift the untreated waste water and storm flows into the new elevated inlet channel or stormwater management system. To handle both dry weather and storm water flows the TPS will be designed to handle flows of up to 7,000 l/s. Under dry weather flow conditions there will be a free discharge into the sump of the TPS from the waste water transfer tunnel, but under storm flows the discharge will be submerged and the Waste Water Transfer Tunnel will be used as in-line storm storage as agreed with the Environment Agency, prior to discharging additional flows to off-line Storm Tanks on the site if and when required. Five storm water pumps (plus one standby), each with a pumping capacity of 1,000l/s, are available to divert storm flows to the off-line Storm Tanks, if and when required.

1.7.3 The waste water will flow into the TPS under gravity but will then be pumped approximately 31m upwards into the elevated Inlet Channel or to the Storm/Treatment Tanks. A 31m lift will convey the waste water from approximately 23m below ground to approximately 6m above ground (top water level of the elevated Inlet Works). Elevating the Inlet Works water level allows the waste water flows to flow by gravity through the treatment process. The Waterbeach pipeline will connect to the TPS and may also include a spur direct to the inlet works.

1.7.4 The sump to the TPS, which will funnel the waste water into the pumps, will be approximately 5m below the invert level[1] of the waste water transfer tunnel giving a total depth below ground to the TPS of approximately 28m, including a concrete base pad. At this stage it is considered unlikely that piled foundations will be required for the TPS, but if they were it would be unlikely that these would extend more than a further 7m below the base pad, to a depth of 35m in total. This will be confirmed during the detailed design stage of the project and the need for piling the base of the TPS may be removed at that stage. The TPS will be fully covered with access covers to allow the pumps to be lifted out for maintenance/ replacement. Access stairs will be installed within the TPS to facilitate maintenance activities and will be accessed through further access covers within the cover. There will also be a supply of final effluent for future cleaning of the TPS.

1.7.5 There will be a Valve Chamber and a Control Building containing the Motor Control Centre (MCC) and flow monitoring devices for the TPS.

1.7.6 Air venting from the TPS will be routed through an Odour Control System/Unit, which will also serve the inlet works.

1.7.7 The sizing of the TPS is outlined in Table 1-4.

Table 1-4: TPS sizing

Item	Maximum design parameter
Finished ground level (approximate)	9.5m Above Ordnance Datum (AOD)

[1] Invert level is the term given to the level of the bottom of the inside of a drainage pipe or inspection chamber. Drainage layout drawings usually show cover levels and invert levels of inspection chambers or manholes. The cover level is the finished ground level.

Item	Maximum design parameter
Invert level of incoming sewer	-13.0m AOD
Formation level of TPS	Up to 35m below finished ground level, including possibility of piles, <2m above finished ground level
Configuration	Circular (approximately 24m external diameter)
Dry weather flow pumps	4 No.
Storm pumps	6 No.
Maximum flow capacity	7,000 l/s (but could be uprated with pump replacement)
Odour control unit	20m x 10m x 5m high with 5m dia. x 4m high carbon vessel
Odour control unit exhaust stack height	16m above finished ground level
Overall footprint of TPS area	65m x 115m

Stormwater management

1.7.8 The proposed WWTP will result in reduced concentrations of all regulated water quality constituents (including suspended solids, Biological Oxygen Demand, Ammoniacal Nitrogen and Phosphorus) in final effluent entering the River Cam under non-storm conditions. When the proposed WWTP starts to operate, this means that water quality in the River Cam will improve, compared to the existing Cambridge WWTP and its current permit.

1.7.9 Storm overflows provide an essential role in combined waste water network systems, operating like pressure release valves to protect homes and businesses from flooding during periods of extreme rainfall. The Environment Agency (EA) issues permits for storm overflows.

1.7.10 The proposed WWTP will provide greater resilience and improved storm management, meaning storm overflows and Combined Sewer Overflows (CSOs)[2] are less likely to occur. As Greater Cambridge continues to grow, the proposed WWTP

[2] England has a combined sewage system made up of hundreds of thousands of kilometres of sewers, built by the Victorians, in many urban centres. This means that clean rainwater and waste water from toilets, bathrooms and kitchens are conveyed in the same pipe to a sewage treatment works.

During heavy rainfall the capacity of these pipes can be exceeded, which means possible inundation of sewage works and the potential to back up and flood peoples' homes, roads and open spaces, unless it is allowed to spill elsewhere. Combined sewer overflows (CSOs) were developed as overflow valves to reduce the risk of sewage backing up during heavy rainfall.

Overflows of diluted sewage during heavy rainfall are not a sign that the system is faulty. Combined sewer overflows (CSOs) are a necessary part of the existing sewerage system, preventing sewage from flooding homes and businesses. Source: https://environmentagency.blog.gov.uk/2020/07/02/combined-sewer-overflows-explained/, last accessed 27.09.2022.

will be able to treat a greater volume of flows to a higher standard than would be the case at the existing Cambridge WWTP.

1.7.11 The proposed WWTP will have increased 'flow to full treatment' (FFT) compared to the existing Cambridge WWTP. Preliminary storm water modelling (Application Document 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 this ten year period.

1.7.12 The TPS has been designed to receive all flow conditions (including storm) without having a negative impact on the existing Cambridge sewer network. Should the level of flow ever exceed the facility's 'flow to full treatment' (FFT) capacity of 2,000 litres/second, storm pumps will start working to divert the excess incoming flows to the proposed WWTP stormwater storage and treatment plant.

1.7.13 The volume of stored stormwater will be up to 20,400m^3 (calculated in accordance with EA guidance, based on a storage requirement of 68.26l/p/day, including 5,000m^3 in the waste water transfer tunnel). This will be diverted back to the TPS once the storm has passed and flow rates have reduced below the FFT. Stormwater storage will be in an open topped rectangular or circular tank(s). The Storm Tanks will also have discharge pipework that transfer screened flows to the River Cam.

1.7.14 The sizing of the Storm Tanks is outlined in Table 1-5.

Table 1-5: Storm Tanks sizing

Item	Maximum design parameter
Finished ground level (approximate)	9.5m Above Ordnance Datum (AOD)
Storm Tanks – configuration	Rectangular 71m long x 54m wide (or circular/cylindrical - total surface area of tanks = 3,774m^2)
Storm Tanks – depth below finished ground level	5m
Storm Tanks – height above finished ground level	14.5m AOD
Storm return (to inlet) pumps	4 No.
Stormwater storage capacity	20,400m^3

Inlet Works

1.7.15 The Inlet Works will be located close to the TPS and will receive the flows pumped from the TPS. As well as receiving flows from the TPS, the Inlet Works will also receive imported liquors from septic tankers. Treated liquors from the STC will be added after the FFT flow measurement at the end of the Inlet Works.

1.7.16 The Inlet Works are often referred to as preliminary treatment. The Inlet Works typically consists of a concrete structure with flow channels, within which the mechanical plant will be installed to screen out solids and remove grit from incoming flows to protect downstream plant and equipment.

1.7.17 During screening, large nondegradable objects (such as nappies, face wipes and plastic bags) are removed. Screens comprise a series of apertures (holes or slots depending on the type of screen employed) through which all the flow must pass. Solid objects (otherwise known as "rag") larger than the aperture size accumulate on the screen surface and are removed by an automatic raking or washing system and conveyed to the screenings handling plant for further washing to remove organic matter that is returned to the treatment process. The rag will be washed and compacted on-site and exported off-site for appropriate disposal potentially using skip wagons.

1.7.18 The Inlet Screens as well as the channels they are in, along with the TPS, will be enclosed/covered and the air extracted to an Odour Control Unit, serving the TPS and inlet works, to mitigate odour impacts. The Inlet Works is also designed to be as linear as possible to reduce turbulence and therefore minimise odour release at source.

1.7.19 Grit which is present in the incoming waste water due to road runoff, that may accumulate in downstream process tanks, is also removed to reduce risk of excessive wear in pumps and equipment. The grit removal process provides a low-velocity zone that allows grit to settle out but organic matter to remain in suspension. Deposited grit is conveyed from where it has settled and removed intermittently either hydraulically or by a solids removal pump and discharged to a grit handling plant. The grit is washed to remove organic matter, which is returned to the process. The grit will be exported off-site for disposal (assumed to be landfill) or recovery at an appropriately licensed facility, consistent with the method used for grit arising from the existing works.

1.7.20 The sizing of the Inlet Works and estimated operational waste from the Inlet Works are outlined in Table 1-6 and Table 1-7, respectively.

Table 1-6: Inlet Works sizing

Item	Maximum design parameter
Inlet Works: elevated screen channel – configuration	12m wide x 3m deep x 60m long
Inlet Works: elevated grit removal chambers – configuration	16m wide x 3m deep x 17m long
Inlet Works: elevated flow measurement	5m wide x 3m deep x 22m long

Item	Maximum design parameter		
channel – configuration			
Inlet Works – height above finished ground level	8m		
Screenings handling plant	2 No. 12m x 9m x 4m high		
STC Odour Control Unit 2	1	20m long x 10m wide	16m vent stack
Overall footprint of Inlet Works area	90m x 75m		

Table 1-7: Operational waste from Inlet Works

Waste type	m^3/week	t/m^3	Anticipated vehicle type	Estimated vehicles/week
Screenings	12.6	1	6 yard skip	4
Grit	6.1	2.65	7 yard skip	2

Primary treatment

1.7.21 The purpose of primary treatment is to reduce the suspended solids and organics loads to be forwarded to the secondary treatment. At the primary treatment stage, a large proportion of the solid organic matter is separated from the water by allowing it to gravitate to the base of the Primary Settlement Tanks (PSTs). The settled solids, referred to as primary sludge, are removed from the tanks by mechanical scrapers directing the sludge to central wells within the tanks, from where it is withdrawn and pumped to the STC for further treatment.

1.7.22 To increase the amount of suspended solids that will settle and to enhance phosphorous removal, ferric (iron) coagulant (or an acceptable alternative) will be dosed to the influent of the primary treatment to increase the precipitate phosphate in the form of a settleable floc. This will reduce the phosphate load on the secondary treatment stage. The coagulant will be stored and made up in a building adjacent to the Inlet Works and added to the flows at the end of the Inlet Works channel.

1.7.23 The tanks are designed hydraulically to retain the water for a calculated period of time before releasing the remaining waste water, referred to as settled sewage, over a weir near the top of the tank and then transferring the flows to the secondary treatment stage of process by gravity flow.

1.7.24 The sizing of the Primary Settlement Tanks is outlined in Table 1-8.

Table 1-8: Primary Settlement Tanks sizing

Item	Maximum design parameter
Finished ground level (approximate)	9.5m Above Ordnance Datum (AOD)
PSTs – configuration	Circular 6 No. 37m dia, or rectangular with equivalent surface area
PST – depth below finished ground level	8m
PST – height above finished ground level	15.5m (AOD)
Overall footprint of PSTs area	175m x 115m
Ferric Dosing Plant	20m x 5m x 5m high above finished ground level

Secondary treatment and Final Settlement Tanks

1.7.25 Secondary treatment is the biological treatment process in which bacteria remove the soluble and poorly settling organic and inorganic fractions of the primary treated sewage effluent. The bacteria is placed in an environment where they receive oxygen, allowing them to metabolise the organic compounds utilising them for growth and multiplication.

1.7.26 The secondary treatment process is an enhanced Activated Sludge Process (ASP). The preferred design for this process would incorporate a modern Membrane Aerated Bioreactor (MABR) configuration to ensure maximum oxygen transfer with low energy utilisation. As discussed in section 1.5 above, the selected technology and its final configuration will be confirmed in the final detailed design process.

1.7.27 In the ASP, a large quantity of microorganisms or bacteria (also called floc) are held in an aeration tank, or “reactor”, and supplied with air. Settled sewage from the PSTs is lifted via an Interstage Pumping Station to a mixing and conditioning chamber prior to being fed into the aerated reactor and allowed to mix with the microorganisms until the liquor has been purified via aerobic digestion. When this is complete the mixture (called mixed liquor) is transferred to a Final Settlement Tank (FST) via central feed well, which dissipates energy and provides even radial distribution of flow.

1.7.28 The FSTs are circular clarifiers, sized so the rise rate of the flow is low enough to allow the biological flocs to settle out and concentrate, and a clear flow to continue over the weirs to tertiary treatment. A mechanical rotating bridge scraper transports the settled sludge to a central hopper. The majority of this concentrated sludge is pumped back to the anoxic zone as Return Activated Sludge (RAS) to maintain the concentration of mixed liquor suspended solids. A portion of the settled sludge is wasted as Surplus Activated Sludge (SAS) and is pumped to the STC for treatment. Aeration requirements for the ASP will be provided by a mechanical blower system, coupled with a submerged air distribution pipework arrangement. The mechanical blowers draw fresh air/oxygen in and blow it into the distribution pipework under pressure, achieved through compression or pneumatic pumping. These blowers will be located in a building alongside the ASP to mitigate any noise impact.

1.7.29 As well as growing, the microorganisms also breed and die. Therefore, with a continual feed supply the number of microorganisms increases until the oxygen supplied to the tank cannot support them. To avoid this situation, an amount of floc is removed daily to keep the concentration of micro-organisms constant. The sludge removed is called Surplus Activated Sludge (SAS) and is discharged to the STC.

1.7.30 The sizing of the ASP and final settlement tanks are outlined in Table 1-9 and Table 1-10, respectively.

Table 1-9: Activated Sludge Process plant sizing

Item	Maximum design parameter
Finished ground level (approximate)	9m Above Ordnance Datum (AOD)
ASP Tanks – configuration	Reactor - Rectangular 4 No. x 20m wide x 90m long Mixing and conditioning tank – 25m wide x 25m long
ASP Tanks – depth below finished ground level	6m
ASP Tanks – height above finished ground level	17m (AOD)
Blower Building – height above finished ground level	14m (AOD)
Overall footprint of ASP area	115m x 135m

Table 1-10: Final settlement tanks sizing

Item	Maximum design parameter
Finished ground level (approximate)	9m Above Ordnance Datum (AOD)
FSTs – configuration	Circular 8 No. 39m dia.
FST – depth below finished ground level	5m
FST – height above finished ground level	18m (AOD)
Overall footprint of FSTs area including RAS/SAS PS	130m x 225m
RAS pumps	16 No.
SAS pumps	2 No.

Tertiary treatment

1.7.31 The purpose of the tertiary treatment stage is to provide the final, finest grade of treatment to ensure the effluent complies with discharge consent limits. At this stage of the treatment process, the bacteria have already removed the required soluble and poorly settling organic and inorganic fractions to the required levels in the secondary treated step and polishing alone remains. This may specifically focus on converting the remaining soluble phosphate (not removed in the primary treatment or utilised in cell growth in secondary treatment) to solids for removal in tertiary treatment to comply with the discharge consent proposed for discharge to the River Cam. Some of the final effluent will be used for wash water at the proposed WWTP and a Wash Water Pumping Station will distribute the wash water via low and high pressure ring mains.

1.7.32 As discussed in section 1.5 above, the selected technology and its final configuration will be confirmed in the final detailed design process however it is currently anticipated that the tertiary treatment will be in the form of a trim dose of iron dosing (ferric sulphate) followed by tertiary solids filtration, using continuously backwashing sand filters. As water flows upwards through the filter bed to the filtrate outlet, precipitated phosphorous particles and other solids are filtered out in the sand bed. The sand is continuously circulated by an airlift pump and impurities washed from the sand in the sand washing device. The dirty backwash is sent to the primary treatment stage or STC. The solids removal process can be enhanced by addition of other chemicals or media as necessary to assist solids separation and to suit the operation of the process.

1.7.33 The sizing of tertiary treatment plant is outlined in Table 1-11.

Table 1-11: Tertiary treatment plant sizing

Item	Maximum design parameter
Finished ground level (approximate)	9.5m Above Ordnance Datum (AOD)
Filtration plant – configuration	Circular or rectangular tank configuration (supplier dependent) within the overall footprint of TTP area given below
Filtration plant – depth below finished ground level	5m
Filtration plant – height above finished ground level	19.5m (AOD)
Ferric dosing plant	20m x 12m x 7.5m high above finished ground level
Overall footprint of TTP area	60m x 40m

Treated waste water collection chamber

1.7.34 Following the final effluent sampling and measurement chambers required as part of discharge consent requirements, the flow will enter the treated waste water collection chamber and from there be conveyed via the final effluent and storm pipeline for discharge to the River Cam.

1.8 Sludge Treatment Centre

Sludge Treatment Centre design capacity

1.8.1 The layout of the Sludge Treatment Centre and its relationship to other parts of the proposed WWTP is shown on the Design Plans – Proposed Waste Water Treatment Plant (Application Document Ref 4.9). The integrated STC will be designed to treat indigenous sludge produced at the Proposed Development plus imported liquid sludges up to the amount of 16,000 Tonnes Dry Solids (TDS) per annum.

1.8.2 The existing Cambridge WWTP has around 45 satellite sites which send wet sludge for treatment. This wet sludge would be diverted to the proposed WWTP. There is no change to the spatial extent and number of satellite sites anticipated to be served by the proposed WWTP compared to the existing Cambridge WWTP.

1.8.3 Biogas generated by the sludge treatment process will be firstly burned within on-site steam raising boilers to generate heat for use on site. Surplus gas can be cleaned for export to the national natural gas network ("Gas to Grid"). Generating and feeding renewable bio-methane into the national grid would reduce the project's carbon emissions as well as provide renewable heat to people's homes to offset the current use of natural gas derived from fossil fuels.

1.8.4 The Applicant's preference is to develop a Gas to Grid facility, however the option has been retained in the DCO application to instead burn the biogas within efficient combined heat and power (CHP) engines to generate electricity for use on site, with waste heat used within the plant.

1.8.5 The decision whether to adopt Gas to Grid or CHP will be made prior to the implementation of the DCO, following more detailed analysis, based on several technical and financial factors, including emissions performance, analysis of the medium-to-long term energy market, the cost of the technology, and discussions with the operator of the gas grid network. Both options have been assessed in this Environmental Statement. The choice of technology will be confirmed as part of the agreement of the detailed layout of the project under the DCO Requirements.

Sludge import, storage, and screening

1.8.6 The STC will include dedicated sludge reception facilities for imported primary settled sludge and Surplus Activated Sludge (SAS), imported by road in tankers from surrounding WWTPs. The proposed WWTP will service a similar number and geographical extent of these "satellite" sites as the existing WWTP. Sludge will be delivered into reception tanks similar to the arrangement below, before being screened for rag and grit prior to thickening to remove excess water before the next stage of treatment. These tanks and screens will be odour controlled via one of the STC odour control plants.

1.8.7 Indigenous primary and imported sludges will be stored in covered holding tanks and screened prior to thickening. All tank sizes are currently estimated and the number and exact configuration is to be confirmed during detailed design.

1.8.8 The sizing of the sludge storage capacity is outlined in Table 1-12.

Table 1-12: Sludge storage capacity sizing

Name	No.	Maximum design parameter
Finished ground level (approximate)	-	9m Above Ordnance Datum (AOD)
Imported and indigenous primary sludge	2	1,295m^3 nominal each 16.5m diameter, 8.5m high
Un-thickened sludge tanks	3	1,327m^3 nominal each 16.5m diameter, 8.5m high
Overall footprint of imports and screening area	-	80m x 50m 17.5m (AOD)

Sludge thickening

1.8.9 The imported sludges and indigenous primary sludge are screened prior to mixing with indigenous SAS. The combined sludge is conditioned with polyelectrolyte and thickened to reduce the volume to be digested by removing excess water, known as filtrate. The thickening filtrate flows, as well as washdown flows, are returned to the proposed WWTP for treatment. The thickening process will be odour controlled via one of the STC odour control plants.

1.8.10 The sizing of the thickening facilities is outlined in Table 1-13.

Table 1-13: Thickening equipment sizing

Name	No.	Maximum design parameter
Finished ground level (approximate)	-	9m Above Ordnance Datum (AOD)
Thickening building to house the various thickening equipment	1	28m long x 18m wide 10m high
Thickened sludge blending tank	1	800 m^3 – 11.5m diameter 10m high
Overall footprint of thickening area	-	70m x 25m 19m (AOD)

STC odour control plant

1.8.11 Odour control plant will be provided within the STC to mitigate odour impacts. This is anticipated to comprise bio trickling filters followed by an activated carbon polishing units. A Bio Trickling Filter is a combination of a biofilter and a bioscrubber contained within a vessel or tank. The bacteria responsible for decomposition are immobilised on a carrier or filter material. The filter material consists of synthetic foam, lava or a structured plastic packing.

1.8.12 The sizing of the odour control plant is outlined in Table 1-14.

Table 1-14: Odour control plant sizing

Name	No.	Maximum design dimensions	Maximum height
STC Odour Control Unit 1	1	20m long x 10m wide	16m vent stack
STC Odour Control Unit 2	1	20m long x 10m wide	16m vent stack

Digestion and post-digestion

1.8.13 Prior to digestion, a pre-digestion treatment process is included with a pasteurisation step, that destroys or deactivates organisms, enzymes and harmful pathogens. It also controls the hydrolysis step, which is often the rate-limiting step in the digestion process, to ensure optimal performance of the digesters.

1.8.14 The Anaerobic Sludge Digesters are the main sludge treatment step of the sludge treatment process, where the volatile solids are destroyed, and biogas released as part of the treatment process. This process renders the sludge more pleasant to handle, plus reduces pathogen activity and odour. During digestion, sludge is fed into a vessel in the absence of oxygen and maintained at about 35 to 42^{o}C (known as mesophilic digestion). The sludge is retained in the digester for a minimum of twelve days, but an average of sixteen days. During this period the bacteria within the digester are able to break the sludge down into smaller fractions which they can utilise as food. From this process, methane (biogas) is produced as a by-product. This is discussed further below at paragraph 1.8.23.

1.8.15 Digested sludge from the digesters is transferred to a post-digestion stage where the digestion process of the sludge, and therefore the production of methane, is halted through the introduction of air to remove the anaerobic conditions and through vacuum de-gassing to remove the methane. This makes the sludge safe for the post-digestion dewatering stage. The detail of this post-digestion process will be secured through the Environmental Permit.

1.8.16 The proposed WWTP comprises two digesters. The top of the digesters is to be no more than 20m above existing ground level. The existing ground level is 10.4mAOD and the proposed finished ground level in the STC is approximately 9mAOD.

1.8.17 The digesters are the largest structures on the STC and will require piled foundations. These foundations will not be deeper than 25m.

