Cambridge Waste Water Treatment Plant Relocation Project
Anglian Water Services Limited

Appendix 13.1: Historic Environment Baseline Assessment

Application Document Reference: 5.4.13.1
PINS Project Reference: WW010003
APFP Regulation No. 5(2)a

Revision No. ~~01~~02
~~April~~September 2023

Document Control

Document title	Historic Environment Baseline Technical
Version No.	02
Date Approved	26.01.23
Date 1st Issued	30.01.23

Version History

Version	Date	Author	Description of change
01	30.01.23	-	DCO Submission
02	29.09.23	-	Rule 9 edits

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1 Introduction

1.1 Overview

1.1.1 This Historic Environment Technical Appendix presents information to enable statutory consultees, members of the public and the Secretary of State to understand, identify and assess the likely significant effects of the Cambridge Waste Water Treatment Plant Relocation project (hereafter referred to as the CWWTPR project) on the historic environment.An Environmental Impact Assessment (EIA) Scoping Report was prepared in October 2021, which detailed the scope of the historic environment assessment undertaken for the CWWTPR project. This Historic Environment Technical Appendix provides a detailed assessment of the heritage assets within this defined scope and their value, as well as assessing the potential effects of the CWWTPR project. It provides supplementary information to aid understanding of the identified effects. This technical appendix supports the findings of Chapter 13 (Historic Environment) of the Environmental Statement (ES) (Application Document Reference 5.2.13) and should be read in conjunction with this document.

1.1.3 This Historic Environment Technical Appendix:

- Describes the methodology used to identify and assess likely significant effects in the ES;
- Identifies the relevant legal, policy and guidance framework that has informed the undertaking of this assessment;
- Describes the baseline environmental conditions against which the effects of the CWWTPR project are predicted;
- Identifies and assesses the effects that could result from the CWWTPR project during construction and operation, including likely significant effects; and
- Provides a summary of residual effects for the mitigated CWWTPR project.

1.2 Project Description

1.2.1 This section provides a summary of the Proposed Development. A full description of the CWWTPR project can be found in Chapter 2 of the ES (App Doc Ref 5.2.2).

1.2.2 The Proposed Development comprises the relocation of the Cambridge Waste Water Treatment Plant (WWTP) from its existing site, on land adjoining the north-eastern side of the city of Cambridge, to a new location. The relocation is required to enable delivery of the 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.

1.2.3 The purpose of the proposed WWTP will be to treat all waste water and wet sludge from the Cambridge catchment just as the existing Cambridge WWTP currently does. It will also treat that from the growth indicated and being planned within the

catchment in the Local Plan to 2041, with ability to expand beyond to deal with further growth.

1.2.4 As part of its statutory function, Anglian Water operates the existing Cambridge WWTP. The existing Cambridge WWTP receives waste water from the Cambridge catchment either directly from the connected sewerage network or brought by tankers to the plant from homes and businesses that are not connected. The waste water is then treated and the treated effluent is discharged through an outfall to the nearby River Cam. The existing Cambridge WWTP is an integrated WWTP, as would be the Proposed Development. The existing Cambridge WWTP will be decommissioned once the proposed WWTP is fully operational. However, the demolition works for the site are outside the scope of this project and will be undertaken by the site developer.

1.2.5 The proposed WWTP site is located 2km to the east of the existing Cambridge WWTP, within the administrative boundary of South Cambridgeshire Council. The circular site will include the waste water treatment plant (comprising Inlet/terminal pumping station, stormwater management, inlet works, primary, secondary and tertiary treatment and treated waste water collection), the sludge treatment plant (comprising a treatment centre, import, storage and screening) and associated site wide provisions, including an access and internal roads and parking, utilities, lighting, fencing and security. This main site will be surrounded by a landscaping scheme, including an encircling planted bund for screening, which is described in full in the environmental statement chapter 2 (App Doc Ref 5.2.2).

1.2.6 The Proposed Development of Waterbeach New Town lies to the north of Cambridge. The Waterbeach new town development, when built, will comprise approximately 11,000 new homes along with associated business, retail, community and leisure uses. Waste water from Waterbeach will ultimately be treated by the proposed WWTP once operational. However, the rate of development at Waterbeach New Town may require a new pipeline (rising main) to be built from Waterbeach to the existing Cambridge WWTP to allow treatment of waste water in advance of the proposed WWTP becoming operational. In that case, either a later connection would be made to the proposed WWTP from a point on the pipeline route, or flows diverted from the existing Cambridge WWTP via the transfer tunnel.

1.2.7 Wastewater 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 and will be up to 24m deep (cover depth to the top of tunnel). 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. The waste water transfer tunnel corridor is a wide area extending eastwards from the existing Cambridge WWTP to the new Cambridge WWTP crossing below the existing railway line, the River Cam, Horningsea Road and the A14 along its route. The new tunnel is a gravity system and will require six shafts, sited at connections, changes of tunnel direction, and otherwise approximately at 600m intervals.

1.2.8 The treated effluent transfer pipelines extend from the new Cambridge WWTP to a new outfall location on the east bank of the River Cam, close to the current outfall location. The treated effluent pipeline corridor extends west from the boundary of the site 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. The final effluent (FE) pipeline will have an approximate length of 1.25km and an internal diameter of 1.5m. A new outfall structure will be constructed on the bank of the Cam.

2 Methodology

2.1 Introduction

2.1.1 The historic environment baseline report comprises all aspects of the environment resulting from the interaction between people and places through time. This includes all surviving physical remains of past human activity, whether visible, buried or submerged, as well as landscaped and planted or managed flora. For the purposes of this assessment the historic environment has been considered in terms of the following aspects, which can be intersectional.