1.8.18 The sizing of the digesters is outlined in Table 1-15.

Table 1-15: Digestion plant sizing

Name	No.	Maximum design dimensions	Maximum height
Digesters	2	4,900m^3 – 22m dia.	30.4m (AOD)
Post digestion storage	2	400m^3 – 8.5m dia.	9.5m
Heating, pasteurisation and hydrolysis (HpH) heating tank	1	400m^3 – 7m dia.	15m
HpH pasteurisation tank	2	400m^3 – 7m dia.	15m
HpH hydrolysis tank	1	1,500m^3 – 14m dia.	15m
Overall footprint of digestion plant	-	100m x 60m	20m
Depth of piled foundations	139	-25m depth below ffl	n/a

Sludge dewatering and cake storage

1.8.19 Digested sludge from the post-digestion tanks is dewatered to reduce the volume of sludge to be transported off-site. The sludge is conditioned using coagulant such as polyelectrolyte and dewatered mechanically, with the current proposal being by centrifuge or volute dewatering press. In the centrifuge the sludge is subjected to centrifugal forces which throw the water out of the sludge and allow a "cake" with typically 22 to 25% dry solids content to be discharged to a cake barn (warehouse) prior to being transported off-site by road vehicles for use as a bio-fertiliser. The vehicle exports have been assessed in the Traffic and Transport chapter of this ES (Application Document reference 5.2.19).

1.8.20 The sizing of the cake storage and estimate of biosolids to land are outlined in Table 1-16 and Table 1-17, respectively.

Table 1-16: Cake storage sizing

Name	No.	Maximum design parameter
Finished ground level (approximate)	-	9m Above Ordnance Datum (AOD)
Cake storage barn or silo area	1	30m x 40m 18m high (AOD)
Dewatering centrifuges/volutes	2	20m long x 20m wide 8m (gantry height)
Overall footprint of dewatering and cake storage	-	60m x 50m 9m high

Table 1-17: Biosolids to land estimates

Waste type	m^3/a	t/m^3	Wet tonnes/yr
Digested sludge to land at 22% Dry Solids Content	40,196	2	80,391

Liquor treatment

1.8.21 The water removed from the sludge during the dewatering process is known as centrate. This is discharged separately and either treated in a dedicated liquor treatment plant or returned to the Inlet Works for further treatment. While it is currently planned that a separate liquor treatment facility will be included, there is, as discussed in section 1.5 above, the potential for an alternative approach to be adopted with a nutrient recover plant being included within the development proposals, as assessed within this Environmental Statement.

1.8.22 The final selection of a separate or combined liquor treatment plant or nutrient recovery will be confirmed during detailed design in accordance with the DCO Requirements including Requirement 3 (phasing plan) and Requirement 7 (Detailed design). The potential nutrient recovery option is included in the project parameters at Part 14 of Schedule 14 of the draft Development Consent Order (Application Document reference 2.1)

Table 1-18: Liquor treatment plant sizing

Name	Maximum design parameters
Finished ground level (approximate)	9m Above Ordnance Datum (AOD)
Reactor	25m diameter 9m high
Stilling tank	5m diameter 9m high
Settlement tank	15m diameter 9m high
Total liquor treatment plant area	75m x 40m x 18m (AOD)

Table 1-19: Nutrient recovery option sizing

Name	Maximum design parameters
Finished ground level (approximate)	9m Above Ordnance Datum (AOD)
No. of stripping/scrubbing columns	3
Stripping/scrubbing column heights	25m (AOD)
Stripping/scrubbing column diameters	3m
Feed pumping station – depth below finished ground level	5m
Total area	50m x 50m x 27m (AOD)

Heat generation, gas utilisation and storage

1.8.23 Biogas from the digesters and post digestion tanks is captured, stored in a gas bag, and utilised to provide heat to the process through burning within a steam raising boiler. For the preferred option of export of gas to the grid, excess biogas is cleaned-up through a biogas upgrading plant and enriched with propane for injection to the national gas network in order to provide green gas and offset natural gas usage.

1.8.24 The biogas upgrading plant will either be a chemical scrubbing process or pressure membrane process, where impurities within the biogas are removed and captured, leaving the biomethane ready for enrichment.

1.8.25 Whilst the use of Gas to Grid technology is the Applicant's preferred option, the use of efficient Combined Heat and Power (CHP) engines, remains an alternative, as discussed at section 1.5 above. The CHP engines would produce heat and electricity to deliver the energy requirements of the STC and wider plant.

1.8.26 The biogas system also includes a waste-gas-burner (flare), which burns the biogas during a failure event on-site, to protect people and the environment from potential harmful impacts.

1.8.27 The propane enrichment process described at paragraph 1.8.23 above will utilise propane stored in horizontal cylindrical tanks, on a concrete slab next to the gas enhancement equipment. The gas is imported through standard lorry delivery once every 1-2 weeks.

1.8.28 Heat recovery from waste water is also likely to take place during operation of the proposed WWTP. This will reduce the amount of biogas required for heating and increase the volume of biomethane injected into the grid. Heat pump technology situated close to the point of demand would upgrade waste heat on-site from final effluent or waste water. Heat pumps are small, enclosed units.

1.8.29 Ancillary services and equipment such as power supply, control equipment, wash-water, heat equipment, chemical dosing and potable water supplies will also form part of the sludge treatment works.

1.8.30 As discussed in the Other Consents and Permits Register (Application Document reference 7.1), these activities will require additional consent under the Environmental Permitting Regulations (EPR) 2016, which incorporates the application of the Industrial Emissions Directive and include the burning of biogas in boilers or CHP engines and the flaring of gas in emergency situations.

1.8.31 The sizing of the gas handling equipment is outlined in Table 1-20.

Table 1-20: Gas handling equipment sizing

Name	No.	Maximum design parameter
Finished ground level (approximate)	-	9m Above Ordnance Datum (AOD)
Gas holder	1	2,000m^3 – 17m dia. 16m high – gas bag 20m high – lightning protection masts
Flare	1	2,000m^3/hr 15m high
Overall footprint of biogas storage and utilisation area	-	30m x 30m 20m high
Biogas upgrading plant	1	1,000m^3/hr - 30m x 30m (in addition to above) 12m high
CHP	2	c3 megawatts (MW) 50m x 50m (same footprint as BUP) 33m (stack combined with boiler flue, AOD)

Steam Raising Boiler

1.8.32 Steam demands for the pasteurisation tank and the low temperature hot water circuit will be supplied by a dual fuel direct fired boiler, burning the biogas generated on site (or in the event of failure, gas imported in the pipeline serving the WWTP, see section 1.9 below), and steam/hot water heat exchanger.

1.8.33 Emissions from the burners will be exhausted via a boiler flue stack which will comply with limits as specified within a Medium Combustion Permit issued under the Environmental Permitting Regulations, as discussed in the Other Consents and Permits Register (Application Document reference 7.1). The permit will require the monitoring of emissions and additional specific requirements set by the Environment Agency.

1.8.34 Spent water within the boiler case is removed through a blow down process and discharged into a blow down vessel, before being discharged to the on-site drainage system.

1.8.35 The sizing of the steam raising boiler is outlined in Table 1-21.

Table 1-21: Steam Raising Boiler sizing

Name	No.	Maximum design dimensions	Maximum height
Boiler Building	1	20m long x 20m wide	8.5m
Boiler Stack	1	2m dia. plus access platform	33m (AOD)

Name	No.	Maximum design dimensions	Maximum height
Overall footprint of boiler plant	-	35m x 25m	33m (AOD)
Boiler capacity	2	2MWth (total maximum 7MWth)	N/A

Final effluent treatment plant

1.8.36 The STC will include a final effluent treatment process. This process will filter and disinfect final effluent for use within the sludge treatment process to help with the transfer of heat, cooling and washdown. The disinfection ensures that no pathogens are added back into the treated biosolids before being used within agriculture as a valuable soil conditioner.

1.9 Site-wide Provisions

Utilities: provision and connection

1.9.1 The sludge treatment centre will require a new gas connection to the national grid network in order to fuel the boilers in case of plant failure. It is anticipated that, should Gas-to-Grid technology be adopted, the same connection point will be utilised to inject biomethane to the grid. It is expected that the new gas connection will extend from the STC to the existing intermediate pressure gas pipeline that runs along the north side of the disused railway to the south east of the proposed WWTP. The gas connection will be a medium diameter pipe of less than 200mm which will be laid in a trench greater than 500mm below the surface, which will be reinstated after the pipe has been laid.

1.9.2 The new gas connection outside of the earth bank does not form part of the DCO works and will be developed and delivered by the gas network operator using its permitted development powers.

1.9.3 The proposed WWTP will be powered by a new electrical supply from UK Power Networks. A new dual 11kV connection from Fulbourn sub-station is proposed. These cables will be buried from the sub-station to the proposed WWTP, following a route that will be defined by the network operator under the network operator's permitted development rights. There will be two HV Ring Main Units located within the proposed WWTP.

1.9.4 The potable water supply to the proposed WWTP will be supplied by Cambridge Water. The current proposal is for a new connection from Horningsea Road running adjacent to the new access road.

1.9.5 A new telecoms connection will be supplied which is likely to run in a duct from Horningsea Road adjacent to the new access road.

Estimated water consumption

1.9.6 A summary of the estimated change in water consumption through construction, commissioning and operation is provided in Table 1-22.

Table 1-22: Estimated water consumption (m^3/day)

Programme	Existing Cambridge WWTP demand	Proposed WWTP			Tunnel	
		Site establishment demand	General construction demand	Proposed WWTP demand	Tunnel site establishment demand	Pipe jack machine demand
Current site demand	286					
Start on-site	286	22.5				
Start of main construction	286	22.5	161.4			
Start of tunnel construction	286	22.5	161.4		4.5	30
End of tunnel construction	286	22.5	161.4		4.5	30
Start of wet commissioning	286	22.5		c1,000		
Existing WWTP decommissioned, proposed WWTP fully operating		22.5		448		

Ancillary on-site buildings

1.9.7 Work offices, substation building, workshop and vehicle parking, including electrical vehicle charging points will be included. In addition to these buildings there will be up to 13 Motor Control Centre (MCC) kiosks located around the Proposed Development with varying dimensions up to 27m long x 6m wide x 3.5m high. A more detailed description of the main buildings is provided in Table 1-23.

Table 1-23: Ancillary building sizing

Building	Maximum Floor Area (m^2)	Maximum Height (m) above finished ground level	Function
Gateway building including: • Anglian Water Services offices; • Recycling Environmental Services (RES) offices; • welfare facilities; and • Discovery Centre.	1,300 (50m x 16m)	9 (two-storey)	Offices for Anglian Water site operations and maintenance personnel and RES drivers and operational staff. Discovery centre for visitors.
Workshop building including: • laboratory; • general workshop; • innovation space; • fleet workshop; and • welfare facilities.	1,200 (55m x 16m)	10	For use by site operations and maintenance staff.
District Network Operator (DNO) enclosure	50 (5m x 10m)	3	For Distribution Network Operator's substation.

Building	Maximum Floor Area (m^2)	Maximum Height (m) above finished ground level	Function
Vehicle parking	4,000		Parking for: • 10 No. cars for AWS staff including 3 No. EV charging points; • 10 No. AWS vans; • 51 No. cars for RES staff including 16 No. EV charging points plus a minimum 30% progressively installed as demand increases; • 7 No. articulated lorries; • 3 No. trailers; • 10 No. visitor car park spaces outside the earth bank including 3 No. EV and 1 No. coach parking space; and • 50 No. bicycles.

Gateway Building

1.9.8 The Gateway Building is a two-storey structure at the entrance to the proposed WWTP, which contains offices, welfare facilities and the Discovery Centre, as well as any plant required by the building. It has been designed by local architects with finishes and appearance designed to be sympathetic with the landscape and be of good design. The evolution of its design is described in the Design and Access Statement (DAS) (Application Document Ref 7.6).

1.9.9 The building has ground floor access from both sides, allowing public access from the west and access for staff from the east, and provides access to the earth bank at the first floor.

1.9.10 Facilities include a suite of large and small offices and meeting spaces on the ground and first floor, as well as messing facilities (including kitchenette, showers, changing and toilet facilities). The Discovery Centre, located on part of the first floor, provides an education space for invited visitors, as well as multipurpose meeting spaces and a viewing terrace.

1.9.11 The footprint of the building will be a maximum of 58.2m long by 17.1m wide (within a maximum limit of deviation of 68m by 20m as shown in 4.10.1 Design Plans), with the upper floor being set back by approximately 2.5m from the front of the building. There is a flat blue/green roof with rows of south facing solar photovoltaic (PV) panels. The height from the ground to first floor is 4m and the first floor to the top of the green roof is 4.3m. The overall maximum height to the top of the PV panels is 9m.

1.9.12 Spaces have been allowed at ground floor level for bins and plant, including grey water harvesting and air handling and a dedicated enclosure is provided for up to 50 bikes.

1.9.13 The building will be designed to achieve BREEAM “Excellent” standard and to be minimally lit externally.

Workshop building

1.9.14 The workshop building is a single storey, with a maximum height of 10m tall with a footprint of no more than 55m long by 16m wide. It is situated towards the south west of the rotunda, adjacent to the staff car park.

1.9.15 The building provides two separate workshop spaces – a large space for the maintenance of equipment and a smaller space for vehicles maintenance. The innovation space and laboratory are within separate rooms. In addition, messing facilities (including a kitchenette, showers, changing and toilet facilities), a storeroom and space for services are provided. The cladding will be sufficiently insulated to ensure an acceptable working environment. Large openings in the south elevation provide access for vehicles and equipment.

1.9.16 The southerly orientation and angle of the pitch roof facilitates the installation of photovoltaic panels on the roof. The large span structure is likely to be constructed using a steel portal-frame, sized to accommodate the lifting of equipment. External walls are clad in profiled metal sheeting or profiled cementitious boarding. The cladding zone immediately below the eaves is allocated for clerestory windows to provide natural light into the workshop and for air intake/extract grills.

1.9.17 A containerised liquified natural gas (LNG) station will be located adjacent to the workshop. The Anglian Water Services Limited tanker fleet, which will undergo conversion, will be able to use this facility to refuel, reducing the carbon footprint of the vehicle operations.

1.9.18 It should be noted that the air quality assessment (Chapter 7 of this ES, Application Document reference 5.2.7) adopts the worst case of the Anglian Water tanker fleet not being LPG fuelled.

Internal road network, within the proposed WWTP

1.9.19 The entrance to the proposed WWTP will be via the main entrance gate, set within the earth bank adjacent to the Gateway Building, into the operational area. There will be a weighbridge at the gate area. Within the site, a perimeter road is proposed to provide access to the different parts of the proposed WWTP. Other internal roads will be included to provide vehicular access to particular areas of the plant for operational purposes.

1.9.20 Roads within the STC and chemical delivery areas are anticipated to be of low carbon concrete (or an impermeable material) construction to provide adequate containment (a requirement for the STC area under the environmental permitting regime). The internal drainage system, including road surface finishes and containment of spillages will be managed and controlled through the Environmental Permit, see Other Consents and Permits Register (Application Document reference 7.1). Roads (including turning areas) with heavy vehicle movements will be of a concrete construction. Roads where vehicle movements are deemed to be lighter and do not require containment are likely to be of a permeable material construction (block paving or similar). Car parking areas are likely to be constructed either with a heavy-duty permeable block paving or a grass reinforcement system base. Areas of light or infrequent vehicular use are to be constructed of ground stabilised material to significantly reduce the carbon footprint of the design.

1.9.21 The maximum sizing of internal roads is outlined in Table 1-24.

Table 1-24: Internal roads sizing (maximum dimensions)

Design of internal roads	
Two way roads	8m wide
One way roads	4m wide
Total area of internal roads	**35,500m^2**

Fencing and security

1.9.22 A security fence will enclose the operational areas of the proposed WWTP and be concealed within the external earth bank. This will consist of a steel mesh fence up to a maximum of 3m high with a barbed wire topping coil. The design of the fence will be appropriate for the level of security required at each operational area and, where possible, adapted to align with the overall site vision. The fence will be designed in line with the requirements set out in the Security and Emergency Measures Directive (SEMD).

1.9.23 Gates for vehicular and/or pedestrian access will be of a similar height and either a single or double gate type. Where appropriate, gates will be automated.

1.9.24 A network of pole mounted Closed Circuit Television (CCTV) cameras will be installed within the perimeter of the operational areas for security purposes.

1.9.25 The indicative fencing and CCTV parameters are outlined in Table 1-25 and Table 1-26, respectively.

Table 1-25: Maximum fencing parameters

Design Fencing Parameters	
Indicative length of Perimeter security Fencing	1.6km
Fence Type	Steel mesh with barbed wire topping coil
Fencing Height (agl)	3m (subject to SEMD requirements)

Table 1-26: Maximum CCTV parameters

Design CCTV Parameters	
Camera Height	4m
Camera Position	Inside the perimeter fence boundary
CCTV Lighting	Infrared outside daylight hours (not visible light)

Lighting

1.9.26 Lighting will be designed in both construction and operation to satisfy minimum light requirements to ensure the safety of people, while avoiding light pollution, sky glow and minimising light spill and glare.

1.9.27 A Lighting Design Strategy (Application Document reference 5.4.2.5) has been developed which has regard to advice from Institution of Lighting Professionals, CIBSE guidance and British Standards on lighting in industrial environments, lighting in the exterior environment and lighting for the protection of bats. Six lighting design objectives guided the development of the project specific lighting design principles:

- maintain safety,
- utilise low level lighting,
- minimise light spread,
- avoid or minimise night working,
- minimise number of lighting assets, and
- minimise impacts on ecological receptors.

1.9.28 Temporary lighting will be provided during the construction phase in construction laydown areas, parking facilities and office areas. The use of flood lights will be minimised, and the need for extended night time working will be avoided except in exceptional circumstances (for accidents and emergencies, or critical tasks such as continuous concrete pours and at drive shaft sites). At these locations, tower lights will be used to light the construction compound using downward facing, directional lighting that minimises light spill and is directed away from residential and other sensitive areas as far as practicable. Temporary lighting will be selected and optimised according to the location but will be no more than 8m in height and mounted on columns/ structures.

1.9.29 Periods of operation of construction lighting will be managed according to the sensitivity of the location and the works being undertaken at the time. A more detailed summary of principles regarding the lighting design strategy during construction are set out in Section 6 of the Lighting Design Strategy (Application Document Reference 5.4.2.5).

1.9.30 Lighting adjacent to the new access on Horningsea Road will be delivered in accordance with a design to be agreed with the local highway authority. This may include retrofit of adjacent lighting columns if appropriate and will meet safety and balance environmental effects, using soft, directional, downward facing lights, using bats as an indicator species.

1.9.31 During operation, road and task lighting will be provided around the site to ensure the safety of operational staff and visitors. The lighting will be designed to minimise any off-site effects and use specifically designed down-lighting equipment that avoids light spillage and glare, with sharp cut off. The final lighting design will be confirmed during detailed design prior to commissioning of the proposed WWTP following the principles set out in the Lighting Design Strategy (Application Document Reference 5.4.2.5)

1.9.32 As a water industry facility, the minimum light design provision required to operate and maintain the Proposed Development are defined by the Water Industry Mechanical and Electrical Specifications (WIMES) 3.02(E). Worst case lighting requirements are presented in the Lighting Design Strategy (Application Document Reference 5.4.2.5). Surface water drainage

Temporary/construction drainage

Treated effluent transfer pipelines

1.9.33 Where deep excavations are required, if any ground/surface water is encountered it will be pumped out and passed through an appropriate form of treatment to remove suspended solids before being discharged to an approved location and/or temporary lagoon, in accordance with details that will be agreed prior to the discharge taking place, in accordance with the Code of Construction Practice Part A and Part B (Application Document Refs: 5.4.2.1 and 5.4.2.2) and a construction water discharge activity permit, from the Environment Agency (as referred to in the Other Consents and Permits Register, Application Document reference 7.1).

1.9.34 Where water is required as part of the construction process, it will be contained, recycled and reused as much as possible before being sent to an appropriate designated place for treatment prior to any discharge back to a watercourse. The abstraction of water for construction would require a water abstraction licence from the Environment Agency (see the Other Consents and Permits Register, Application Document reference 7.1)

Proposed WWTP

1.9.35 The majority of surface water will be dealt with via soakaways with rain/surface water recycling systems employed to allow reuse where possible for construction related activities. Any contaminated surface water will be contained, stored within a sealed system and treated appropriately before being discharged to an appropriately licenced facility. A Drainage Strategy has been developed (Application Document Ref 5.4.20.12) which will continue to evolve during detailed design. The construction phase drainage system will be installed in phases at an early stage in the groundworks for the proposed WWTP.

1.9.36 Groundwater encountered during construction will be pumped out and passed through an appropriate form of treatment to remove suspended solids before being discharged to an appropriately licenced location.

Permanent drainage

1.9.37 All surface water that has the potential to be contaminated will be contained within an enclosed drainage system and fed back through the works process to be treated prior to being discharged to river via the Final Effluent and Storm Pipeline and Outfall.

1.9.38 Where there is not the potential for surface water to be contaminated, it may be treated in a number of ways, following the SuDS hierarchy:

- collection through an enclosed drainage system before being pumped directly to river via Final Effluent and Storm Pipeline and Outfall;
- allowed to run off via a soakaway, where there is no detriment to the existing drainage;
- collected by and dealt with via a SuDS arrangement where appropriate and feasible. The SuDS may incorporate aspects of the previously two mentioned options;
- The SuDS system will comprise of swales/lagoons within the proposed WWTP and once full, connections to the seasonal ponds and land art (ridge and furrow creation including an external ditch around the base of the earth bank) where surface water and ground water (in the unlikely event that this emerges) can be

attenuated and returned to the ground. These systems will be linked and likely overflowed into one another in series. The proposed landscape for development is at the top of a raised area so will naturally allow the surplus water to gravitate away from the proposed WWTP into the green and wooded areas at green field run off rates. The uses of SuDs approach as described will enable the surface water drainage to be managed so as not to exceed equivalent greenfield runoff rates.

- the proposed WWTP drainage system (for where the surface is impermeable and at risk of contamination) is to be designed to route runoff back to the head of the works;
- surface water, in areas where the surface is impermeable and at risk of contamination, will be collected via a network of combined kerb/drainage units, which will form a dedicated drainage network located within the proposed WWTP; and
- those parts of the proposed WWTP where rainfall either falls onto or drains into the treatment units produce no runoff to the proposed surface water drainage system – due to rainwater being captured by both the open process units within the proposed WWTP and the contained and treated impermeable areas (where there is a risk of contamination), the impact of surface water on the overall area will be reduced by the development.

1.9.39 In relation to the permanent access road drainage:

- minimal additional highway works or additional carriageway are required – no changes are proposed to the existing highway drainage system (except potential for additional gullies/relocated gullies depending on carriageway levels adjacent to the access to Horningsea Road);
- permanent access road and drainage is proposed to be gullies and piped system on the 'embankment' section of the permanent access road, discharging to a swale on southern side of the permanent access road, eastern section of the permanent access road to discharge directly to swale from carriageway – water to discharge into the proposed WWTP drainage system for non-contaminated flows, and water to be attenuated on-site where appropriate, as shown in the Design Plans – Highways (Application Document Ref 4.11); and
- Drainage for the landscaped earth bank will likely be via French drains within the earth bank itself connecting into a catcher drain at the toe of the earth bank – this will then connect into either the existing land drainage network (with or without a swale to attenuate flows) or connect into the proposed WWTP drainage system for non-contaminated flows.

1.9.40 The drainage plans will be developed during detailed design in accordance with the Drainage Strategy (Application Document Ref 5.4.20.12) and submitted for approval under DCO Requirement 16 (Application Document reference 2.1).

Site wide chemical consumption and location

1.9.41 During operation of the proposed WWTP, a number of processes will require the dosing of chemicals. These chemicals will be securely transported, transferred, stored and dosed using closed, controlled dosing systems. The majority of chemicals, such as ferric sulphate, have low hazard potential. An estimated summary of the type, location of dose and an estimate of quantity is provided in Table 1-27 below.

Table 1-27: Estimated chemical consumption

Chemical type	Location of dose	m^3/d	t/m^3	t/annum
Ferric sulphate	Primary settlement stage	14.3	1	5,220
Ferric sulphate	Tertiary stage	3.9	1	1,409
Polyelectrolyte (100% active)	Primary Settlement Stage (only for high-rate clarifier option)	0.26	0.7	66
Polyelectrolyte (100% active)	Sludge thickeners	0.63	0.7	161
Polyelectrolyte (100% active)	Sludge dewaterers	0.39	0.7	100
Boiler water treatment chemicals	Boiler building	Dependent on boiler type – minimal quantity		
Antifoam	Digesters	Only required in emergency – infrequent use		
Caustic soda (alkalinity pH correction)	Liquor treatment plant	Dependent on technology selected		
Glycerol	Liquor treatment plant	Dependent on technology selected		
Activated carbon	Odour control units	Maintenance replacement* every 5-10 years,		

Chemical type	Location of dose	m^3/d	t/m^3	t/annum
		minimal quantity		

**Although the activated carbon media is replaced, the media is taken to the supplier's premises where it is washed, sieved, and regenerated for re-use. This process results in minimal loss of media and very minimal amounts of actual waste (<<1%)*

1.9.42 Storage and use of some of these chemicals may require consent if they are above certain thresholds. Consent under the Planning (Hazardous Substances) Act 1990 from the Health and Safety Executive may be required (see Other Consents and Permits Register - Application Document reference 7.1).

Odour mitigation

<u>Odour mitigation during construction</u>

1.9.43 Aside from the typical impacts through construction associated with construction plant (dust etc.), the main sources of odour impact come from the commissioning process and the decommissioning process at the existing Cambridge WWTP.

1.9.44 To minimise odour during the commissioning process, odour ducting and odour treatment will be in place before the commissioning of process flows commences – water testing of tanks is typically done with clean water, so no odour risk for early commissioning tests. Any seed sludge required for the process commissioning of the aeration stage or digesters will be delivered in sealed articulated tankers and pumped into the tanks.

1.9.45 During the decommissioning process at the existing Cambridge WWTP, tanks will be drained through the existing treatment process as far as reasonably practical, as new flows are diverted to the proposed WWTP and tanks and lanes in use are systematically reduced. Any residual sludge within the Primary Settlement Tanks, Aeration Tanks or Final Settlement Tanks that cannot be pumped to the sludge treatment process, will be removed via suction pump and either taken offsite for treatment or treated onsite via a temporary pasteurisation process such as a quick lime dosing plant. These temporary processes are often sealed, however the resulting cake may be odorous. This cake will remain on site for as little time as possible. Odour suppression equipment will be utilised where appropriate to minimise any offsite impacts.

1.9.46 During decommissioning of the Sludge Treatment Centre, all sludge tanks will be emptied and treated through the existing process as far as reasonably practical. All biosolids will continue to be tested to ensure HACCP compliance before being sent to land. As the digestion process relies on being full before it can spill to the next tank in series, inevitably a volume of sludge will remain in the last digester at the end of decommissioning that is not fully digested and therefore cannot be taken to land without further treatment. This sludge will be removed via suction pump and either treated offsite or within a temporary onsite treatment process, as described above. This temporary treatment process, along with the above, will be relatively short interventions (week(s) rather than months).

1.9.47 It is also likely that at the very bottom of some of these tanks some residual grit will remain. This grit will be removed via suction pumped to skips or taken off-site to suitable grit washing facilities. The volumes of grit remaining for disposal are expected to be small, and can be handled in accordance with the grit removal practises that form part of the existing Cambridge WWTP treatment process, where at the Inlet Works grit is removed to skips and disposed off-site.

1.9.48 Tie-ins to existing sewers will be planned and associated method statements compiled. In all cases, the new infrastructure is constructed to make sure it is ready to receive the flows, prior to any change over in as swift manner as possible. This may look like building a chamber or shaft with a new exit pipe around an existing pipe and breaking through to allow flows to continue from the existing pipe through the new chamber/shaft to the new pipe. Odour impacts associated with these connections to existing sewers are instantaneous on the day of break-though and considered negligible.

Odour mitigation during operation

1.9.49 Whilst it is accepted that waste water and sludge treatment can be odorous processes, technology selection, operation and good management of assets allows odour to be managed.

1.9.50 In order to achieve the commitment of a negligible odour impact at sensitive receptors (as defined by the Institute of Air Quality Management), the following mitigation measures have been incorporated into the design of the Proposed Development:

- choosing the main treatment process for its lower turbulence and emissions, which achieves a lower odour footprint than the impact at site selection stage;
- layout arrangements to locate the most odorous elements towards the centre of the site;
- moving the preferred layout geographically, to achieve the least impact at existing receptors;
- Inlet Works layout “straightening” to reduce potential turbulent flow areas;
- hydraulic design for the uncovered areas of the proposed WWTP to utilise gravity flow to reduce turbulence;
- pumped flows to uncovered tanks will be discharged below water level to reduce turbulence;

- choosing the aeration equipment for appropriate portions of the treatment process as a low-pressure system, which reduces turbulence;
- covering of reception areas, such as the TPS, Inlet Works and sludge tanks with the air vented through Odour Control Units;
- challenged standards to reduce the overall footprint of the Inlet Works, primary tanks and sludge tanks; and
- separated out suitable combinations of tanks and equipment for the odour control units grouping and design, to ensure the most appropriate odour control systems could be provided per flow and load combinations (e.g. the Terminal Pumping Station, which has a large volume of air at a low concentration to extract and treat, now has its own dedicated odour control unit).

1.9.51 To ensure odour impacts are managed through the operational phase, an Operational Odour Management Plan (OMP) will be compiled from the Preliminary Odour Management Plan (Application Document Ref 5.4.18.4) during commissioning. The OMP will be one of the management plans required as part of the Environmental Permit. This will detail how operations are to be undertaken to minimise impact during normal and abnormal scenarios. The document will describe how to respond to any complaints, how to record any instances of odour impact and how to address abnormal issues such as spillages in a way that odour can be mitigated as far as possible.

1.9.52 The OMP will include information about normal operational activities that may present typical odour concerns. In addition, the OMP will contain details of abnormal events, (e.g. a tank failure or sludge spills and how that would be contained, cleaned up and the notifications to the Environment Agency and other regulatory agencies that would be required).

Landscaping, biodiversity and recreational access

1.9.53 The proposed WWTP will be surrounded by a new landform from raised embankments forming a circle around the facility, inspired by local hillforts and long linear features such as dykes. This new landform aims to screen the majority of the lower structures from all directions. The landscape design aims to integrate the proposed WWTP into its landscape setting and screen the structures of the proposed WWTP in views from the west and south, where it will be most visible. The earth bank and planting has been embedded as an integral component of the design, following consultation feedback from the early stages of the project.

1.9.54 The heights and massing of structures has been reduced following successive rounds of consultation as set out in Chapter 3: Site Selection and Alternatives, which sets out the main alternatives considered and also in the separate Design and Access Statement (Application Document Ref 7.6). The Gateway Building, which marks the entrance to the main works is integrated with the earth bank, whose design has also been modified, reducing it in scale and setting it into the landscape in response to consultation feedback, as described in the Design and Access Statement. Furthermore, tree stands of native woodland are proposed around the northern, western and southern sides of the site, which would introduce a new habitat and vital screen to the proposed WWTP from Horningsea and Fen Ditton villages.

1.9.55 The green space around the proposed WWTP is not intended as a recreational destination in its own right, and no additional parking is being provided for public access. However, providing pedestrian access to the landscaped area, will provide an access to open green space, thereby mitigating impacts on recreational amenity. The proposed WWTP paths will be connected to the wider network of Public Right of Ways (PRoW), and a new bridleway will improve access to Quy Fen and Anglesey Abbey.

1.9.56 The project also includes proposals to create an extension to the ditch network for the purpose of i) water vole habitat mitigation and ii) river unit gain to fulfil commitments to achieve biodiversity net gain (BNG). This is described in detail in Chapter 8: Biodiversity and Biodiversity Net Gain (BNG) Report (Application Document Ref 5.4.13).

1.9.57 Full details of the landscape design and recreational connectivity, its evolution and the design response to consultation are provided in the Landscape, Ecological and Recreational Management Plan (LERMP) (Application Document Ref 5.4.8.14), ES Chapter 3: Site Selection and Alternatives, Chapter 4: Consultation, and the Design and Access Statement (Application Document Ref 7.6).

2 Connecting Infrastructure and Ancillary Development

2.1 Transfer tunnel and tunnel corridor

2.1.1 Waste water will be transferred from the existing Cambridge WWTP using a new tunnel constructed from an interception point at the existing Cambridge WWTP to the proposed WWTP. The tunnel will have an approximate length of 2.4km, an internal diameter of 2.4m (with a nominal external diameter of 2.7m) and will be between approximately 10m to 20m in depth depending on the ground surface (cover depth to the top of tunnel), as shown on Design Plan – Waste Water Transfer Tunnel and Longitudinal Section (Application Document Ref 4.12) (within vertical limits of deviation of ± approx. 2m). Surface and sub-surface constraints as well as geology are key influences on the tunnel alignment and the intermediate shafts required to facilitate tunnel construction.

2.1.2 The Waste Water Transfer Tunnel, from the existing Cambridge WWTP to the proposed WWTP crosses below the existing railway line, the River Cam, B1047 Horningsea Road and the A14 along its route. The tunnel would be constructed using a micro tunnel boring machine within a corridor which provides a nominal working corridor of approximately 20m for lateral deviation from the tunnel line, but its actual dimensions would be as stated above.

2.1.3 The new tunnel is a gravity system and will require six shafts, sited at connections and changes of tunnel direction and otherwise approximately at 600m intervals, at the following locations:

- interception shaft 1, located at the existing Cambridge WWTP to intercept the existing incoming 2.12m (internal diameter) tunnel;
- intermediate shaft 2, located adjacent to the existing Cambridge WWTP interception shaft and linking to the new tunnel;
- intermediate shaft 3, located adjacent to the eastern boundary of the existing Cambridge WWTP, on the west side of the railway;
- intermediate shaft 4, located on the eastern side of the River Cam;
- intermediate shaft 5, located on the west side of Horningsea Road (the B1047); and
- reception shaft 6, which will accommodate the TPS located at the proposed WWTP.

2.1.4 There will be construction compounds around each shaft location, as shown on the Design Plans – Proposed Waste Water Treatment Plant (Application Document Ref 4.9). Each construction compound will be established by stripping the topsoil including associated vegetation clearance/trimming and stabilising the base. Topsoil will be used to form a bund around the compound for compounds where the compound is to be fully restored. This bund will act as a visual screen and noise barrier. It will be vegetated. A spoil storage compound will temporarily store spoil arisings and will also serve as a visual screen and noise barrier. A temporary fence will be erected, parking and welfare portacabins, an excavator and crane, tower lighting, waste skip, water filtration, material storage, generator and workshop. The Micro Tunnel Boring Machine (MTBM) will be lowered into the drive shaft after it has been excavated and will drive to the reception shaft, where it will be lifted out. Pipe sections will be stored at the drive sites. Spoil will be taken out from the drive shaft, stored temporarily in the spoil store and surplus transported to the main development site for use in the earth bank.

2.1.5 Works on the existing Cambridge WWTP to intercept flows will be undertaken through interception shaft 1, which will include a temporary over pumping arrangement to divert flows while the interception is being made. It should be noted that there is potential to merge the interception shaft 1 and intermediate shaft 2 to create one singular shaft.

2.1.6 The new tunnel will intercept the existing tunnel at the existing Cambridge WWTP and transfer the flows to the TPS shaft located at the proposed WWTP. The new tunnel will also receive buried pipe flows from other catchments, via a vortex drop pipe located within the interception shaft. The interception shaft will require ventilation facilities and permanent access for infrequent maintenance activities.

2.1.7 The ventilation facility will include a permanent vent stack extending to a height of up to 10m above ground level and an adjacent filter installation at ground level for odour control.

2.1.8 Intermediate shafts 4 and 5 are temporary and will be backfilled using spoil from the shaft excavation and the ground reinstated following construction, with no permanent vent. Once constructed there will be little activity at these shafts until the removal of the MTBM and associated apparatus and connection pipes. After the pipes are connected, the shaft will be backfilled. These shafts are reception shafts not jacking (dive) shafts, so no out of hours working is expected. Shaft 4 will have no weekend or holiday work happening at all.

2.1.9 The reception shaft will be located within the proposed WWTP site operational boundary and will have a larger footprint to accommodate the TPS, which will raise all the incoming flows from the tunnel to the new treatment works.

2.1.10 The tunnel will use a trenchless method of construction known as pipe-jacking and will pass uninterrupted along its route without surface interference. The construction process will require temporary and permanent access shafts. The shafts will require construction compounds for materials and equipment and access.

2.1.11 A particular area of constraint is the railway line crossing, where surface movements and settlements will have tight limits, and will require monitoring to avoid disturbances to the tracks as required by and to be agreed with Network Rail.

2.1.12 The pipe sections (pre-cast coated concrete or Glass Reinforced Plastic (GRP)) will be jacked along the tunnel behind the Micro-Tunnel Boring Machine (MTBM) which is used to excavate the ground. The tunnel will be constructed in sections, each section commencing at (driven from) an intermediate shaft (shafts 3 and 5, known as jack-pit shafts) and progress towards a reception shaft (shafts 2, 4 and 6) (from 3 to 2 and 3 to 4 and from 5 to 4 and 5 to 6) where the MTBM will be retrieved. Where necessary, the spoil removed predominantly via shafts 3 and 5 (behind the machine) will be dewatered and transported to the proposed WWTP and used within the landscaping activities. Any surplus water will be tankered away for disposal at an appropriately licenced facility. The connection from shaft 2 to 1 to the interception point will be manually excavated.

2.1.13 The transfer tunnel forms an integral part of the storm handling system and can attenuate up to 5,000 m^3 of storm flows. This helps the proposed WWTP work more efficiently and not waste energy and carbon in circulating flows. It also reduces embodied carbon as on-site tank capacity can be reduced.

2.1.14 There will be a requirement to control any future developments above the tunnel corridor within reasonable defined limits to protect its structural integrity and to prevent buildings being constructed within the zone.

2.1.15 A summary of the method to be followed to construct the tunnel is provided below:

- The tunnel will be constructed from precast concrete jacking pipes of high quality (manufactured under factory conditions).
- The jacking pipes have gaskets to maintain a watertight seal.
- The tunnel will be created by a Micro-Tunnel Boring Machine (MTBM) which has a closed face and an earth balancing facility (to ensure the tunnel remains watertight).
- The precast concrete tunnel units will be jacked behind the MTBM from the jacking shaft.
- To assist the jacking process a bentonite slurry will be used to reduce the friction.
- Once the tunnel is complete the slurry will be recovered and replaced with a cement grout.
- Adequate cover will be maintained above the tunnel; even in the vicinity of the river the cover is significant (and exceeds 3 tunnel diameters).

- Groundwater ingress will be controlled – the tunnel units will have seals and the MTBM has a closed face, and there will be a seal at each shaft (between the shaft wall and the exterior face of the jacking pipes).

- The water tightness of the tunnel will be proven by an internal visual/camera inspection to ensure there are no internal leaks.

- There are 6 shafts in total connecting to the Waste Water Transfer Tunnel which are summarised as follows:

  - Permanent Shaft 1: required to connect the existing Riverside tunnel with the new tunnel and for potential future access

  - Intermediate (temporary) Shafts 2, 3, 4 and 5: required to facilitate the construction of the tunnel and will be backfilled after use

  - Permanent Shaft 6: required to accommodate the Terminal Pumping Station (TPS) facility; to house the pumps that lift the flow to the new works

- Several techniques are available to construct the shafts, depending upon local geotechnical conditions. The preferred techniques include:

  - Underpinning (for dry ground conditions): 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.

  - Caisson (suits wet ground): permits the shaft to be sunk progressively through the ground 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.

  - Secant piling: the shaft is formed of overlapping concrete piles and then lined.

- Shafts 1 to 5 will be likely be constructed using either the underpinning or caisson technique; and Shaft 6 may use the techniques as per shafts 1 to 5 or alternatively a secant piled technique.

- The precast concrete segments are of high quality (manufactured under factory conditions) and are suitable for both underpinning and caisson techniques.

- The precast concrete segments interlock and have an integral water-tight seal.

- The water tightness of the shaft will be proven by internal visual/camera inspection (to ensure there are no internal leaks).
- Groundwater will be encountered in some of the shafts, in particular in chalk and shaft 6 where an upper greensand band (approx. 0.5m thick) is a potential 'weak' aquifer.
- Encountering groundwater will favour either the Caisson technique or possibly the Secant pile technique (for Shaft 6).
- Any groundwater will be tested and managed using a variety of techniques, including:
  - Using a temporary lagoon to hold the water and improve the quality, such as the removal of silt and sediment (by detention and/or using proprietary equipment, Siltbuster™ or equivalent) and the correction of pH (say by using CO_2 to correct for alkaline conditions from the chalk)
  - Returning the ground water to the existing treatment works at for processing (by pipeline if feasible, or tankers depending on the volume)
  - Approval will be obtained from the regulatory authorities before any discharge is made should that be acceptable
- The shaft construction technique will influence the type of groundwater issues encountered, for example:
  - For the caisson technique the shaft may be allowed to fill and only emptied once the caisson end is sealed and the shaft is at the required depth; so here groundwater is only a periodic issue.

2.2 Final Effluent and Storm Pipeline and Outfall Corridor

2.2.1 The Final Effluent and Storm Pipeline comprising a final effluent pipeline and a storm overflow pipeline will extend from the proposed WWTP to a new discharge location on the east bank of the River Cam, close to the discharge location of the existing Cambridge WWTP.

2.2.2 These pipelines will be installed at between approximately 1m to 3m in depth depending on the ground surface, as shown on Design Plan – Outfall and Longitudinal Section (Application Document Ref 4.13) which also shows the relevant limits of deviation which have been assessed as a worst case within this Environmental Statement.

2.2.3 The Final Effluent and Storm Pipeline corridor extends west from the boundary of the proposed WWTP area crossing Horningsea Road and running parallel to the A14 to a section of the River Cam directly north of the A14 bridge and upstream of Baits Bite Lock. The proposed corridor is in the field to the south of the driveway to Biggin Abbey.

2.2.4 The Final Effluent (FE) pipeline will have an approximate length of 1.25km and an internal diameter of 1.5m.

2.2.5 The 4m fall in the elevation, between the proposed overflow weir at the proposed WWTP and the outfall into the River Cam (during high river conditions), provides an opportunity to operate the Final Effluent and Storm Pipeline without the assistance of pumps.

2.2.6 The FE pipeline will be laid adjacent to the storm outfall compartment (which is designed to include one pipeline of 1.8m internal diameter).

2.2.7 The FE and Storm Pipeline will be provided with access manholes where required, including at changes of direction and on either side of crossings (for example, of the Horningsea Road at Chainage Ch560 and the significant drainage ditch at Chainage Ch1250). Some of the manholes may require a venting facility to allow air to enter or exit as sections of the pipeline fill, surcharge and empty during operation.

2.2.8 The route of the FE and Storm Pipeline includes crossing a set of overhead powerlines and the Horningsea Road. The FE and Storm Pipeline will also be required to cross under drainage ditches which are a feature of the local area.

2.2.9 The road crossing will be approved or deemed approved by the Highways Authority(ies) and will either be carried out by an open-cut method requiring temporary control and/or road alignment (using a lane-by-lane diversion technique of the road) or by a trenchless method (such as pipe-jacking). The preferred crossing technique for the FE and Storm Pipeline across obstacles (including the road and drains) is to utilise open-cut techniques.

2.2.10 The crossing of the significant drain just east of the River Cam will be via open cut method. The ditch will be temporarily flumed with a section of plastic pipe to allow plant to track over it. Road plates will be added above the pipe to spread the load. The flow in the ditch is known to be very low and often dry in the summer months. The preferred crossing option would be to complete the works at a time of zero flow, cut through the ditch, lay the pipe then reinstate the ditch. If this is not possible for programme reasons and flow is present in the ditch, the flow will be temporarily diverted by over pumping (potentially directly into the river) and stopping up the ditch. The crown of the pipes will potentially be close to the invert of the drain following installation (potentially as low as 300mm). To protect the pipe during ditch maintenance they will either be wrapped in a protection material, such as concrete canvas, or protection planks added to the bottom of the ditch above the pipes. These planks will then be covered over to ensure the ditch looks as natural as possible after reinstatement. The final decision on protection design will be done in collaboration with the landowner.

2.2.11 Access is required to the FE and Storm Pipeline and outfall structure during construction and any permanent facilities should inspection or maintenance be required (such as manholes) and to control any future developments in the vicinity of the pipeline(s) assets. The method of construction will be by means of open cut and re-instatement, as summarised below:

- several pipe systems and materials were considered during optioneering (including steel, concrete, PVC, GRP and a HDPE/steel composite pipe system known as Aquaspira);
- the preferred pipe material is the composite system known as Aquaspira, which is a gravity pipe system operating with a maximum of 0.5bar (5m);
- the pipes are considered of large internal diameter: 1.5m in the case of the treated effluent pipeline and 1.8m for the storm pipeline;
- the flows entering the outfall pipe system will be controlled by a weir at the treatment works (set at an elevation of 8.5m AOD); the flow(s) will be released at an outfall structure at the downstream end of the pipes (the river level is typically at 3.9m AOD);
- the pipes are in 2.6m lengths and have watertight spigot and socket joints, each containing an elastomeric sealing ring arrangement;
- the complete pipeline system will be inspected by visual or CCTV examination;
- the pipes will be laid with sufficient cover for protection, and also to prevent floatation when empty; in areas where the cover is insufficient ballast will be added to the pipeline (using fixed weights or ballast bags);
- the pipes will be constructed to comply both with Anglian Water Standards;
- the pipes will be laid in a granular surround; with impermeable barriers across the trench (clay stanks) at regular intervals to prevent the easy passage of water along the pipe route (through the backfill material);
- some groundwater issues will likely be encountered, in particular at the approach to the river in the vicinity of the ditch crossing;
- there are several techniques that could be considered to cross the ditch, including:
  - Using a pipe or flume technique (by extending the existing pipe under the field entrance to transfer the flow further along the ditch);
  - Using a temporary diversion channel; or

  - By over pumping.

- the preferred method is the pipe and flume arrangement.

2.3 Waterbeach Pipeline

2.3.1 Two new pipelines (rising mains) (hereafter Waterbeach pipeline) are required from Waterbeach to the proposed WWTP in order to support the development of Waterbeach New Town as there is insufficient capacity within the current network to accommodate these flows. The new town development when built out will comprise some 11,000 new homes along with associated business, retail, community and leisure uses. The new rising main will also accommodate flows from the existing Waterbeach catchment.

2.3.2 The developer 'need date', based upon the existing capacity within the network and the predicted built out rates of Waterbeach New Town, is expected to be before the proposed WWTP is operational. As such, the Waterbeach pipeline has been designed to take flows into the existing Cambridge WWTP for an interim period as a reasonable worst case scenario. Once the proposed WWTP is constructed, the southernmost section of the Waterbeach pipeline (i.e. that to the south of the new works) will become redundant and will be decommissioned.

2.3.3 A new pumping station will be required within the Waterbeach New Town development area, to pump flows into the new rising main. The final location will be agreed with the Waterbeach developer, who will obtain the necessary planning consents for the pumping station, although it will be constructed by Anglian Water Services Limited. Construction of the pumping station is expected to take place at the same time as the pipeline is laid. This pumping station will be delivered outside the scope of CWWTPRP.

2.3.4 The existing Waterbeach Water Recycling Centre (WRC) discharge permit has a maximum daily permitted flow which will be exceeded should all of the flows from the Waterbeach New Town development be connected to the existing Waterbeach network. The date of this exceedance is dependent upon the build out of the new town development.

2.3.5 Waterbeach WRC currently has a permitted dry weather flow of 1,350m^3/day and a measured flow in 2020 Q90 of 1,031m^3/day into Bannold Drain. This is located to the east of the Waterbeach WRC running parallel with Bannold Drove. It is managed and maintained by Waterbeach Level (part of the Ely Group of Internal Drainage Board) (IDB). Once the new pipeline is operational all flows from the WRC will be pumped directly to the existing Cambridge WWTP/the proposed WWTP TPS. The existing flow into the ditch will therefore cease.

2.3.6 It is anticipated that the developer of the Waterbeach housing development will obtain consent for the new pumping station and alignment of the rising main within their site under their planning permission, with the Waterbeach pipeline connecting at a point along their red line boundary. As the precise location of the pumping station is not yet approved, a corridor has been included within the existing DCO boundary, for the new rising main, which will be delivered as part of CWWTPRP.

2.3.7 Redevelopment of the Waterbeach WRC compound will be a separate future project alongside Waterbeach New Town, which is outside of the scope of the Proposed Development.

2.3.8 The Waterbeach pipeline is expected to comprise twin 500mm pipes to be laid below ground (with the exception of the section within the existing Cambridge WWTP). The two new pipelines (rising mains) will be approximately 8.4km in length in length, circa 5.6km to the proposed WWTP and circa 2.8km from the proposed WWTP to the existing Cambridge WWTP.

2.3.9 The new Waterbeach pumping station is outside of the scope of CWWTPRP but is expected to have a maximum footprint of 40m x 40m with a maximum height of 4.5m (overhead gantry).

2.3.10 From the Waterbeach New Town development area, the Waterbeach pipeline will route east/south east crossing under the railway but avoiding the new Waterbeach railway station platform before continuing southwards through fields. It will cross to the east side of the River Cam after about 1.9km and continue southward to the east of the village of Horningsea before crossing under Low Fen Drove Way. It will then continue southward for approximately another 400m before routing west and connecting into the existing Cambridge WWTP, crossing under Horningsea Road, the A14, the River Cam, Fen Road and the railway en-route.

2.3.11 A short section of the Waterbeach pipeline (+475.0m to +972.0m (refer to Application Document Ref 4.14.11) will be installed through trenchless techniques as part of a range of measures to avoid habitats.

2.3.12 The alignment of the pipeline within the existing Cambridge WWTP will be within a corridor as shown on the Works Plans (Application Document Ref 4.3.1) and will be partly above and partly below ground, as shown on the General Arrangement Plan (Application Document Ref 4.2.1).

2.3.13 A connection point will be installed where the Waterbeach pipeline routes close to the proposed WWTP in order to allow the flows to be diverted to the proposed WWTP once it is operational. This is likely to comprise a below ground junction and associated isolating valves connecting into the TPS and will be located to the west of the proposed WWTP and is likely to run adjacent to the corridor for the permanent access road. Once this connection is made, the remaining section of the Waterbeach connection to the existing Cambridge WWTP would become redundant and it would be left in situ and decommissioned, using isolating valves or an equivalent technique to close it off at each end.

2.3.14 Associated with the Waterbeach pipeline (comprising two rising mains) will be a number of air valves located within the proposed working corridor. The number of air valves is still to be finalised, but it is anticipated that there will be in the region of 16. The air valves will be located below ground with an accessible manhole cover at ground level. This type of air valve operates infrequently to vent (or to admit) air to/from the atmosphere during particular conditions, for example during commissioning of the Waterbeach pipeline (by expelling air as the pipeline is filled and vice-versa, taking in air should the pipeline require to be emptied or drawn-down for any reason such as inspection or repair) and also occasionally during operation to release small amounts of air (that would otherwise be trapped within the pipeline at high points along the pipe route) in the pipeline. Once the pipeline is commissioned the operation of any air valve would be a very short- term event as the pipeline is pressurised and filled with waste water, and consequently the air volumes to be released are small. Given the very intermittent frequency of operation and the limited quantity of air involved it is not likely that any associated odour would be detected. The valves will likely be combination air valves, with a large orifice (of approximately 0.2m in diameter, used during commissioning filling/emptying) and a small orifice (used during operation to vent small pockets of trapped air), located in a chamber approximately 1m in depth and attached to the rising main via connecting pipework.

2.3.15 In order to lay the Waterbeach pipeline, a working corridor of up to 30m wide is proposed. The precise alignment of the rising mains within the corridor will be determined by a number of factors including the outcome of further surveys, discussion with landowners and technical considerations such as ground conditions. Further assessment will also be needed to determine the exact crossings points under the River Cam, the railway line and the A14, within the corridor. The crossings under the railway and A14 will be monitored to avoid disturbance in accordance with requirements to be agreed with Network Rail and National Highways respectively. The Waterbeach pipeline will cross through a number of hedgerows and ditches. Where it traverses such features, the working width will be reduced to approximately 6m to minimise effects. Hedgerows will be reinstated where possible with the same hedgerow plants. Ditches will be temporarily stopped up, over-pumped if necessary and reinstated after the pipeline has been laid. Minor modifications to field drainage will be made along the route of the pipeline if required to maintain adequate drainage, including altering the drainage of the field in Plot 060a into the watercourse in Plots 058a and 058e, shown on the Land Plans (Application Document Ref 4.4). Drainage will be designed to maintain run off rates at green field rates, so no net change is anticipated.

2.3.16 The Waterbeach Pipeline will be located at an average depth of 2-5m below ground level except where it passes beneath the River Cam, larger drainage ditches, the A14 and the railway where it will be up to 20m deep and at least 2m below the depth of the watercourses. The alignment of the Waterbeach pipeline is shown on the General Arrangement Plans (Application Document Reference 4.2) and its depth on the Design Plans– Waterbeach Long Sections (Application Document Reference 4.14), these plans also show the relevant order limits which have been assessed in this Environmental Statement. Vertical limits of deviation for the pipeline are set out in Article 6 of the DCO (Application Document Reference 2.1).

2.3.17 Vehicle access will continue to be required to the Waterbeach WRC and new Waterbeach pumping station during operation. This is anticipated to be off the existing Bannold Drove, which will also be used to access the northern part of the Waterbeach pipeline.

2.4 Off-site Highway Network Alterations

2.4.1 The proposed WWTP is located east of junction 34 of the A14 and north-west of Junction 35 of the A14. The local roads in the vicinity of the site include Horningsea Road to the west, High Ditch Road to the south and Low Fen Drove Way to the north and east.

2.4.2 A number of options for A permanent access road to the proposed WWTP from the existing highway network were assessed as part of the public consultation. The permanent access road is for access to be off Junction 34 of the A14 as follows:

- westbound traffic exits the A14 at Junction 33 (A10), traverse Milton interchange, re-join A14 eastbound, exit at Junction 34 (Fen Ditton), straight movement from exit slip road, reconfigured 4 arm signalised junction; and
- eastbound traffic exit at Junction 34 (Fen Ditton), left turn to Horningsea Road, straight movement from exit slip road, reconfigured 4 arm signalised junction.

2.4.3 The permanent access road will be constructed as an initial enabling works (Sections 3.1 & 3.3) activity to allow the access to be used for construction vehicles using the proposed WWTP. A temporary site access from Lower Fen Drove Way will be provided during the initial stages of construction of the permanent access road, for a period for between 3 to 6 months. Other temporary accesses for the purposes of construction and maintenance of associated development, including interconnecting pipelines are shown on the Access and TRO Plans (Application Document Ref 4.7).

2.4.4 In addition to the permanent access road off the Horningsea Road, and associated works to the existing signalised junction to form the new access, the proposals include mitigation and enhancement measures to improve access for pedestrians and cyclists in the area, as shown in the Design Plans – Highways (Application Document Ref 4.11):

- the existing footway/cycleway on Horningsea Road to be widened to 3m from the A14 on-slip signalised junction to Low Fen Drove Way;
- a 1m verge/buffer between the footway/cycleway and the main carriageway;
- works to replace the existing parapet on the A14 overbridge on Horningsea Road with a higher barrier suitable for cycleways in order to bring it up to current cycleway design safety standards;

- improvements to the existing pedestrian crossing point on the ‘on-slip’ and ‘off-slip’ roads;
- provision of a central pedestrian island on Horningsea Road to allow pedestrians and cyclists to cross from the existing footway/cycleway on the west side of Horningsea Road to the footway/cycleway network on the proposed WWTP site;
- a footway/cycleway link on the east side of Horningsea Road to provide access from Low Fen Drove Way to the new crossing facility on Horningsea Road;
- signage, associated electrical equipment and reconfigured kerb lines;
- a reduction in the maximum speed limit on Horningsea Road from 60mph to 40mph between the villages of Horningsea and Fen Ditton (subject to agreement from the Local Highway Authority and the Police); and
- restrictions on the turning movements at the new four arm signalised junction to manage access to the proposed WWTP (covered by a Traffic Regulation Order, subject to agreement from the Local Highway Authority):
  - no right turn from the permanent access road onto Horningsea Road;
  - no right turn from Horningsea Road into the permanent access road; and
  - no left turn for HGVs from Horningsea Road into the permanent access road.

2.4.5 It is not anticipated that any permanent PRoW, cycleway or highway diversions are required as part of the permanent access road.

2.4.6 It is anticipated that lighting will be required around the permanent access road junction and the new pedestrian crossing point on Horningsea Road. The extent of the proposed lighting is to be agreed with the LHA. At present, street lighting is confined to the area in the immediate vicinity of the existing signalised junctions. As part of the Proposed Development, it is considered that as a worst case, lighting on Horningsea Road is required from Low Fen Drove Way to approximately 100m south of the southern A14 on-slip signalised junction.

Operational traffic

2.4.7 Table 2-1 provides the predicted number of visits (two-way) associated with proposed WWTP staff and smaller scale deliveries once the facility is operational which are unlikely to require HGVs. The realistic worst-case scenario for transport impacts during the am and pm peak hours is set out in Traffic and Transport (Chapter

19) and controlled through the Operational Workers Travel Plan (Application Document Ref 5.4.19.8).

Table 2-1: Estimated operational visits associated with proposed WWTP staff (two way)

Vehicle movement type	Vehicle movements per day (two way)	Frequency
Sludge technicians	4	Daily
Operations team	4	Daily
Maintenance technician	2	Mon-Friday
CHP technician	2	Mon-Friday
Cars	12	Daily
Chemical deliveries and other service vehicles	4	Daily
Office workers using the proposed WWTP	60	Daily
Operational visitors to the WWTP	4	Daily
Total estimated small vehicles and van visits to site	**92 (46 cars/vans)**	**Daily**

2.4.8 In order to give a perspective of how the proposed WWTP will operate in comparison to the existing Cambridge WWTP, both existing and future estimates of HGV movements (two way) are outlined in Table 2-2. The future estimates are based on when the proposed WWTP is at full capacity including all the built-in growth of the existing Cambridge WWTP and the additional capacity added from Waterbeach. When the proposed WWTP is commissioned, it is likely that the traffic movements at that time will be similar to the existing works and will just be diverted from Cambridge to the Proposed WWTP.

Table 2-2: Estimated future operational HGV movements vs current operational HGV movements (two way)

Type	Average daily vehicle movements (two way)	
	Existing Cambridge WWTP	Future
Liquid sludge imports	57	62
Biosolids exports	10	10
Non-routine tanker movements	12	14
Septic waste tanker delivery movements	50	60
Total HGV movements	**129**	**146**

2.4.9 Typically imports and exports occur throughout the day but assuming a ten-hour period for tanker movements, the average hourly two way flow would be 15 which is equivalent to one tanker in each direction every 8 minutes. The peak is likely to be less than 50% more than the average flow.

2.5 Proposed WWTP Access

2.5.1 The proposed WWTP will be connected to the existing highway network via a new two-way access road, as set out in Section 2.4 (Off-site Highway Network Alterations), with associated landscaping, drainage and a weighbridge. This will be unlit.

2.5.2 A separate entrance for pedestrians and cyclists is located slightly to the north of the vehicle entrance, to separate pedestrians and visitors from HGV movements.

2.6 Renewables infrastructure

2.6.1 As described above in respect of the Sludge Treatment Centre (STC), renewable energy will be created on site and either exported as biogas (Gas to Grid) or the gas used on-site in boilers and efficient Combined Heat and Power (CHP) engines.

2.6.2 Additional renewable power generation may also be included in the form of solar power generation. The amount of solar installed will be determined by the likely additional power demand of the site (depending on whether a Gas to Grid or CHP solution is adopted) and on the available space within the proposed WWTP.

2.6.3 The preferred approach is to install solar photovoltaic panels ("PV") on the southern side of the north extent of the landscaped earth bank, facing inwards and screened by the earth bank from external views, over car parking spaces and on building roofs. No solar PV installation is planned in the area outside the earth bank, where ecological mitigation and enhancement and landscape mitigation is proposed. The proposal is for up to 7 hectares of photovoltaic cells with a capacity of approximately 7 Mega Watts of renewable electricity, generating approximately 7 Giga Watts/hr of electricity over a year. However, if CHP technology were selected the level of PV installation could be significantly lower than this as the electricity requirements of the project would largely be delivered by the CHP engines.

2.6.4 Solar PV and energy storage technologies are rapidly evolving. As a result, the parameters of the DCO will maintain flexibility to allow the latest technology to be utilised at the time of construction. The solar installation will consist of the principal following infrastructure:

- solar PV modules;
- PV module mounting structures;
- inverters;

- transformers;
- switchgears (housed inside a building);
- onsite cabling; and
- one or more battery energy storage system (expected to be formed of lithium-ion batteries storing electrical energy).

2.6.5 Battery technology is also rapidly evolving therefore again the design will allow for the flexibility to adopt new energy storage technologies. There are two primary technologies that currently could be utilised at the proposed WWTP – a lithium-ion battery, or variant of (e.g. Tesla) or a vanadium redox flow battery (e.g. Invinity/RedT), which has inherently low fire risk. In either case, cooling systems, monitoring, fire and smoke detection and fire prevention/fire control systems will be incorporated. These will be linked to the site wide control system, which will be locally and remotely monitored. Details of both systems are provided in Table 2-3.

Table 2-3: Battery technology option summary

Technology	MW	kWh capacity
Tesla (Lithium Ion)	2.5	5,000
Invinity (VRF)	2.5	10,000

2.6.6 Power frequency electric, magnetic and electromagnetic fields (EMFs) arise from the generation, transmission, distribution and use of electricity and occur around power lines and electric cables as well as around domestic, office or industrial equipment that uses electricity. For the Proposed Development, EMFs may arise close to the power cables supplying the proposed WWTP or within the solar array. The Department of Energy and Climate Change (DECC) provide guidance on public exposure guidelines and any solar array will be designed so that exposure guidelines are not exceeded (DECC, 2012).

2.7 Existing Cambridge WWTP diversions

2.7.1 The treatment operations at the existing Cambridge WWTP are to be terminated so that the site can be ready for re-development. This will require the relocation of a number of incoming sewers, including rising mains and gravity sewers. 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 inch PVC);
- MILPSM local rising main (8 inch 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 (dia. TBC);
- MILLSM local rising main (dia. TBC); and
- Waterbeach pipeline (south of the proposed WWTP).

2.7.2 The above sewers, with possibly the exception of the Waterbeach pipeline, will be diverted to the interception shaft at the existing Cambridge WWTP and routed to the tunnel via a vortex drop pipe. The Waterbeach pipeline will be diverted to the proposed WWTP TPS, as described in Section 2.3 (Waterbeach).

2.7.3 The objective of the Milton diversions is to free up as much of the existing Cambridge WWTP as possible to allow future developments to proceed. However, as part of these diversions, some provision will be required to accommodate a containerised dosing installation which may be required in order to control the septicity of the diverted flows.

2.8 The Outfall

2.8.1 The new outfall will be located on the east bank of the River Cam approximately 90m downstream of the existing outfall from the existing Cambridge WWTP, and 30m downstream of the A14 bridge. The river levels in this part of the River Cam are controlled by Baits Bite Lock, which is located approximately 500m further downstream of the outfall.

2.8.2 The discharge of Final Effluent (FE) from the outfall will be discharged in line with the proposed WWTP discharge consent, via a FE pipe with a nominal internal diameter of 1.5m. By 2035 the FE dry weather flow (DWF) is estimated to be approximately 53,860 m^3/day (equivalent to 0.62m^3/s), rising to 57,280^3/day by 2041 (equivalent to 0.66m^3/s). On occasion, and depending on conditions, the FE treated effluent flow rate may increase temporarily to an approximate peak of 2m^3/s.

2.8.3 The outfall requirements have been extensively discussed with and remain subject to final agreement with the Environment Agency. The outfall design process includes reference to the guidance provided by the CIRIA 'Culvert, screen and outfall manual (C786F)' (CIRIA, 2019).

2.8.4 The final design of the outfall will be determined at the detailed design stage in accordance with the DCO Requirements. The preferred design option is the multi-valve arrangement, with a single FE and single storm pipe. This allows for a smaller footprint, with the finished platform level matching the existing bank height, minimising the need for excavation in this area, maintaining the existing bank edge, minimising any effect on the river footpath (PROW 85/6) and ditch to the rear of the footpath, and incorporating bank protection and reed/sedge bed either side (north and south) of the outfall, for the full length of the new sheet piled section, to mimic, maintain and enhance the natural bank at this location, reinstate the ditch and incorporate mitigation measures for water vole in the bank and ditch. The preferred indicative arrangement is shown in the Design Plans - Outfall (Application Document Ref 4.13)

2.8.5 The construction of the outfall will be managed under a Construction Outfall Management and Monitoring plan, developed and approved in accordance with Requirement 10 of the draft DCO (Application Document reference 2.1).

2.8.6 Bank and bed protection will be provided as part of the design. This will be in the form of rip rap bed protection and steel sheet piling to protect the banks as shown in the Design Outfall Plans and Sections 4.13.

2.8.7 Permanent access to the outfall will be possible from one of the following options:

- access from the south, via the Horningsea Road and an existing track (running parallel to the A14), that serves Poplar Hall and provides track access to the Riverbank and to the field adjacent to the outfall; and
- access from the river, using barges/rafts or similar.

2.8.8 Temporary access to the outfall area will be available during construction along the pipeline corridor. The construction compound in this area has been set back from the river footpath and ditch. The field in which the compound is sited will be restored to its current status, or improved following removal of the construction compound.

2.8.9 Construction of the outfall will make use of in-situ and pre-cast techniques where appropriate and will require a temporary coffer-dam located on the river bank, extending into the river to accommodate the main structure sited on the river bank and to facilitate bed removal and bed protection works in the river. The coffer dam will be a temporary structure up to 300mm above the flood level or 150mm above the local bank, to ensure that the temporary works to construct the outfall and install the bed protection are protected from flooding.

2.8.10 The existing footpath PRoW following the east bank of the River Cam will be temporarily diverted and fully restored on completion of the outfall works.

2.8.11 Following completion of the outfall works the habitat management and operation of the outfall will be managed under an operational outfall management and monitoring plan agreed with the Environment Agency and Natural England under DCO Requirement 10 (Application Document reference 2.1).

2.9 Waterbeach pipelines

2.9.1 A summary of the method to be followed to construct the Waterbeach pipeline is provided below:

- For Waterbeach there are two adjacent 500mm parallel pipelines; the pipes are solid wall HDPE (high density polyethylene);
- This is a pressurised pipeline system;
- The pipes will typically be of 15 or 18m lengths and each pipe length welded together to form a continuous pipeline string;
- The complete pipeline system will be pressure tested to ensure water tightness; typically by pressure testing to 1.5 x working pressure;
- The pipes will be constructed to comply with Anglian Water Standards;
- The pipes will be laid in a granular surround; with impermeable barriers across the trench (clay stanks) at regular intervals to prevent the easy passage of ground water running along the pipe route (through the backfill material);
- Water crossings, for example of the River Cam, will require techniques such as horizontal directional drilling (HDD). Elsewhere there are up to 9 ditch crossings of these 2 are likely to be by trenchless techniques;
- Some ditch crossing may use techniques that will be developed using good practice guides such as:
  - using a pipe or flume technique
  - using a temporary diversion channel
  - or by over pumping
- Where floatation is an issue (due to the buoyancy of the pipe) weights (in the form of saddlebags) may be used; and
- Any contaminated water/groundwater will be tested and managed using a variety of techniques, including:
  - Using a temporary lagoon to hold the water and improve the quality, such as the removal of silt and sediment (by detention and/or using proprietary equipment, silt buster or equivalent) and the correction of pH (e.g. by using CO_2 to correct for alkaline conditions from chalk);
  - Returning the water to the existing Cambridge WWTP or Waterbeach WRC for processing (by pipeline if feasible, or tankers depending on the volume);
  - Mobile water treatment plants (possibly trailer or container mounted) may also be used to treat the water; and

– Discharges of construction water may require a water discharge activity permit, as described in the Other Consents and Permits Register (Application Document reference 7.1).

2.10 Storm Pipeline and Storm Outfall

2.10.1 The storm pipeline will be laid adjacent to the Final Effluent Pipeline (jointly referred to as the FE and Storm Pipeline). The preliminary arrangement for the storm pipeline includes one 1.8m nominal internal diameter pipe, extending from an overflow control facility at the proposed WWTP, to the outfall at the River Cam.

2.10.2 The influent flows to the proposed WWTP are currently being refined by hydraulic models of the existing sewer network and include allowances to accommodate the planned development requirements and growth allowances. During a 1 in 100-year storm in the catchment area (including climate change allowance) the flow rates to the new works, dependant on the storm intensity chosen, are expected to peak at $7m^3/s$. The storm flows will be influenced by the treatment plant, processes and attenuation capabilities; and will be discharged sporadically following a storm event and associated treatment, in line with the proposed WWTP storm consent. The estimated magnitude and frequency of the storm events continue to be developed through network modelling and storm storage and treatment options. Based on these results the storm flow could peak at around $5m^3/s$ for a 1:100 storm event during a worst day discharge.

2.10.3 The FE flow will be used to flush the storm outfall pipeline when required following the conveyance of any storm flows.

3 Construction and Decommissioning

3.1 Construction phasing and sequence of assembly

3.1.1 The construction of the Proposed Development will be organised into a number of phases and works packages.

3.1.2 The phases comprise:

- proposed WWTP site set up and enabling works, including access;
- laying the Waterbeach pipeline connection;
- progressive establishment of landscaping in phases during each planting season;
- construction and assembly, including all buildings and structures, solar panel installation on roof and inner sides of the earth bank;
- laying transfer pipelines;
- wet and dry commissioning of the proposed WWTP;
- decommissioning of the existing Cambridge WWTP; and
- laying the diversion of the Waterbeach connection direct to the proposed WWTP and decommission the connection to the existing Cambridge WWTP.

3.1.3 The works packages comprise:

- WWTP;
- STC;
- on-site infrastructure, including building and internal access roads;
- off-site infrastructure, including pipelines;
- highway modifications and permanent access road;
- provision of utilities;
- renewables; and
- landscaping and completion works.

3.1.4 A list of the expected primary construction packages is indicated in Table ***3-1*** and an anticipated programme of work is illustrated in Figure 3.1. The earliest anticipated start date for construction is the first half of 2024 and permanent operation commencing in 2028.

Table 3-1: Provisional primary construction packages

Package	Activities
Phase 1 Enabling	• construction of WWTP access road • temporary utilities provision for construction site • visual mitigation planting • site compound and perimeter fence • • environmental mitigation works within the CEMP and archaeological work to begin construction • existing Cambridge WWTP compounds and shaft construction commencement
Phase 2 Enabling	• construction support services, e.g. concrete batching plant, cabins, and store • topsoil strip including associated vegetation clearance/trimming and reduced levels excavation • earthworks for creation of the earth bank • construction access tracks, and working platforms, drainage
Offsite infrastructure	• transfer pipeline and shafts • FE and Storm pipeline • outfall structure • rising main diversions • permanent utilities provision electricity, gas, water, communications • existing highway modifications • permanent access road
Site buildings and above ground site infrastructure plus MCC's and software integration	• office building workshops, control rooms and kiosk • site wide infrastructures including roads, HV ring main, potable water and wash water main, drainage

Package	Activities
	• MCC's and software integration • generator compound, generators and switch gear • LV and HV switch gear and building for incoming electricity main
Waste Water Treatment Plant (including Terminal Pumping Station)	• Terminal Pumping Station and Inlet Works • Storm Tanks and management system • primary treatment process • secondary treatment • final and tertiary treatment • Intermediate Pumping Station • Final Effluent Pump Station/Collection Chamber
STC (including indigenous and imported sludge management)	• indigenous and imported sludge storage and management systems • pre-digestion and digestion plant • renewables e.g. PV, gas to grid, CHP • gas bag and gas flare • sludge cake storage barn
Completion and soft landscaping	• landscaping • footpaths and access route • clearance of construction compounds roads etc • security fencing and cameras • installation of solar array
New plant commissioning	• west commissioning and process start up and plant optimisation
Existing plant decommissioning	• Existing plant shutdown and decommissioning as described at section 3.4 below
Demolition of existing site (not within scope of DCO, to be authorised under separate planning	• decontamination • site clearance and demolition

Package	Activities
permission by site developer)	

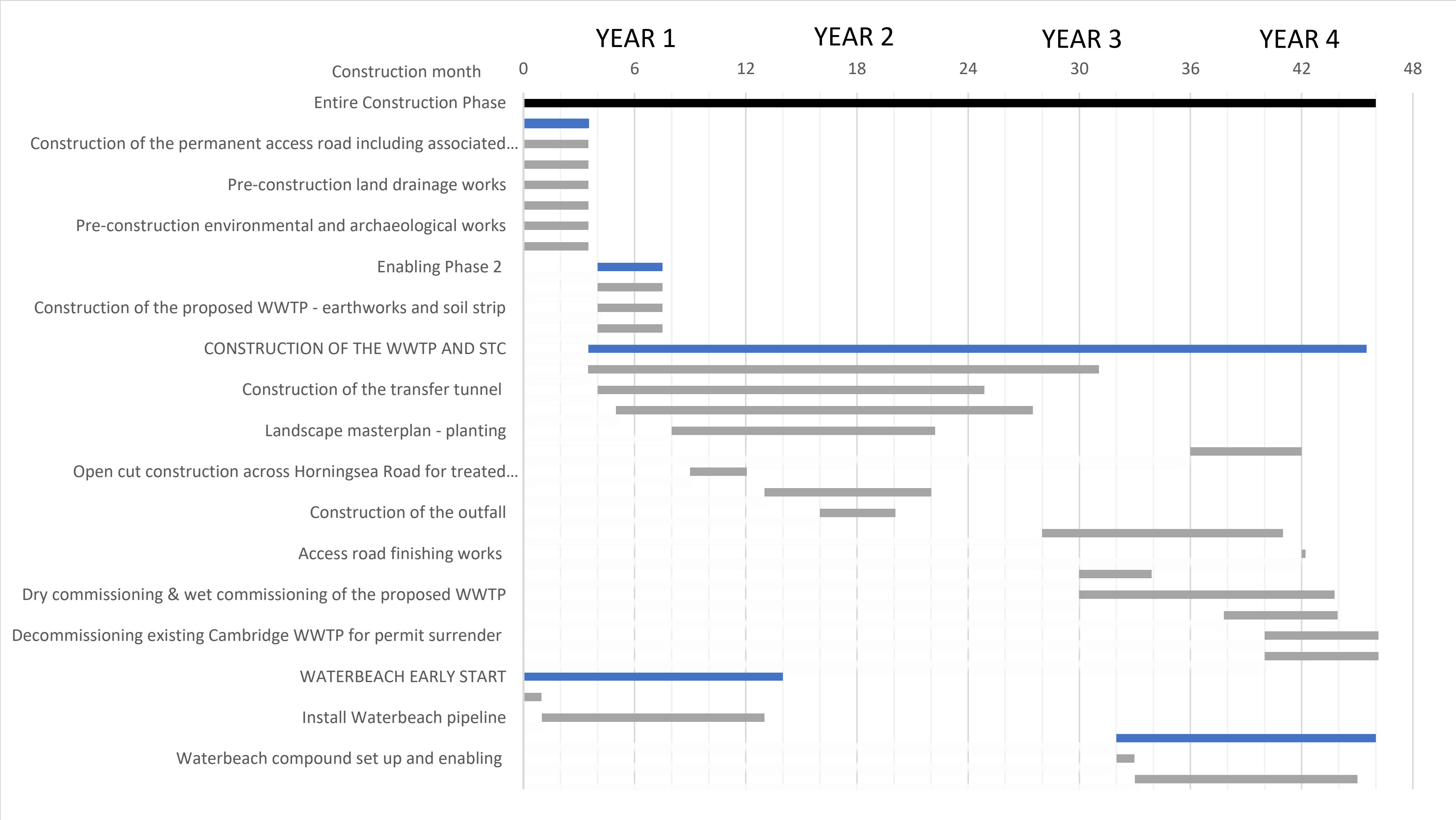


Figure 3.1: Provisional anticipated programme of works in months

3.1.5 The installation of the Waterbeach pipeline has been shown from the earliest possible stage and a late possible stage as an alternative. The option of installing portions of the pipeline that may interfere with other planned development, such as the relocated Waterbeach train station in the north, is also intended. This would involve establishing a smaller construction compound, driving under the railway, installing sufficient length of pipe and leaving this in situ, out of the way of other construction activity, so that the connection can be picked up at either end at a later stage. Discussions with the Waterbeach Station design team are ongoing, with a view to coordinating these activities to minimise disturbance. If the need for Waterbeach pipeline is delayed the individual components of the Waterbeach p

3.1.6 Pipeline would be unaffected and its sequencing would follow a similar pattern, as shown in the programme, although multiple teams could also be working on different sections at the same time. Cumulative construction traffic flows would be managed in accordance with the Construction Traffic Management Plan (CTMP) (Application Document Ref 5.4.19.7).

3.1.7 The construction sequence of the Proposed Development is summarised below and provided in more detail in Section 3.3. Where a works number is identified these can be found on the Works Plans (Application Document Ref 4.3). Mitigation relating to the below can be found in Parts A and B of the COCP (Application Document Ref 5.4.2.1 and 5.4.2.2):

- Enabling Works (Phase 1)
  - Enabling compound established adjacent to the construction access, with temporary site access off Low Fen Drove Way during these early enabling works (Works No.21) and perimeter fencing.
  - Construction of permanent access road off Horningsea Road including the new junction bellmouth (Works No.02); perimeter land drainage to pick up and divert existing field drainage system; and installation of power, water, telecom services to perimeter of site (Works No.21).
  - Construction compounds, mobilisation of plant, site welfare and services, commencement of shaft construction at existing Cambridge WWTP (Works No.18, 25 and 28).
  - Establishment of part of Waterbeach Pipeline North (Works No. 33) including temporary site compound to facilitate crossing the railway and to avoid or reduce potential conflict with the new Waterbeach Train Station. This will include up to 50m of pipework installation either side of the railway line.
  - Environmental mitigation works within the CEMP and archaeological work to begin construction.
  - Visual mitigation planting.

- Enabling Works (Phase 2)
  - Establishment of working area by removing topsoil and moving it to a temporary earth bank, and the excavation of subsoil to reduce the site level to that proposed for the finished site. The subsoil will be used to construct the landscaped earth bank around the new works. In addition, establishment of the main site compound, principal store area, sub-contractor compound and a concrete batching plant will take place; this will be located outside of the earth bank and adjacent to the access road to be used during the construction of the works.
  - Create stable working platforms to each works area and construct internal access roads for use by construction plant and material deliveries. Each working area will also be provided with temporary site drainage, the provision of utility services and work area compounds and offices.
- Proposed WWTP Construction
  - Construct both the STC and WWTP, whereby their respective construction programmes will run simultaneously. Both are likely to involve ground improvement to support the structures (potentially piling), secondary excavation to form the footprint of each process unit and both in situ and precast concrete techniques to construction foundations, support structures and tanks. Interconnecting pipework will follow. Once the principal structures are complete the site team will undertake the mechanical and electrical installation packages for each process block. Each process block will then be dry commissioned ready for a co-ordinated wet commissioning programme.
  - Once construction of the WWTP and STC has been established, on-site infrastructure will be constructed, including operational buildings, the permanent access road, car parks, permanent HV/LV switchgear buildings and generator areas. Where possible, topsoil will be placed on the earth bank and early landscape packages started.

3.1.8 Other than bringing utility services of gas, water, power and telecom services into the proposed WWTP, the associated activities for the proposed WWTP include the following:

- Waste Water Transfer Tunnel to bring effluent from the existing Cambridge WWTP to the proposed WWTP;
- the FE pipeline returning the treated water to the River Cam from the proposed WWTP;

- the storm pipeline returning occasional settled storm flows to the River Cam from the proposed WWTP; and
- rising main diversions to bring raw sewage flows that currently arrive at the existing Cambridge WWTP through sewers other than the main incoming tunnel from Central Cambridge.

3.1.9 The likely sequence of these works is as follows:

- construct an access shaft to the Waste Water Transfer Tunnel;
- form the Waste Water Transfer Tunnel between the existing Cambridge WWTP and the proposed WWTP using Micro-Boring Tunnel Machine followed by pipe-jacking techniques;
- use open cut pipelaying techniques to construct the rising main diversions around the existing Cambridge WWTP and into the Waste Water Transfer Tunnel connection chamber; and
- while constructing the Waste Water Transfer Tunnel also construct the FE and Storm Pipeline from the proposed WWTP to the River Cam.

3.1.10 Current key programme durations are:

- enabling phase 1 works and site mobilisation – approximately 3.5 months;
- permanent access road construction – approximately 4 months;
- construction of the Waterbeach pipeline – approximately 12-14 months;
- construction of WWTP including water testing and dry commissioning – approximately 31 months;
- landscaping – approximately 36 months, followed by ongoing maintenance;
- construction of the STC including water testing and dry commissioning – approximately 19 months;
- construction of the outfall (including riverbank protection works) and FE and Storm Pipeline – approximately 12 months;
- construction of the Waste Water Transfer Tunnel – approximately 18 months;
- wet commissioning – approximately 5.5 months; and
- decommissioning the existing Cambridge WWTP – approximately 8 months.

Wet commissioning and transition

3.1.11 During the approximately 5.5 month period of wet commissioning of the proposed WWTP there will be some overlap in the operation with the existing Cambridge WWTP. This will result in a transfer of flow from the existing Cambridge WWTP to the proposed WWTP, a reduction in its discharge rate and a gradual increase in the rate of discharge from the proposed WWTP. At this stage, there will be more than double the treatment capacity available for the same flow to treatment. Discharge consent limits will continue to be complied with throughout this period. No deterioration in water quality would be expected on this basis.

Assessment years

3.1.12 Figure 3.1 above shows the anticipated durations for the construction of the Proposed Development. The Figures below provides a high level programme of construction phase to Year 1 of operation used to develop "assessment years" for the EIA process and operational assessment years, including the proposed Phase 2 construction described at paragraph 1.6.6 above.

3.1.13 The construction commencement date will be dependent on several factors and the earliest possible date that enabling activities could commence is October 2024. The maximum total construction duration is estimated to be three years and 10 months (46 months).

3.1.14 The assumed years for the overall construction are from Year 1 (assumed to commence in 2024) until Year 4 (assumed to commence in 2028) of the construction programme.

3.1.15 The tasks and durations set out in this Chapter are indicative for the purposes of informing assessments presented within the Environmental Statement. The final construction programme will be prepared prior to construction commencement.

3.1.16 Before the main construction can take place a number of activities must be completed, including engineering design, procurement and the discharge of relevant DCO Requirements which may include, in some cases, pre-commencement environmental or archaeological surveys.

3.1.17 The construction durations considered are a realistic worst-case estimate covering construction of the project components to provide treatment capacity associated with phase 1 of design capacity since this represents the peak of activity, for example peak in vehicle movements, peak use of construction plant and equipment, maximum extent of temporary land requirements and land clearance. Section 2 of Chapters 6 -20 has considered the effect of a shift (delay) to the expected start date of Year 1 (assumed to start in 2024) of construction and whether or not this could affect the assessed baseline.

3.1.18 Actual construction durations will be dependent on a number of factors including, the final construction strategy, the availability of materials and components required to complete the works, the availability of specialist staff to complete construction tasks, the duration(s) of approvals for related statutory consents and permits and the occurrence of weather events resulting in delays.

3.1.19 Year 1 of operation is expected to commence in 2028. This represents the start of Phase 1 of operation as set out in Table ***1-3***.

3.1.20 Before Phase 1 of operation can commence a number of activities must be completed, including:

- satisfaction of pre-operation statutory consent conditions; and
- preparation of detailed management and monitoring plans for example:
  - those associated with the LERMP (Application Document Refence 5.4.8.1); and
  - detailed outfall management and monitoring plans as required by the CoCP Part B (Application Document Refence 5.4.8.2)
  - operational logistics plan as required by the CoCP Part B (Application Document Refence 5.4.8.2)
  - updated operational worker travel plan as required by the outline OWTP (Application Document Refence 5.4.19.8)
  - operational bird strike hazard management plan as required by the outline wildlife hazard management plan (Application Document Refence 5.4.8.18)

3.1.21 Year 9 of operation is expected to commence in 2036. This represents the start of Phase 2 construction and operation as set out in Table ***1-3***. For the purpose of assessment, the second phase of operation would be from Year 9 to Year 23 (2036 until 2050).

3.1.22 Before phase of 2 construction and operation can commence a number of activities must be completed, including:

- the Environmental Permit variation (for discharges to water) and satisfaction of associated statutory consent conditions; and
- completion of required management plans, risk and assessments and method statements as required by the operational EMS in relation to works associated with the construction of the final PST and FST.

3.1.23 The operational phase durations considered are realistic worst case estimates taking into account the phased permit in relation to treated effluent volumes as set out within Table 1-3. The actual operational phase durations will be dependent on a number of factors including, the rate of development within the catchment and the corresponding need to complete the works to reach full treatment capacity within the proposed WWTP, and the duration(s) of approvals for related statutory consents and permits.

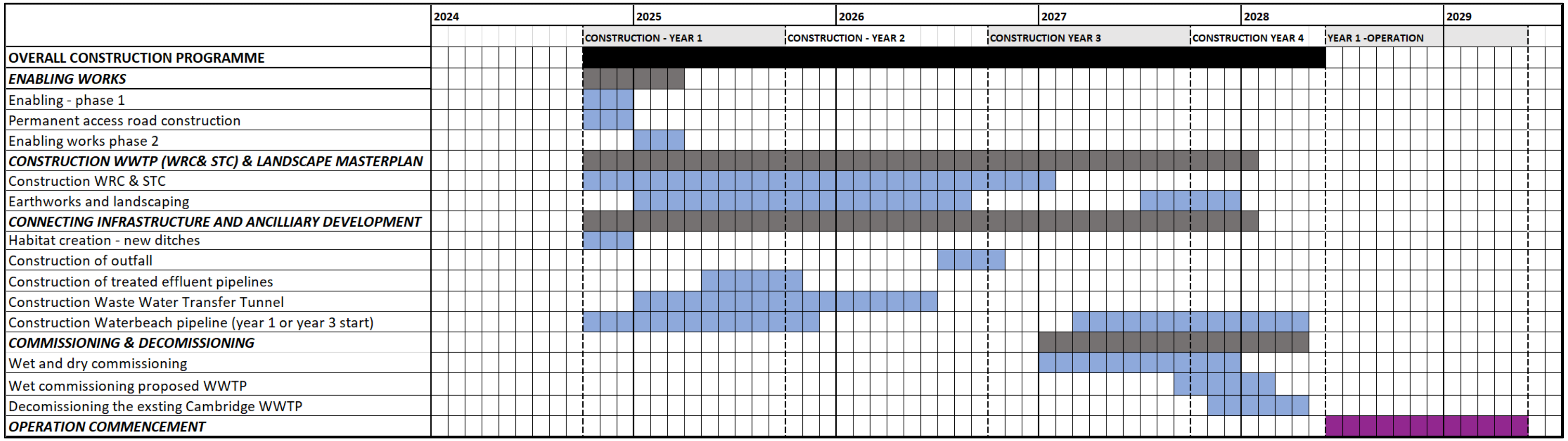


Figure 3.2: Construction years to operation year 1

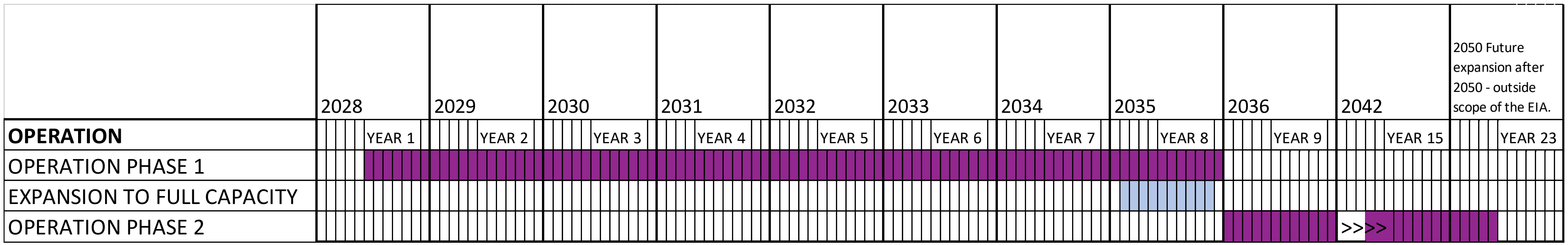


Figure 3.3: Operational years and phase 2 construction and operation

3.2 Working Hours

3.2.1 It is anticipated that industry standard construction working hours (Monday to Friday, 07:00 to 18:00 and Saturday, 08:00 to 16:00) will be generally adhered to during the construction period, with flexibility retained to extend these during the summer months as set out in more detail in the Code of Construction Practice Parts A and B (Application Document Ref 5.4.2.1 and 5.4.2.2) to maximise the works which can be undertaken during this period. Other than at the proposed shaft 4 location where no work outside of the weekday working hours will be allowed or during bank holidays. Some activities will need to take place outside of the industry standard hours. At this stage, the following specific activities have been identified:

- tunnelling – this will take place 24 hours a day, 7 days a week;
- concrete pours – where large concrete pours are required, it is not possible to pause these mid operation;
- major infrastructure crossings including crossing the railway and A14 – the time periods when these works can be undertaken will be dictated and controlled by Network Rail and National Highways respectively;
- 24 hour call out associated with the over pumping for the connection shaft; and;
- deliveries including abnormal loads – in order to mitigate the impact on the road network during peak periods, these will need to take place outside of the standard construction working hours.

3.2.2 Conversely, construction hours will be limited at some locations, for example at the Shaft 4 compound and its access near Red House Close, no noisy or intrusive construction activity will take place before 07:00, and if necessary, workers will not be allowed to access this location before 07:00. Construction work activities will be restricted to the working week and not during the weekends or bank holidays in this location.

3.2.3 Mobilisation activities may take place an hour either side of the construction working hours elsewhere. These activities exclude intrusive noise and include:

- arrival and departure of the workforce at the construction site compounds and movement to/from places of work;
- general refuelling;
- site inspections and safety checks;
- site clean-up (site housekeeping that does not require the use of plant);
- site maintenance; and

- low-key maintenance and safety checking of plant and machinery.

3.3 Construction Techniques and Methodology

Phase 1 Enabling Works

3.3.1 Once site access is permitted Phase 1 Enabling Works will take place before construction activities commence *and any similar ancillary activities related to the carrying out of these works*:

- environmental enabling work to implement the Construction Environmental Management Plan (CEMP) and archaeological work to begin construction.
- pre-construction land drainage to provide a new header main that will drain the existing field drainage system once it is disturbed by the construction work.
- while the permanent access road including the new junction bellmouth (Works No.02) and initial earthworks operations are being carried out, a temporary set of site offices, stacked up to approximately 12m high and welfare units will be established alongside the new site entrance. From this compound, the enabling works will be managed until the permanent site compound is established.
- Commence the earthworks to remove topsoil and subsoil including associated vegetation clearance/trimming from the access road and site compound area l. Any excavated subsoil will be placed directly into the access ramp along side the imported stone for the abutment construction or placed in the earth bank that surrounds the proposed WWTP and forms the operational site boundary. The subsoil will be compacted to an agreed specification. The topsoil will be placed in a separate temporary stockpile adjacent to the permanent earth bank for spreading at a later date. The temporary topsoil stockpile will be covered, seeded and/or kept damp as required to prevent dusting and degradation of the soil;imported stone or soil improvement will be used to establish a site compound, internal site access routes and process plant construction areas.
- temporary perimeter fencing erected around the proposed WWTP development area.
- visual mitigation planting will commence.
- construction compounds, mobilisation of plant, site welfare including services and commencement of shaft 1,2,3 & dewatering pit construction at existing Cambridge WWTP to enable the construction works of the transfer pipeline.

- establishment of part of Waterbeach Pipeline North (Works No. 33) including temporary site compound to facilitate crossing the railway and to avoid or reduce potential conflict with the new Waterbeach Train Station. This will include up to 50m of pipework installation either side of the railway line.

Phase 2 Enabling Works

3.3.2 The following activities make up Phase 2 Enabling Works:

  - site wide top soil strip including associated vegetation clearance/trimming and placement will commence following the access road installation and site compound completion, excavated subsoil will be placed directly into the earth bank that surrounds the proposed WWTP and forms the operational site boundary. The subsoil will be compacted to an agreed specification. The topsoil will be placed in a separate temporary stockpile adjacent to the permanent earth bank for spreading at a later date. The temporary topsoil stockpile will be covered, seeded and/or kept damp as required to prevent dusting and degradation of the soil;

  - In addition, establishment of the main site compound, principal store area, sub-contractor compound and a concrete batching plant will take place; this will be located outside of the earth bank and adjacent to the access road to be used during the construction of the works.

- Once the principal earthwork platforms are complete, stable working platforms will be installed to each working area within the earth bank. These are likely to be constructed from import recycled aggregates and/or use soil improvement techniques such as cement stabilisation. One of these techniques will also be used to establish the site roads, which will later become the permanent access road around the proposed WWTP. From the working platforms, any foundation support systems, such as concrete bored and driven piles or other ground improvement techniques, will be installed below the footprint of the new tanks, chambers and support slabs;

- the final enabling activity to each working area will be to carry out localised earthworks to reshape the footprint of each tank, platform etc. to facilitate the follow-on structure; and

- any below ground pipe work that also extends below the footprint of the new tanks or base slabs will also be installed.

Construction of the WWTP and STC

3.3.3 The construction of the WWTP and STC have similar elements and use similar techniques which are summarised in the below sections. They also involve the three construction disciplines of civil, mechanical and electrical.

Bases, walls and ground and suspended slabs

3.3.4 Generally reinforced in situ cast concrete will be used to construct the bases, walls and slabs of the tanks and chambers that form the structural element of each of the above process tanks.

3.3.5 Where ground bearing cannot be achieved with cast in situ base slabs, a piled solution will be adopted. The assessment of construction activities in the technical chapters has been based on a variety of piling techniques taking place for a maximum duration across the construction period. In the worst case this scenario would entail a maximum of 1500 No 600mm diameter bored piles, across the site, to a maximum depth of 25m.This maximum depth has been set to avoid impacts on the greensands aquifer layer. Hammer driven piles would not be used on the site.

3.3.6 Where it provides carbon, time, and/or cost savings with health, safety, welfare and environmental benefits, in situ concrete techniques will be replaced with either precast concrete or alternative material such as recycled plastic. These alternative techniques are often used to form smaller chambers, or for the walls and suspended slabs within the process tanks.

3.3.7 For smaller above ground tanks, glass coated steel tanks sitting on a concrete slab will be used. These will be brought to site in segments and assembled on site.

Inter-process pipework

3.3.8 Between each process tank, there will be below and above ground interconnecting pipe. The below ground pipework will generally be constructed using open cut techniques. The pipe materials could be made from concrete, ductile iron, uPVC or GRP.

3.3.9 The above ground pipework will be supported on galvanised steel frames and depending on use, could be made from stainless steel, ductile or plastic. Some of the above ground pipework will be clad in insulation to protect it from freezing or to retain heat. Environmental permitting requirements will also influence the pipe design and need for secondary containment.

Access, mechanical and electrical equipment platforms

3.3.10 To support mechanical and electrical equipment and provide access to the tanks; galvanised steel walkways and platforms will be constructed over and up to the process tanks. These will be fabricated off-site and installed on-site.

Process and control building

3.3.11 Some of the mechanical equipment and the electrical control panels will require housing in process buildings or kiosk. These will be provided by a GRP kiosk or by galvanised steel frame building with profiled steel cladding. The solution that is used will depend on the size of the building required. For the GRP kiosk solution, these will be fabricated off-site and brought to site as a complete unit or as segmental units which bolt together on-site. For the steel framed solution, the steel sections will be fabricated off-site, erected on-site and cladding fixed in situ.

Mechanical equipment

3.3.12 Mechanical equipment required for each process will be manufactured off-site and delivered for installation into or adjacent to the process tanks and buildings noted above. They will be fitted and connected on-site as required by the design by specialised sub-contractors.

Electrical equipment

3.3.13 As with the mechanical equipment, electrical equipment will be assembled into control units off site as far as possible (e.g. MCC panels). However, a lot of the electrical cabling and components have to be fitted and connected locally to mechanical equipment and therefore require installing and site with cables passing between each component and its associated mechanical item. The cable will be run on cable trays or with cable ducts. Both high and low voltage cable will be required on site.

Wet and dry commissioning

3.3.14 Once a process unit is assembled and the civil, mechanical and electrical works are complete, the unit is ready to be tested. Three types of test are usually required: water test, dry testing and wet commissioning.

3.3.15 The water test checks that the tank or pipe will hold water at the design pressure and not leak in line with industry guidelines. This can involve significant volumes of water standing in the tanks for a number of days. The water used for these tests is often extracted from a local watercourse or from a temporary lagoon constructed for this purpose, which in this case, might utilise water from the surface water management system. The size of this lagoon is determined by the largest structure on site requiring a water test.

3.3.16 At 4,262m^3, the digesters are the largest structure. Assuming a shallow depth of 1m the lagoon would be 5,000m^2 (or 70m x 70m if square). A small weir will be construction between the main body of the lagoon and the area water is extracted for the test to ensure no sediment is passed forward. This lagoon will be located near to the site compound and outside but as close to the earth bank as possible. The earthworks will be balanced so the spoil excavated to form the bottom will be used to create the sides which will be battered. Therefore, the lagoon will be half below existing ground level and half above. Further works will be completed to see if either the water depth can be increased reducing the overall footprint, or water sourced from elsewhere such as final effluent from the existing Cambridge WWTP or Waterbeach conveyed to the site using either the Waste Water Transfer Tunnel or Waterbeach pipeline, respectively. Alternatively, it may be possible to utilise rainwater or groundwater captured in the on-site surface water system. The source of this water will be agreed as part of a commissioning plan. The source of this water will be agreed as part of a commissioning plan. Subject to ongoing monitoring of groundwater levels and the performance of the on-site drainage system during the construction phase, this lagoon may be retained, modified, or relocated within the proposed WWTP and incorporated in the drainage plan for management of peak rainfall events and groundwater. It may subsequently be used for irrigation of the landscaping features as part of the Landscape, Ecological and Recreational Management Plan (LERMP) (Application Document Ref 5.4.8.14).

3.3.17 Dry testing checks that the mechanical and electrical equipment has been installed correctly and works when required producing its anticipated output (e.g. air flows for blowers and switch limits for control panels).

3.3.18 Wet commissioning is when the plant starts to treat the effluent as it is designed. This is a planned sequence of activities that seeds the process tanks with the biological enzymes and the STC with sludge that each process can treat. This is a gradual operation which will progressively turn the flows from the existing Cambridge WWTP to the proposed WWTP and upon completion, the process of closing down the existing Cambridge WWTP will commence.

3.3.19 Seed sludge for the aeration plant will come from the existing Cambridge WWTP and will either be conveyed by the Waste Water Transfer Tunnel or via sealed articulated tanker. Seed sludge for the digesters will come from another HpH STC (likely to be either Basildon, Cliff Quay or Colchester) and will be transported by sealed articulated tankers. It is common to seed one digester up to approximately 30-50%. This would constitute a volume of up to approximately 2,131m^3, or approximately 42 to 70 tankers at 6% dry solids and will be a phased process completed over several days. Further work will be completed to see if it is possible to retrieve a seed sludge from the existing Cambridge WWTP for the digesters or if the sludge can be delivered as cake and re-wetted on site to reduce the tanker movements required and hence their duration.

Terminal Pumping Station

3.3.20 The TPS is an approximately 20m internal diameter 28m deep shaft that receives waste water from the Waste Water Transfer Tunnel and pumps it to the Inlet Works or to the Storm Tanks. The approximate ten pumps required to pump these incoming flows are installed at the bottom of this shaft and are connected to the inlet or Storm Tanks by large diameter steel pipes rising up the side of the shaft and into a valve chamber adjacent to the TPS.

3.3.21 With a below ground pumping station of this depth, specialised deep shaft construction techniques are required. This may involve segmental shaft lining, contiguous bored or similar techniques. Any groundwater present will be controlled through internal dewatering. External dewatering is not anticipated to be necessary. Once the shaft has been excavated to the required depth, a concrete plug with under reaming to the shaft walls is a possible solution to resist uplift. Once cast, this will form the base of the pumping station.

3.3.22 In situ concrete works will then follow to construct the pumping station within the shaft. This will include forming the aperture to receive the incoming effluent main. The pipe jacked pipe and cutting head of the MTBM will be received through this aperture and removed from the shaft.

3.3.23 Once the in situ concrete works are complete within the shaft, the steel pumped delivery mains from each pump will be installed and fixed to the shaft lining, these delivery mains will leave the shaft via apertures formed in the wall of the shaft and be connected to valves within the adjacent valve chamber.

3.3.24 The large submersible pumps will be installed after the suspended roof slab to the TPS is in place and the pump guides have been fitted.

3.3.25 All cabling from the pumps and the level sensors required to manage the TPS will be wired back to the Motor Control Centre within a Control Building adjacent to the Terminal Pumping Station.

3.3.26 Finally, an overhead crane built within a galvanised steel frame will be installed to allow maintenance of the pumps and other infrastructure.

Site building

3.3.27 The offices and workshops required on this site are anticipated to be structural framed buildings with in situ concrete floor slabs sitting on concrete pad foundations. The build could be a mix of one to two stories with flat roofs. Brick, stone (gabion) or profiled steel cladding will be used to form the perimeter walls, and standard building process will be used to fit out each of the building as required by their purpose. Where practicable the buildings with no flammable process inside them will likely have solar panels fixed to their roofs.

On-site infrastructure

3.3.28 On-site infrastructure includes access roads, parking areas, loading bays and operation yards for the management of incoming and outgoing tankers.

3.3.29 The construction techniques to build these areas will be a mixture of standard designs for reinforced concrete or tarmacadam roadways. Standard construction techniques will be used to construct these. It is anticipated that ground stabilisation methods may be used to for both the subbase on concrete/tarmacadam finishes or indeed be a full road solution itself with a finishing layer of pea gravel.

Off-site infrastructure

Waste Water Transfer tunnel from the existing Cambridge WWTP

3.3.30 Construction of permanent and temporary shafts to access the Waste Water Transfer Tunnel will use similar techniques to those used to construct the shaft for the TPS (shaft 6). The four temporary intermediate shafts (shafts 2, 3, 4 and 5) and 1 permanent shaft (shaft 1) are smaller in diameter, but almost as deep.

3.3.31 Using pipe jacking techniques, the Waste Water Transfer Tunnel will be tunnelled from temporary shaft 5 adjacent to the A14, driving it towards the new works and into the TPS, then driving from the same shaft towards the existing Cambridge WWTP. Due to limits on how far a pipe can drive using this technique, the pipe jacked bore will then be moved to a second temporary shaft (shaft 3) closer to the existing Cambridge WWTP and driven in both directions to complete the tunnel.

3.3.32 Material arising from construction of each intermediate shaft will be stored at the shaft construction compound and used to backfill the shaft on completion of the tunnel construction. All other material arising from the pipe jack construction will be transported to the proposed WWTP and included within the earth bank. The transport of this material will only happen in the daytime working hours and unlikely to be at weekends.

3.3.33 When constructing the Waste Water Transfer Tunnel, the flows to the existing Cambridge WWTP via the existing tunnel will be maintained in operation and protected from damage. When ready, the existing tunnel will be broken into (at shaft 1) and ‘turned’ to divert flows towards the proposed WWTP.

3.3.34 Over pumping of the waste water flows is likely to be used when breaking into the existing tunnel and will require an additional temporary rectangular pumping pit (to provide an adequate connection to the Riverside tunnel), located immediately upstream of shaft 1, complete with submersible pumps and a power supply (from generators) and bypass pipelines (to maintain the flow to the existing TPS).

3.3.35 At around the same time, the gravity and rising main diversions at the existing Cambridge WWTP, which are of smaller diameter (ranging from 225 to 450mm diameter) but similar depth, will also be diverted into the new tunnel at shaft 1. Temporary shored and open cut pipelaying techniques are likely to be used for this work.

3.3.36 The preferred route of the sewer and rising main diversions, and connection pipe, is mainly located within the existing Cambridge WWTP site, with minor works in the vicinity of Cowley Road. Constraints to accommodate include existing services (e.g. gas, water, HV and fibre). Some limited temporary traffic management may be required on Cowley Road to manage any potential connections and excavations within the road and pavement.

FE and Storm Pipeline to the River Cam

3.3.37 The FE and Storm Pipeline will be installed using traditional pipelaying techniques and generally the two pipelines (a 1.5m diameter pipe for FE and an adjacent 1.8m diameter pipe for storm flows) will be installed within a battered excavation. The excavation will vary in depth as the ground level varies and to accommodate the difference in pipe diameters. According to the depth and stability of the excavation, trench shoring may be necessary to provide support and to limit the width of the excavation. The pipes will be lifted into place and jointed using an excavator and/or a crane. The pipes will be backfilled as required by the specification, any excess material will be removed from site and placed in the landscaped earth bank.

3.3.38 Prior to laying the pipes, a working easement will be established, up to 40m wide and fenced on both sides. The easement width will be calculated to allow sufficient area to stockpile topsoil, subsoil, and to allow room to string out the pipes and to provide a working area to lay the pipes whilst also allowing access to the rest of the pipeline and the outlet chamber. The first section of the easement will be accessed from the compound on the proposed WWTP.

3.3.39 It will be necessary for the pipeline to cross the Horningsea Road. The current proposal is to open cut this crossing whilst maintaining single lane access around the excavation. The single lane access will be traffic light controlled and is likely to require a localised diversion around the working area. The full carriageway will be reinstated once the pipes have been laid.

3.3.40 The outfall structure will be constructed on the eastern bank of the River Cam and will be approximately 12m long x 6m wide x 3m deep, as shown on Design Plans - Outfall (Application Document Ref 4.13). The structure may be constructed using in situ or precast concrete and will be built within a sheet pile cofferdam. The cofferdam will be designed to exceed (by maintaining a freeboard) the flood protection levels currently provided by the riverbank.

3.3.41 Areas likely to generate significant sediment, such as during the removal of bed material and placement of scour protection within the river, will be carried out behind the cofferdam using appropriate silt and sediment removal techniques to achieve a compliant water quality standard prior to any discharge back to the watercourse.

3.3.42 When the outfall is complete and connected to the FE and Storm Pipeline the temporary protection from the river will be removed.

3.3.43 During construction, the discharge structure is expected to be accessed along the pipeline easement. As a result, the PRoW along the river will be diverted; it is proposed to divert the footpath from the east bank within the adjacent field. Pedestrians will then be diverted back to the River footpath close to where it joins Green End.

Fen Ditton rising main diversions

3.3.44 The Fen Ditton rising main is a 150mm diameter pump rising main starting at a pumping station in Fen Ditton. It pumps waste water from Fen Ditton to the existing Cambridge WWTP. This main will be diverted with the existing Cambridge WWTP into the proposed interception shaft. The installation is likely to use open cut direct lay techniques to install the pipe. The pipe will be laid at minimum depths where possible.

Waterbeach Pipeline

3.3.45 It is expected that the Waterbeach pipeline will take approximately 12 to 14 months to complete, commencing no sooner than mid-2024 but maybe as late as mid-2027. This is reflected in figure 3.1 showing the early and late options for the construction of the pipeline. Construction of the new Waterbeach pumping station is likely to take place at the same time as the pipeline is laid and will run in parallel (separate to this project). The route of the Waterbeach pipeline, its working corridor and its depth is shown in the long sections on Design Plans - Waterbeach pipeline Long Sections (Application Document Ref 4.14) (note that its depth below the surface depends on the ground level, as the pipeline follows a linear path, whereas the ground does not).

3.3.46 The initial design allows for the Waterbeach pipeline to be connected into the existing Cambridge WWTP. A junction will be installed along its route near the proposed WWTP and a connection laid directly from the junction into the proposed WWTP. Either during commissioning or when the proposed WWTP is operational, the Waterbeach flows will be diverted directly into the proposed WWTP, and the redundant pipe will be blanked off at each end and left in situ. Depending on Waterbeach New Town build out rates, if the pipeline is not required until later in the programme, it could be constructed direct to the proposed WWTP, without the need to connect to the existing Cambridge WWTP. Waterbeach flows will increase gradually as housing and the related development is progressively constructed over a projected sixteen to twenty-year period.

3.3.47 The Waterbeach pipeline will be installed via a combination of open cut and trenchless techniques. Trenchless crossing techniques are proposed for the River Cam, A14 and railway. These will be either horizontal direction drilling (HDD) or pipe jack micro tunnelling.

3.3.48 Directional boring/HDD is generally accomplished in three principal phases. First, a small diameter pilot hole is drilled along a directional path from one surface point to another. Next, the bore created during pilot hole drilling is enlarged to a diameter that will facilitate installation of the desired pipeline. The size of the drill rig, which is located at the drive pit, depends on the length and diameter of the pipe. Lastly, the pipeline is pulled into the enlarged hole, thus creating a continuous segment of pipe underground exposed only at the two initial endpoints. Directional boring can be utilised to cross any number of surface obstacles including roads, railways, environmentally sensitive features, rivers and canals.

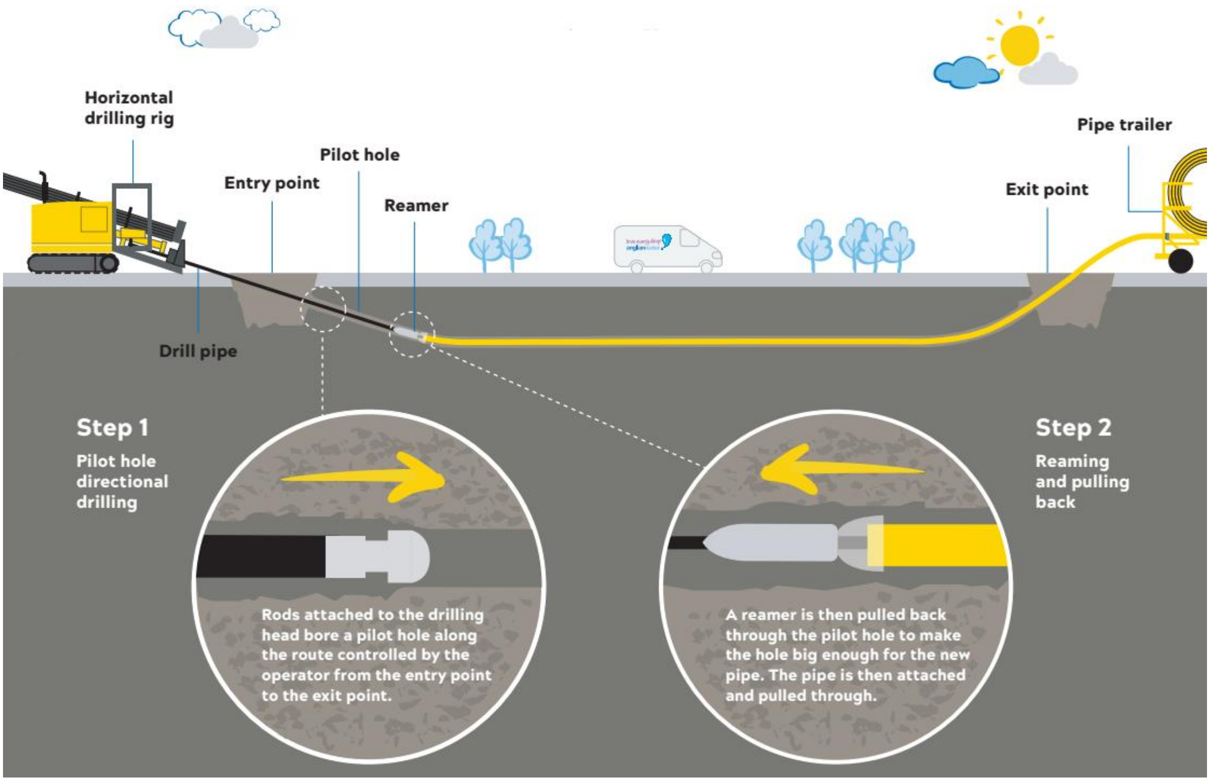


Figure 3.4: Example of a trenchless technique

3.3.49 Where HDD is used, a series of drill pits will be required. The final location of these will be dependent upon the length of the drill shot being undertaken. The associated access pits are expected to be approximately 10m x 5m. There will be a drive pit and a reception pit. These will be backfilled once the drill shot is complete.

3.3.50 Horizontal directional drilling is done with the help of a viscous fluid known as drilling fluid. It is a mixture of water and, usually, bentonite or polymer continuously pumped to the cutting head or drill bit to facilitate the removal of cuttings, stabilize the bore hole, cool the cutting head, and lubricate the passage of the product pipe. The drilling fluid is sent into a machine called a reclaimer which removes the drill cuttings and maintains the viscosity of the fluid for its re-use.

3.3.51 Where pipe jack micro tunnelling is used then a larger access pit and reception pit will be required, circa 15m x 15m. A thrust wall will be installed and a hydraulic ram will be used to drive a cutting machine, behind which sections of pipe will be driven to the reception pit, where the cutting machine will be removed. It is anticipated that this technique will only be used in relation to the southern railway crossing.

3.3.52 In both cases, material excavated from the bore will be temporarily stored in an enclosure and used to reinstate open cut sections of the pipeline, which will be used for the remaining route.

3.3.53 Where the pipeline is installed by open techniques, the topsoil will be stripped including associated vegetation clearance/trimming and placed to one side of the working corridor. Subsoil will also be temporarily removed, whilst a trench in which to lay the pipeline is cut. This will then be backfilled, compacted and the topsoil reinstated. The soil will be reinstated in the order in which it was removed to preserve the soil structure. The excess material will be graded over the full working width as far as possible, to reduce the requirement for off-site removal.

3.3.54 The pipeline will need to cross a number of existing drainage ditches. Shallow ditches will be temporarily dammed and over pumped to maintain water flow whilst excavation works lay the pipe are undertaken. These will be reinstated promptly once the pipe has been laid. Larger ditches may be crossed using trenchless crossing techniques as detailed above. Where land drains are encountered that will be repaired to a standard design.

3.3.55 Testing and commissioning of the pipeline is likely to be done in sections using water supplied by tanker. This may then be recovered or a permit to discharge into local watercourses will be obtained.

Highway modifications and permanent access road

3.3.56 Construction traffic will use the permanent access road in order to access the proposed WWTP. Temporary traffic management will be required during construction of the access road (and associated mitigation measures on Horningsea Road). There may be a requirement for short term road closures (and associated diversion routing) on Horningsea Road for specific construction activities, although these would be kept to a minimum as the diversion route from Horningsea to Fen Ditton (a 1.5 mile journey) is 7.1 miles (via the shortest diversion route: Waterbeach, the A10 and A14). Any road closures will be planned to avoid the working hours of the main site. Access along the existing footway/cycleway on Horningsea Road is to be maintained.

3.3.57 The traffic management proposals on Horningsea Road will be finalised in consultation with National Highways and the Local Highway Authority. It is expected that the majority of the highway works can be carried out under Traffic Management that maintains vehicular access on Horningsea Road, under temporary signal control.

3.3.58 For a limited period of time (approximately three to six months) and to allow construction of the permanent access road, temporary access will be required. This temporary access is proposed to use the existing Horningsea Road and Low Fen Drove Way in part, with a temporary site access formed off Low Fen Drove Way. The access will be designed to segregate vehicle, pedestrians and delivery vehicles from private cars. A temporary diversion of the PRoW will be required during this period to segregate non-motorised users. Sufficient parking and storage areas will be provided so that site operations do not impact the local area. The first part of this site access road will be hard standing and provided with wheel cleaning facilities to make sure no mud etc. is allowed to get onto the existing highways. This temporary site access will be closed when the permanent access road has been constructed and is operational.

3.3.59 All vehicle and pedestrian movements will be managed via a Construction Transport Management Plan (Application Document Ref 5.4.19.7) which will be developed in consultation with key stakeholders and the local community. Good practice measures will be adopted with the aim of reducing both HGV and private car use wherever possible. The design of both the compounds and their access roads will be sympathetic to the local surroundings and take into account how the local community use the surrounding highway network.

3.3.60 A similar approach will be followed for satellite compounds whereby key stakeholders and the local community will be consulted. The existing footway/cycleway to the west of the Horningsea Road carriageway will be maintained with suitable barriers separating the footway from the works. Any site crossing points on the footway will be controlled with suitable traffic management (signals/marshals etc.). This covers the access for site compounds at shaft 4 and 5 off Horningsea Road south of the A14, and the access to the FE and Storm Pipeline easement west of Horningsea Road to the River Cam.

3.3.61 As well as developing temporary accesses into the main and satellite compounds, a construction crossing will be established across the Horningsea Road to link the proposed WWTP, FE and Storm Pipeline and outfall. This crossing will operate whilst the FE and Storm pipeline and the outfall are constructed. The health, safety, and welfare of both existing users and our operatives will be paramount when designing this and all other access points. Traffic management in the form of temporary signal control and lane narrowing will be required during the laying of the FE and Storm Pipeline across Horningsea Road.

Construction equipment

3.3.62 A large amount of construction equipment will be required to support the construction of the proposed WWTP. This will include but will not be limited to earth moving equipment to construct the earth bank, access roads and pipelines, cranage and concreting equipment for the concrete structures, cranage and transport to support the installation of the mechanical equipment and access metalwork, cranage, pipe jacking equipment, and earthmoving equipment to construct the shafts and Waste Water Transfer Tunnel. This equipment will be supported by servicing plant, potentially an on-site concrete batching plant and vehicles. An on-site concrete batching plant would reduce vehicle movements, so the transport assessment assumes no on-site concrete batching plant. There may be occasions when an on-site batching plant would not be able to meet demand or might break down, so flexibility needs to be retained in this regard.

3.3.63 As discussed at Section 1.5 above the project has retained a level of optionality in respect of the proposed concrete batching plant, which would be located in Work No. 21 shown on the Works Plans (Application Document reference 4.3). The batching plant, if required, would be installed following Enabling Works phase 1 and will remain in operation for up to 2.5 years as shown under the ‘construction of the proposed WWTP’ line in figure 3.1. The decision to utilise a concrete batching plant will be made as part of the final design process and through the DCO Requirements, which require a phasing scheme and construction method statements to be developed and agreed with the local planning authority prior to the commencement of development (Application Document reference 2.1).

3.3.64 Plant expected to be used for this type of works are detailed in Table ***3-2***.

Table 3-2: Construction equipment summary

Proposed Development component	Construction equipment
Waste Water Transfer Tunnel shaft and pipe jack	Excavators 30t and 5/8t Tower/mobile crane Muck skips Pipe jack machine Forklift Muck wagons Cabins for compounds Piling rigs
FE and Storm Pipeline	Excavators 30t, 20t and 15t Dumper trucks Crawler crane Rollers Delivery lorries
Outfall	Crawler cranage (40t) Sheet vibratory piling Excavators, long reach, 5t and 20t Concrete wagon and material delivery vehicles 5/10t dumper Cabins for compound
General earthwork and permanent access road	Excavators up to 40t Dump trucks up to 30t Rollers up to 10t Tracked dozers 40t Telehandlers
WWTP and STC concrete structures	Crawler, mobile or tower cranage up to 300t Sheet piling hammer (vibration only expected) Piling rigs

Proposed Development component	Construction equipment
	Excavators, up to 50t Concrete wagon and material delivery vehicles 5/10/20t dumpers Cabins for compound Concreting and access equipment such as compressors, pokers, scaffolding Temporary lighting towers Visiting mobile concrete pump Generators Telehandlers Compressors
WWTP and STC steel process tanks and process equipment	Crawler, mobile or tower cranage up to 300t Sheet piling hammer (vibration only expected) Piling rigs Excavators, up to 50t Concrete wagon and material delivery vehicles 5/10/20t dumpers Cabins for compound Concreting and access equipment such as compressors, pokers, scaffolding Temporary lighting towers Visiting mobile concrete pump Generators Telehandlers Compressors
Internal access roads and infrastructure	Excavators, up to 50t Dump trucks, up to 30t Rollers, up to 10t
Waterbeach pipeline	Excavators from 5-40t Temporary crane (for lifting in tunnelling equipment) Dumpers Tractors, trailers and other fittings Pipe jack machine

Proposed Development component	Construction equipment
	Multiple HDD rigs and associated equipment i.e. slurry cleaning
	Butt fusion machines (for pipe welding) and containers
	Polyhorse (for stacking pipes)
	Forklifts
	Muck wagons
	Rammex machines (for compaction)
	Roller and grader
	Compressors
	Shuttering/trench boxes
	Fuel and water bowsers
	Over pumps for ditch crossings
	Settlement tanks (if de-watering required)
	Generators
	Cabins for compounds
	Waste skips
	Temporary lighting
	Hand tools
Site services equipment	Cabins for main compound
	Generators
	Security fencing and cameras
	Concrete batching plant
	Concrete wagons
	Forklifts / telehandler
	Fuel bowsers and fuel storage tanks
	Tactor and trailer
	Wheel wash
	Pickup trucks and off road vehicles

Construction vehicle movements

3.3.65 Realistic worst case construction vehicle movements are set out in the Traffic and Transport chapter (Chapter 19) and/or accompanying Transport Assessment (Application Document Ref 5.4.19.3). These are based on the am and pm peak hour flows that have been predicted for the project. It is anticipated that abnormal loads will be required for access platform and process tank and pipe bridges, and that delivery of these would be via the main access point. Abnormal load licenses may also be required for pre-assembled process control kiosks.

Construction employment forecasts

3.3.66 Where possible, construction workers will be hired locally, with their access to the site managed through a green travel plan encouraging use of public transport and cycling wherever possible. However, a number of specialist trades are required to deliver the Proposed Development, most or all of which are unlikely to be available within the local area. Therefore, it is anticipated that a number of operatives and members of staff will come from across the UK and potentially Europe.

3.3.67 Figure ***3.5***shows the construction employment forecast for each month over the entire construction phase. The forecast number of staff and operatives required for construction of the Proposed Development is based on similar contracts delivered previously. It is predicted that a peak of 75 supervisory and administrative staff, and 300 operatives would be required across all areas including the existing Cambridge WWTP, the shafts on the Waste Water Transfer Tunnel, the FE and Storm Pipeline and the proposed WWTP. The peak is likely to be reached towards the end of year one and continue through years two and three of the construction programme.

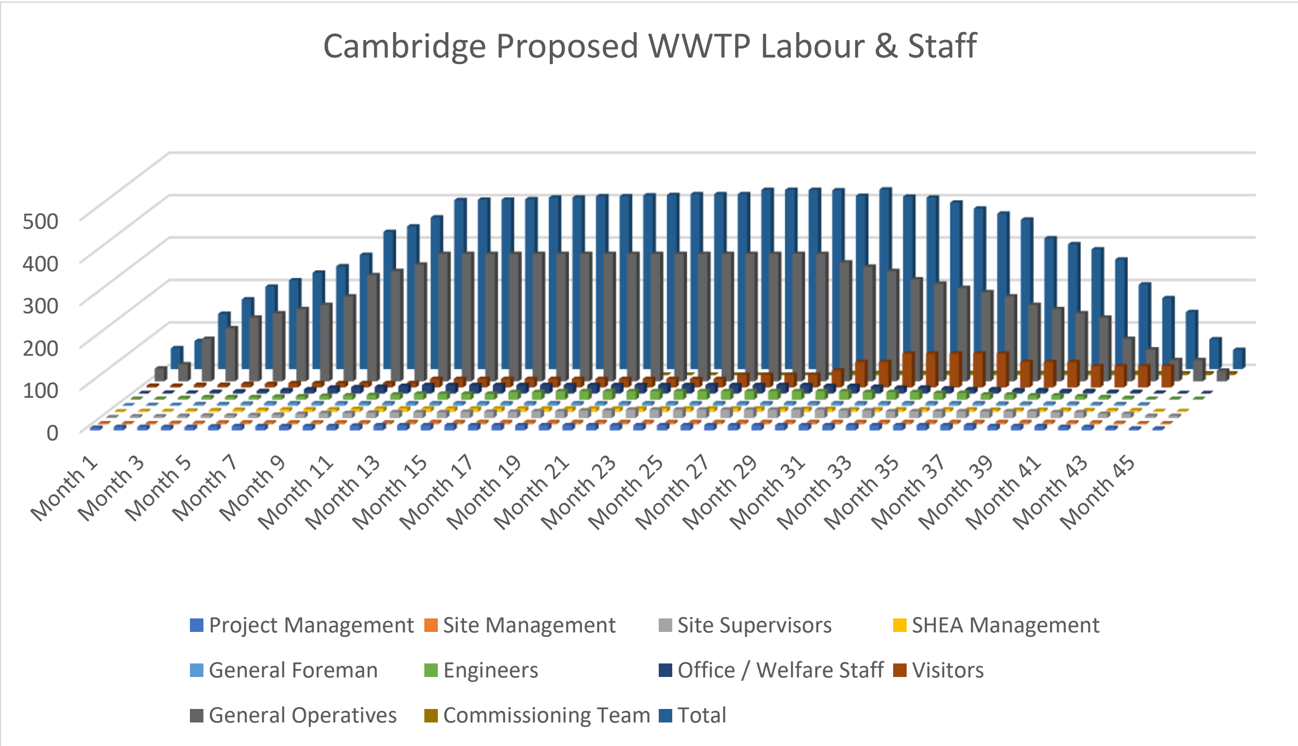


Figure 3.5: Construction employment forecast

3.3.68 Forecasts of where materials and equipment will be delivered from is based on works carried out on similar contracts in this area and across the UK. Where possible, local suppliers will be used. However, their supply chain may be located across the UK or abroad. The source of materials does not affect the transport assessment, given that the strategic highway network has the capacity to accommodate these flows. It is desirable to seek local sourcing where possible to reduce vehicle miles, total emissions and transport costs, but this is subsidiary to the need to deliver materials of an appropriate quality and longevity.

3.3.69 Generally, aggregates and off-site concrete production will be procured locally. All suppliers appear to be located to the west of the site either around the Milton area because of the rail head or to the north west towards Peterborough.

3.3.70 UK manufactured precast concrete units for the process tanks are generally produced in the Midlands or the North West. If overseas suppliers are used, they are generally located in Ireland or Scandinavia and imported through Hull.

3.3.71 Fabricated process equipment and access metal work can be supplied by equipment manufacturers across the UK. Most of these are to the west of the site and located in the Midlands, North West and North East of the country.

Construction compounds

3.3.72 The main construction compound and project administration building will be located on the proposed WWTP and adjacent to Horningsea Road. As well as providing accommodation and car parking for project operational, administrative and welfare functions, this compound will provide supplier and material storage and workshop compounds for plant and equipment maintenance areas. Off-loading areas, security control and potentially a concrete batching plant will also be located in this area. An indicative layout of each of the construction compounds is shown on the General Arrangement Plan (Application Document Ref 4.2).

3.3.73 For the construction of the proposed WWTP, the land identified for the proposed WWTP is of sufficient area to accommodate the construction of the proposed WWTP temporary uses including construction laydown within the permanent footprint of the plant and landscaping as illustrated in the General Arrangement Plans (Application Document Ref 4.2).

3.3.74 Other components of the Proposed Development, such as pumping stations, the outfall to the River Cam, pipe jacking and pipe laying will all require construction compounds, as shown in the General Arrangement Plans (Application Document Ref 4.2). These locations are fixed with the exception of the Waterbeach construction compounds which will be located within the corridor identified at approximately 1km intervals. A summary of all required construction compounds is provided Table ***3-3***.

Table 3-3: Construction compounds[3]

ID	Proposed Development component	Location	Compound area required	Access
1	Existing Cambridge WWTP tunnel interception shaft (shaft 1)/pipe jack reception shaft (shaft 2)	Existing Cambridge WWTP	60 x 130m	From within existing Cambridge WWTP
2	Pipe jack intermediate shaft 3	Existing Cambridge WWTP	64 x 60m	From within the existing Cambridge WWTP
3	Pipe jack intermediate shaft 4	East of Green End Road adjacent to the River Cam	64 x 60m	Off the B1047 Horningsea Road
4	Pipe jack intermediate shaft 5	West of Horningsea Road, south of Poplar Hall access track	64 x 60m	Off the B1047 Horningsea Road
11	Riverside compound for outfall	Location to be agreed with the Environment Agency along river Cam bank	40 x 25m	Accessed from the pipeline easement

Waterbeach Pipeline

<u>Construction phasing</u>

3.3.75 It is expected that the Waterbeach pipeline will be constructed by up to five different full-time teams. There will be around 15 operatives with up to five supervisors and managers. Visitors, such as designers, will also be expected on-site along with associated environmental advisors, such as an ecologist. Various sub-contractors will be required for specialist elements of the works and these will come on-site as required.

3.3.76 While the final phasing of laying the Waterbeach pipeline has not been finalised at this stage and it could proceed in either direction or in more than one section at a

3 The location of construction compounds and intermediate pipe jack shafts is shown on General Arrangement Plans (Application Document Ref 4.2) and the Works Plan (Application Document 4.3.11). Pipes will be laid out temporarily at intervals along the Waterbeach corridor for progressive installation and reinstatement.

time, different gangs would have different responsibilities. For example, one gang may be welding sections of the pipeline, one preparing drill shots and one laying the pipeline via open cut. It is anticipated that on average 40-50m of pipeline will be laid per day where open techniques are used once site preparation works (i.e. topsoil strip and pipe welding) have taken place.

Construction access

3.3.77 Temporary access to the working corridor will be from the adopted road network along existing farm and field access tracks as shown on the Access & TRO Plans. The main temporary access locations (i.e. those required from the adopted road network) are shown in Table 3(where C denotes construction, O operation and A access, so COA9-3 is construction and operational access 9-3). Works to upgrade the access points, including associated vegetation clearance/trimming, are anticipated to accommodate construction vehicles. If required, topsoil may be stripped including associated vegetation clearance/trimming, a mat, gravelling or hard pack will be laid along the tracks and along the working strip to allow vehicles to track through the fields, thereby avoiding the need to take construction traffic through Horningsea. Hardstanding may be required on a seasonal basis. The hardstanding, gravelling and/or mat will be either retained or removed when the works are complete and are likely to be utilised within the proposed WWTP or recycled for use elsewhere and the top soil will be restored.

Table 3-4: Waterbeach pipeline construction access locations via adopted road network

Reference/location	Description of work required	Temporary/ permanent
COA9-3 / Off Bannold Drove	Hardcore/vegetation clearance	Temporary
COA9-1 / Off Bannold Road	Hardcore/vegetation clearance	Temporary
COA8-3 / Off Burgess's Drove	Hardcore/vegetation clearance	Temporary
COA8-1 / Off Clayhithe Road	Hardcore/vegetation clearance	Temporary
COA7-1 / Off Clayhithe Road	Hardcore/vegetation clearance	Temporary
CA7-1 / Off Clayhithe Road	Hardcore/vegetation clearance	Temporary
COA6-2 / Off Clayhithe Road	Hardcore/vegetation clearance	Temporary
COA6-1 / Off Horningsea Road	Hardcore/vegetation clearance	Temporary
CA2-1 / Off Fen Road	Hardcore/vegetation clearance	Temporary
CA2-2 / Off Horningsea Road	Hardcore/vegetation clearance	Temporary
CA2-3 / Off Horningsea Road	Hardcore/vegetation clearance	Temporary
CA2-7 / Off Horningsea Road	Hardcore/vegetation clearance	Temporary
CA2-8 / Off Horningsea Road	Hardcore/vegetation clearance	Temporary
CA2-9 / Off Horningsea Road	Hardcore/vegetation clearance	Temporary
CA1-1 / Off Cowley Road	Hardcore/vegetation clearance	Temporary

Construction compounds and laydown area

3.3.78 Laydown areas will be required along the route of the new rising main, located approximately every 1km within the construction corridor which will be used to store sections of the pipeline whilst the construction takes place. Each laydown area is expected to be a maximum of 20m x 80m. As a reasonable worst case scenario, it has been assumed that each will require the topsoil to be stripped including associated vegetation clearance/trimming, a barrier laid (i.e. terram) and the area covered with temporary hardstanding. The hardstanding will be removed, and the topsoil reinstated when the use of the laydown area ceases.

3.3.79 Compound areas will also be required. The primary compound will be located at the Waterbeach end of the pipeline. This will be a maximum of 100m x 100m. Topsoil will be stripped including associated vegetation clearance/trimming, a barrier laid (i.e. terram) and the area covered with hardstanding. The hardstanding will be removed, and the topsoil reinstated when the use of the compound area ceases.

3.3.80 Satellite welfare units will also be required. These would be mobile units (eco unit or similar) which will move with the construction gang along the pipeline and would be located within the working corridor.

Construction working area

3.3.81 The working area will generally be delineated by a post and rope fence, except in fields where livestock is present in which case livestock or horse fencing will be used.

Public rights of way

3.3.82 The proposed pipeline route would cross seven existing PRoW. One PRoW would not be affected because of the use of HDD. A section of PROW 85/6 along the river will be closed for up to 6 months and a diversion put in place. It is not proposed to close any of the remaining six PRoW; rather, safe priority crossings and/or temporary diversions will be put in place. Safe access for users of the PRoW will be maintained at all times.

Construction vehicle movements

3.3.83 Table 3-5 outlines the expected large vehicle/HGV movements associated with construction of the Waterbeach pipeline.

3.3.84 It is anticipated that construction movements will be highest during the first eight weeks of construction when all the equipment including the pipe sections, pipe rings, plant and machinery are delivered to site and the compound area set up. During this period, hardstanding will also be brought to site and laid along both the access tracks and working strip as required by ground conditions. Construction vehicle movements will then peak again during the last eight weeks when the hardstanding is removed from site along with the plant and machinery and the compounds dismantled.

3.3.85 Construction vehicle movements between these periods will reduce significantly and largely be limited to one off deliveries for specific infrastructure items (i.e. additional pipework and fittings) along with travel to and from site by operatives, supervisors and managers along with associated visitors.

3.3.86 It is expected that the first 4.2km of the pipeline will be accessed from the north via the A10 and Waterbeach whilst the remaining 3.8km would be accessed from the south primarily via A14 Junction 34, with a small element of construction traffic accessing the existing Cambridge WWTP via A14 Junction 33.

Table 3-5: Large vehicle/HGV movements associated with the Waterbeach pipeline (two way)

Activity	Duration	North/south	Vehicle movements per day (two way)
Deliveries of hardstanding, pipe sections, pipe rings, plant and machinery and compound equipment i.e. site cabins etc.	8 weeks	North	68-81
		South	76-89
Deliveries of specific infrastructure requirements i.e. kiosks/pumps, removal of spoil from excavations	35-44 weeks	North (Waterbeach sites)	20
		South (Transfer Tunnels access, Fen Road and Cowley Rd)	40
Removal of hardstanding, plant and machinery, compound equipment i.e. site cabins etc.	8 weeks	North	68-81
		South	76-89

Construction environmental management

3.3.87 A Code of Construction Practice (CoCP) (Application Document Ref 5.4.2.1 and 5.4.2.2), Construction Traffic Management Plan (Application Document Ref 5.4.19.7), Construction Workers Travel Plan (Application Document Ref 5.4.19.9) and Outline Soil Management Plan (Application Document Ref 5.4.6.3) have been produced as part of the DCO application. The aim of the CoCP and related management plans is to reduce impacts from:

- use of land for temporary laydown areas, surface water management, accommodation etc.;
- construction traffic (including parking and access requirements) and changes to access and temporary road or footpath closures (if required);

- noise and vibration;
- utilities diversion;
- dust generation;
- soil removal; and
- waste generation.

3.3.88 The appointed construction contractor will be required to adhere to the management plans prepared as part of the DCO and will identify the procedures to be adhered to and managed by the Principal Contractor throughout construction.

3.4 Decommissioning of existing Cambridge WWTP

3.4.1 As part of the relocation process, the existing Cambridge WWTP will be decommissioned once the proposed WWTP is fully operational in accordance with outline Decommissioning Strategy (Application Document Ref 5.4.2.3). The scope of the decommissioning will align with the requirements set out by the Environment Agency to surrender the current operational permits, specifically the final effluent and storm discharge consents, and sludge treatment operation permit.

3.4.2 Decommissioning will include the draining down and cleaning of existing tanks (including the disposal/treatment of any waste), making the plant mechanically and electrically safe, preventing heat generating equipment from being operated and prevention of rainwater storage in open top tanks.

3.4.3 After completion of the draining down, cleaning and puncturing of all tanks to ensure that no rain water will be captured, the HV network will be isolated and locked off. Once all HV transfers and ring main units are proven dead, cables will be disconnected, blank any holes, cut the cables and pot end. Upon completion of the HV network, the electrical disconnection of all equipment will take place. This will follow the same process in terms of proving dead, removing all fuses, disconnecting all cables, filling/blanking all holes, cutting the cables and where possible pot ending each cables at one end. The cables will be removed from both the field end and the Motor Control Centre (MCC) end. With regards to mechanical decommissioning, the pipework will be disconnected at each end where possible, allowing the pipe to vent, clean and blank the pipes at each end where possible.

3.4.4 Currently, treated waste water is discharged below the river surface via the existing outfall, which is an unobtrusive concrete structure on the east bank of the River Cam, set mostly below the river surface, approximately 30m south of the A14 bridge, as shown on General Arrangement Plans (Application Document Ref 4.2). A short section of concrete capping beam is visible, set flush with the ground at this location. The existing final effluent outfall to the River Cam will be blanked off at each end, without the need for any construction work at the outfall and left in situ. The connection shaft for the Waste Water Transfer Tunnel will be within the existing

Cambridge WWTP site and will be a permanent surface feature to allow access for future maintenance activities.

3.4.5 A summary of decommissioning activities considered within this ES is provided in Table 3-6.

Table 3-6: Existing Cambridge WWTP decommissioning activities

Feature	Description of decommissioning activity
Existing redundant and previously decommissioned filter beds	No action required.
Existing redundant humus tanks and previously decommissioned	No action required.
Terminal Pumping Station	Remove pumps, electrically isolate with cables cut and labelled to prevent use and isolate the incoming flows (pipe stopper and concrete infill inlet pipe approximately 16m deep). Washdown tank, flush pipes and residual sludge to be removed. Access to walkways and ladders/stairs to be prevented.
Inlet screen structure (including detritor)	Clean screens and structure, electrically isolate with cables cut and labelled to prevent use. Existing pipes to be flushed and capped. Wash water to be isolated. Detritor grit to be removed off-site and tank cleaned, mechanical and electrical items isolated and electric cables cut and labelled to prevent use. Access to walkways and ladders/stairs to be prevented.
Wash water system (x2)	Pipelines are already flushed by the nature of the effluent in the mains. Stream C has a storage tank that needs to be drained, washed and de-sludged and then mechanically and electrically isolated with cables cut and labelled to prevent use.
General site utilities	UKPN to decommission all incoming power to the existing Cambridge WWTP. Decommission the HV network across site. The HV system on-site will have all cables disconnected, cut and pot ended to ensure no reconnection is possible.
Potable water supply	Cambridge Water to decommission.
Primary Settlement Tanks	Drain down, de-sludge and clean tanks. Mechanically and electrically isolate with cables cut and labelled to

Feature	Description of decommissioning activity
	prevent use. Access to walkways and ladders/stairs to be prevented.
Stream D forward feed pumping station (including interconnecting pipework)	Remove pumps, electrically isolate with cables cut and labelled to prevent use. Washdown tank, flush pipes and residual sludge to be removed. Access to walkways and ladders/stairs to be prevented.
Stream C distribution chamber	Tank to be drained, de-sludged and cleaned with pipework flushed. Access to walkways and ladders/stairs to be prevented.
ASP structures	Tanks to be drained, de-sludged and cleaned including flush pipes. Electrically isolate with cables cut and labelled to prevent use. Access to walkways and ladders/stairs to be prevented.
Final Settlement Tanks	Drain down, de-sludge and clean tanks. Mechanically and electrically isolate with cables cut and labelled to prevent use. Access to walkways and ladders/stairs to be prevented.
FE outfall pipework	Isolate and cap off to prevent river flows coming back into the existing Cambridge WWTP by installing stop locks in the outfall as allowed for in its design with no need for material construction activity.
SAS / primary thickening building / SAS storage tank / liquor returns pumping station	To be drained, de-sludged and cleaned with pipework flushed. Electrically isolate with cables cut and labelled to prevent use. Access to walkways and ladders/stairs to be prevented.
CHP / digester / gas plant / centrifuge / compost plant / monsal plant	Drain tanks, and flush and purge (removal explosive gases) pipes. Mechanically and electrically isolate with cables cut and labelled to prevent use. Access to walkways and ladders/stairs to be prevented.
Sludge import area	Empty and clean chamber, flush pipework clean.
Sludge blending tanks and drum thickeners	Empty and clean tank, flush pipework clean. Mechanically and electrically isolate with cables cut and labelled to prevent use. Access to walkways and ladders/stairs to be prevented.
Redundant sand filter	Remove effluent and solids, clean chamber. Mechanically and electrically isolate with cables cut and labelled to prevent use. Access to walkways and ladders/stairs to be prevented.
Storm Tanks and storm lagoon	Washdown area, remove sludge, flush pipes, cap off pipe at ground level.

Feature	Description of decommissioning activity
Ferric dosing	Chemical to be removed by certificated carrier. Chemical bund, pumps and all chemical pipework to be flushed and cleaned. Mechanically and electrically isolate with cables cut and labelled to prevent use. Access to walkways and ladders/stairs to be prevented.
Innovations centre	Mechanically and electrically isolate with cables cut and labelled to prevent use. Access to walkways and ladders/stairs to be prevented.

3.5 Site wide works

3.5.1 Various other minor incidental works and/or activities will be required to facilitate the wider development, including:

- highways works, including diversions, kerb alterations, white lining, road markings, re-surfacing, laybys, traffic calming, vegetation clearance, traffic management and turning areas;
- road and traffic signage;
- footpaths;
- fencing, security and safety measures including closed-circuit television (CCTV) cameras and columns;
- access gates;
- drainage including pumping stations and attenuation tanks, manholes, highways and internal road drainage, land drainage restoration and diversion, ground and surface water treatment facilities, soakaways and swales and other sustainable drainage systems;
- chemical dosing pipework;
- temporary construction lighting;
- operational and maintenance task lighting;
- communication and control infrastructure;
- telemetry infrastructure including outstations;
- hard and soft landscaping;
- vehicle restraint systems;

- temporary ramps, accesses, non-motorised links, and crossing facilities during construction works;
- temporary welfare facilities;
- works associated with decommissioning the existing Cambridge Waste Water Treatment Works and assets in Cowley Road, and the existing Waterbeach Wastewater Treatment Works including the diversions of existing utilities and services;
- works within the existing sewers, chambers and culverts and other structures that comprise the existing sewerage network for the purposes of connecting to the Proposed Development, including reconfiguring, modifying, altering, repairing, strengthening or reinstating the existing network;
- works within existing pumping stations including structural alterations to the interior fabric of the pumping station(s), works to reconfigure existing pipework, provision of new pipework, new penstock valves and associated equipment, modification of existing electrical, mechanical and control equipment, and installation or provision of new electrical, mechanical and control equipment;
- installation of electrical, mechanical and control equipment in other buildings and kiosks and modification to existing electrical, mechanical and control equipment in such buildings and kiosks;
- installation of pumps in chambers and buildings;
- works to trees and landscaping works not comprising development;
- works associated with monitoring of buildings and structures;
- works required for the strengthening, improvement, maintenance or reconstruction of any street;
- works to place, alter, remove or maintain street furniture or apparatus in a street, or apparatus in other land, including mains, sewers, drains, soakaways, pipes, cables, and ducts;
- temporary suspension of existing moorings and the relocation of boats/vessels including works to attach mooring structures and equipment to the boats/vessels.
- works to install, divert, repair, replace, maintain and decommission gas, potable water, waste water, electricity and telecommunications services and apparatus; and
- within the inner boundary of the earth bank (Work No. 15):

- internal access and circulation roads, turning areas, hardstanding, and parking;
- air, steam and hot water distribution infrastructure;
- motor control centres (MCC);
- local control panels (LCP);
- programmable logic controllers (PLC);
- HV Switchgears and transformers;
- solar photovoltaic panels;
- switchgear buildings, battery storage buildings and associated connections to the solar PV panels installed in connection with Work Nos. 7, 15 and 19;
- kiosks;
- gas infrastructure;
- closed-circuit television cameras and columns;
- odour ducting and treatment; and
- lightning protection infrastructure including masts, finials, earth matts and bonding.

4 Operation and Maintenance

4.1.1 As part of its asset and operational management system, Anglian Water Services Limited will require access to maintain all of the assets included within the Proposed Development. Typically preventative, predictive and reactive maintenance plans, processes and procedures will cover the full range of activities, from monitoring, inspections, calibrations and testing to repair, overhaul and replacement. Maintenance includes inspection, repair, adjust, alter, remove, clear, refurbish, reconstruct, re-lay, demolish, replace or improve the Proposed Development including undertaking any associated earthworks or maintenance of drainage works and maintenance under the LERMP (Application Document Ref 5.4.8.14). Most assets have a design life of between 5 and 25 years, although non-moving parts such as concrete structures, foundations and pipelines would have much longer expected lifetimes. Examples of annual maintenance activities include:

- overhaul chemical feed pumps, such as O-rings, check valves, and diaphragms;
- inspect and clean chemical feed lines and solution tanks;

- calibrate chemical feed pumps after overhaul;
- operate valves;
- inspect chemical safety equipment and repair or replace as needed;
- inspect, clean, and repair control panels;
- inspect storage tanks and vessels and clean if necessary;
- flush the distribution system and test/check fire system valves;
- identify and evaluate distribution system leaks;
- establish/update water loss mitigation programme;
- inspect, maintain and repair pipes, pumps and valves;
- inspect, maintain and repair tunnels, pipelines and outfall structures; and
- incidental maintenance of an inconsequential nature such as painting, signage and demarcation.

4.1.2 At times, repairs to the transfer pipelines may be required. These activities are not likely to occur frequently, and in each instance are expected to take up to a week and require two vans, one excavator, and one LGV.

4.1.3 The operational working patterns for the proposed WWTP follow a shift pattern to ensure the site is continuously manned, with a skeleton crew present overnight. For day staff the normal start time is 08:00-09:00, ending between 17:00-18:00. Staff will arrive before and leave after their shift. Out of hours response services operate 24 hours a day, 365 days a year to respond to emergencies and incidents. By definition, such events are infrequent.

4.1.4 In addition to the routine activities described above, the operation and maintenance of the plant will also include a programme of asset replacement, depending on their design life.

4.1.5 The relevant asset design life information is outlined below.

Table 4-1: Asset design life summary

Description	Asset Life
Buildings: steel frame: non operational	50
Buildings: steel frame: operational	50
Cranes: overhead gantry	25
Infrastructure: sewers / outfalls	160

Description	Asset Life
Operational structures: concrete	60
Operational structures: on-site pipework	60
Operational structures: steel	20
Operational structures: glass reinforced plastic	25
Operational structures: glass coated steel	20
Permanent roads / hard standing: operational sites	60
Plant: mechanical and electrical static: excl MCC & Borehole pumps	20
Plant: mechanical and electrical static: control panels / MCC	25
Plant: mechanical and electrical static: small pumps < 7.5kw	10
Telemetry: equipment / instrumentation / cabling	15

4.1.6 The assessment of the Proposed Development has assumed asset replacement on a like for like basis once these lifetimes are reached.

4.1.7 There are no current plans to decommission any part of the proposed WWTP, which is designed to accommodate future flows until the end of the current local plan period (2041) and then to be capable of expansion in space that has been provided within the earth bank and by modification, enhancement and optimisation of the design to accommodate anticipated flows into the 2080s and 2090s and beyond. The only circumstances where the proposed WWTP might need to be decommissioned would be if Cambridge were expanded into the Green Belt surrounding the proposed WWTP. This is considered to be a sufficiently unlikely scenario that it does not need to be addressed. In the unlikely event that this might occur, it would be subject to a separate planning process and assessment at the time. Decommissioning would be likely to follow a reverse sequence of construction and commissioning, along broadly similar lines as set out in this chapter for the proposed and existing Cambridge WWTP.

5 Major Accidents and Disasters

5.1.1 In general, major accidents or disasters, as they relate to the Proposed Development, fall into three categories:

- events that could not realistically occur, due to the nature of the Proposed Development or its location;
- events that could realistically occur, but for which the Proposed Development, and associated receptors, are no more vulnerable than any other development; or
- events that could occur, and to which the Proposed Development is particularly vulnerable, or which the Proposed Development has a particular capacity to exacerbate.

5.1.2 In order to address potential major accidents and disasters associated with the Proposed Development, an exercise was completed at scoping stage to identify all possible major accidents or disasters that could be scoped out. The results of this exercise are presented in Appendix I of the Scoping Report (Application Document Ref 5.4.4.3).

5.1.3 A summary of major accident or disasters that were not able to be scoped out is provided in. Reference is made to where these have been considered in the ES technical chapters, where relevant.

5.1.4 Mitigation against the potential for major accident and disasters has been identified during the EIA process and is provided for in three main ways:

- As a requirement of relevant Environmental Permits e.g. Flood Risk Activities Permit, Industrial Emissions, Medium Combustion Plant , as detailed in the Consents and Other Permits Register (Application Document reference 7.1)
- Under other legislation, detailed in the table below, including additional consents such as Hazardous Substance Consent (Application Document reference 7.1)
- Through management plans secured through the Development Consent Order (Application Document reference 2.1) including Emergency Preparedness Plans ("EMP" under the Code of Construction Practice, Application Document Reference 5.4.21, "CoCP", which also covers operational emergency preparedness) and the Asset Management Plan (secured under Requirement 19 of the draft DCO, "AMP")

Table 5-1: Major accident and/or disasters hazard controls

Hazard	Primary mitigation	Secondary mitigation (CoCP / other management plan)	Tertiary mitigation	Relevant item in order application
Hydrological disasters				
Flood and extreme rainfall River flooding affects construction works, people and property	Avoidance of works near flood defence assets. Siting out of floodplain as much as possible Construction method for the outfall will developed with the Environment Agency via the FRAP process.	Code of Construction Practice (CoCP) with specification to prepare detailed management plans: • Emergency Preparedness Plan	Compliance with required regulatory requirements such as (not exhaustive): • Environmental permit (flood risk activities permit) • CDM Regulations	Chapter 20: Water Resources CoCP
Extreme flood event Affects outfall operation and or surface water flooding affect proposed WWTP	Maintain contiguous line of defence to appropriate level within design Outfall and surface water drainage design to 1% AEP event with allowance for climate change	Compliance with management framework: • Contingency plans • Flood warning and flood resilience and recovery planning	Compliance with required regulatory requirements such as (not exhaustive): • Environmental permit (flood risk activities permit) • CDM Regulations	Chapter 20: Water Resources Flood risk assessment (Application Document Ref 5.4.20.1) Drainage Strategy (Application Document Ref 5.4.20.12) CoCP, AMP
Aviation				
Aviation hazard Aircraft hazard collision risk with cranes or tall	Equipment selection Timing of use	<u>**Construction**</u> CoCP measures include:	Compliance with required regulatory requirements	CoCP / EMP

Hazard	Primary mitigation	Secondary mitigation (CoCP / other management plan)	Tertiary mitigation	Relevant item in order application
equipment used during construction of Proposed Development	Highest structures within the permitted limits of safeguard zone	• Requirement to obtain permits for cranes and tall equipment • Emergency response plans **Operation** • Compliance with required management framework. • Associated contingency / incident response plans	Cranes and tall equipment permit from Cambridge Airport	Works Plans (Application Document Ref 4.3) Drainage Strategy (Application Document Ref 5.4.20.12) Details of any agreements with Cambridge Airport
Aviation hazard Aircraft hazard (new or different bird attractants from expanse of cleared landscape / earthworks)	Sequencing of earthworks	CoCP measures such to control attractants Wildlife hazard management plan	Compliance with required regulatory requirements such as (not exhaustive): • Health Safety at Work Act etc 1974 • CDM Regulations • The Department for Transport Circular 1/2010 'Control of Development in Airport Public Safety Zones'	Chapter 8: Biodiversity CoCP (Application Document Ref 5.4.2.1 & 5.4.2.2) Wildlife Hazard Management Plan (Application Document Ref 5.4.8.18)
Aviation hazard New lighting / glint & glare hazards associated within the Proposed Development	Lighting designed in accordance with requirements of the safeguard zone	Operational lighting / solar PV operations as agreed with Cambridge Airport	Compliance with required regulatory requirements such as (not exhaustive): • CDM Regulations • Health Safety at Work Act etc 1974 • The Department for Transport Circular 1/2010 'Control of	Chapter 2: Project Description Chapter 15: Landscape and Visual Amenity Glint and Glare Assessment

Hazard	Primary mitigation	Secondary mitigation (CoCP / other management plan)	Tertiary mitigation	Relevant item in order application
			Development in Airport Public Safety Zones4The Department for Transport Circular 1/2010 'Control of Development in Airport Public Safety Zones' (Department for Transport, 2021)	(Application Document Ref 5.4.15.4) CoCP / EMP / AMP
Aviation hazard New or different bird attractants associated with landscaping	Landscaping designed in accordance with requirements of the safeguard zone	Wildlife Hazard Management Plan	Compliance with required regulatory requirements such as (not exhaustive): • CDM Regulations • The Department for Transport Circular 1/2010 'Control of Development in Airport Public Safety Zones' (Department for Transport, 2021)	Chapter 8: Biodiversity CoCP (Application Document Ref 5.4.2.1 & 5.4.2.2) Wildlife Hazard Management Plan (Application Document Ref 5.4.8.18)
Engineering accident/failures				
Tunnel failure Failure in construction during tunnelling under road and rail infrastructure	BAPA agreement with Network Rail Highways permits / agreements Flood risk activities permit Design and method statements	CoCP measures with specification to prepare detailed management plans: • Contingency plans • Emergency response plans • Safety plan	Compliance with required regulatory requirements such as (not exhaustive): • Health Safety at Work Act etc 1974 • CDM Regulations • Environmental permitting regulations	Chapter 2: Project Description CoCP, EMP, Protective Provisions

4 Control of development in airport public safety zones - GOV.UK (www.gov.uk)

Hazard	Primary mitigation	Secondary mitigation (CoCP / other management plan)	Tertiary mitigation	Relevant item in order application
Flood defence failure Flood defence failure results in flooding and affects construction works, people and property	Maintain contiguous line of defence to appropriate level Avoidance of flood defences by directional drilling/ pipejacking technique under water courses Construction method for the outfall will developed with the Environment Agency via the FRAP process	COCP with specification to prepare detailed management plans: • Flood management plan • Contingency plans • Emergency response plans	Compliance with required regulatory requirements such as (not exhaustive): • Health Safety at Work Act etc 1974 • CDM Regulations • Environmental permitting regulations	Chapter 20: Water Resources CoCP (Application Document Ref 5.4.2.1 & 5.4.2.2) FRA (Application Document Ref 5.4.20.1) EMP / AMP
Utilities failure Power supply failure results in significant disruption to normal operations at proposed WWTP	Embedded features with uninterruptable power supply (UPS) for critical elements of proposed WWTP Standby pumps	Operational management requirements related to Environmental Permit for the proposed WWTP	Compliance with required regulatory requirements such as (not exhaustive): • Health Safety at Work Act etc 1974 • CDM Regulations	Chapter 2: Project Description CoCP (Application Document Ref 5.4.2.1 & 5.4.2.2) EMP / AMP
Industrial accidents				
Fire and explosion Fires and explosion risk associated with digestors and stored gas at existing Cambridge and proposed WWTP during commissioning	Required design features for fire protection at site compounds	CoCP measures to prohibit open fires during construction, to store waste, to prepare emergency response plans with specification to prepare detailed management plans such as: • CEMP	Compliance with required regulatory requirements such as (not exhaustive): • Health Safety at Work Act etc 1974 • CDM Regulations • DSEAR	Chapter 2: Project Description CoCP (Application Document Ref 5.4.2.1 & 5.4.2.2) EMP / AMP

Hazard	Primary mitigation	Secondary mitigation (CoCP / other management plan)	Tertiary mitigation	Relevant item in order application
		• Existing response measures at existing sites (fire / explosion response) • Safety plan • Evacuation plans		
Fire and explosion risk associated with energy storage facility (battery storage)	Installation, inspection, and maintenance in accordance with manufacturers advice and best practice guidance	• Existing response measures at existing sites (fire / explosion response) • Safety plan • Evacuation plans	Compliance with required regulatory requirements such as (not exhaustive): • Health Safety at Work Act etc 1974 • CDM Regulations • DSEAR	"Site Wide Works" in Schedule 1 of DCO (Application Document Reference 2.1) CoCP / EMP / AMP
Fire and explosion Decommissioning at existing sites may present fire risks	Existing fire protection measures at existing Cambridge WWTP	CoCP Managed under active Environmental Permit Existing response measures at existing sites (fire / explosion response) Safety plan Evacuation plans	Compliance with required regulatory requirements such as (not exhaustive): • Health Safety at Work Act etc 1974 • CDM Regulations • DSEAR	Chapter 2: Project Description CoCP (Application Document Ref 5.4.2.1 & 5.4.2.2) EMP / AMP
Malicious attack				
Terrorism / cyber threat		Application of recognised sources of security management good practice, such as the ISO/IEC 27000 series of standards, and implement physical, personnel, procedural and technical measures.		CoCP / EMP / AMP

Hazard	Primary mitigation	Secondary mitigation (CoCP / other management plan)	Tertiary mitigation	Relevant item in order application
		• Physical security measures • Contingency and crisis plans • Multiagency response plans		
Vandalism Vandalism to the Proposed Development in construction and subsequent leaks, spills or hazardous conditions	Temporary site hoarding Site security Lighting Access controls	CoCP with specification in relation to safety and security and requirements for the preparation of detailed management plans: • CEMP • Emergency response plan	Compliance with required regulatory requirements such as (not exhaustive): • Health Safety at Work Act etc 1974 • CDM Regulations	Chapter 2: Project Description CoCP (Application Document Ref 5.4.2.1 & 5.4.2.2) EMP / AMP

References

CIRIA. (2019). *Culvert, screen and outfall manual (C786F).*

DECC. (2012, March). *Power Lines: Demonstrating compliance with EMF public exposure guidelines.* Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48308/1256-code-practice-emf-public-exp-guidelines.pdf

Department for Transport. (2021, October 8). *Control of development in airport public safety zones.* Retrieved from https://www.gov.uk/government/publications/control-of-development-in-airport-public-safety-zones

love every drop
anglianwater

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**

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/