- **Archaeology** includes remains or monuments that are the primary source of evidence about the substance and evolution of places, and of the people and cultures that made them. These include scheduled monuments, protected wreck sites and non-designated archaeological sites.
- **Built Heritage** includes any individual or group of buildings, structures, monuments, or installations that illustrate important aspects of social, economic, cultural, or military history and/or have close historical associations with important people. This includes listed buildings, conservation areas and non-designated historic structures and buildings.
- **Historic Landscapes** as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. This includes world heritage sites, registered parks and gardens, registered battlefields, conservation areas and non-designated historic landscapes.

2.1.2 These three aspects of the historic environment can be defined through designated assets and non-designated assets.

2.1.3 A designated asset is one that has been recognised to be of particular heritage value(s) giving it formal status under law or policy intended to sustain those values. These include World Heritage Sites, Scheduled Monuments, Listed Buildings, Protected Wreck Sites, Registered Parks and Gardens, Registered Battlefields and Conservation Areas. They are designated under the relevant legislation, as defined in Annex 2 of the Glossary of the National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2021).

2.1.4 A non-designated asset is a site, building, monument, place, area or landscape identified as having a degree of significance (termed heritage value in this report, see paragraph 2.7.1 below) meriting consideration in planning decisions but which do not meet the criteria for designated heritage assets. Under paragraph 203 of the NPPF, "*the effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application*" (Ministry of Housing, Communities and Local Government, 2021).

2.1.5 For the purposes of this technical appendix, the ES chapter and associated documents; non-designated heritage assets are those considered to be of

archaeological, architectural, artistic, and/or historic interest and fulfil the criteria for heritage value outlined in the methodology below in Section 2.5. These include:

- Archaeological remains and monuments identified from the Cambridgeshire Historic Environment Record (CHER), maps, LiDAR, historic plans and surveys undertaken for the project that indicate a site of past human activity;
- Buildings or monuments that have been identified from local lists, conservation area appraisals, maps, historic plans and surveys undertaken for the project; and
- Places, areas or landscapes that have been identified from the CHER, national or local mapping programmes, maps, LiDAR, historic plans and surveys undertaken for the project that indicate important areas.

2.1.6 Isolated find spots are not usually considered non-designated heritage assets as they are portable and have been removed from their original context. Areas of geoarchaeological or palaeoenvironmental potential (such as fens, peat deposits or alluvial deposits) are not considered as non-designated heritage assets. However, in both instances these may indicate the presence of deposits or remains that have archaeological potential to understand the activity of people in the past. Their potential is considered under Section 8.

2.2 Study Area

2.2.1 The study areas are defined for each resource or receptor as follows in Table 2-1. These study areas are primarily identified from the Scheme Order Limits, which define the land required for the construction of all elements of the Proposed Development.

Table 2-1: Study Areas

Resource / Receptor	Study Area
Designated Heritage Assets	All designated assets within the Scheme Order Limits and within 1km of the Scheme Order Limits. Those additional designated assets identified within a 10km Zone of Theoretical Visibility (ZTV).
Non-Designated Heritage Assets	All non-designated assets within the Scheme Order Limits and within 500m of the Scheme Order Limits.
Historic Landscapes	All designated landscapes and historic landscape assets within the Scheme Order Limits and within 1km of the Scheme Order Limits. Those additional designated historic landscape assets identified within a 10km Zone of Theoretical Visibility (ZTV).

2.2.2 These study areas can be viewed on figures in Book of Figures – Historic Environment (App Doc Ref 5.3.13). Within this technical appendix and the ES chapter, they are referred to as follows throughout:

- the 500m study area;
- the 1km study area; and

- the 10km ZTV study area.

2.2.3 These study areas have been informed by the consultation undertaken in advance of production of the ES. They have also been informed by professional judgement and are considered proportionate to the potential effects of the Proposed Development as well as to the conditions of the area within the Scheme Order Limits and its surroundings.

2.2.4 The model utilised to produce the 10km ZTV study area and all assessment of permanent change contained within the ES and this technical appendix, is based on the project 15 years into its lifetime. This assumes that vegetation will have matured as expected after 15 years. This is considered to be a realistic projection of the anticipated permanent change in setting of assets from the Proposed Development.

2.2.5 All designated assets identified as within the 10km ZTV have undergone a scoping process to determine whether potential impacts to these assets require assessment. A buffer of 10m has been applied to point data (e.g. listed buildings) when determining which assets fall within the 10km ZTV. The scoping assessment was based on professional judgement. Considerations included, but were not limited to, the following:

- Whether the setting of the asset extended to the Proposed Development;
- Whether the setting of the asset contributes to its value;
- Whether the introduction of the Proposed Development into the setting of an asset will alter the ability to appreciate it and therefore impact on its value; and
- Where the ZTV identified the roofscape of a building, whether views from this contribute to its value.

2.2.6 Assets in the 10km ZTV study area which were scoped in for assessment were subject to a survey and setting assessment.

2.3 Guidance

2.3.1 All relevant guidance has been followed in the production of this report and the ES chapter. This includes the following, of particular relevance:

- Chartered Institute for Archaeologists (CIfA) Standards and Guidance for Historic Desk Based Assessment (CIfA, 2020);
- Historic England (as English Heritage), Conservation Principles, Policies and Guidance (English Heritage, 2008);
- Historic England, Historic Environment Good Practice Advice in Planning Note 2: managing significance in decision making (Historic England, 2015);
- Historic England, Historic Environment Good Practice Advice in Planning Note 3: the setting of heritage assets (Historic England , 2017);
- Historic England, Statements of Heritage Significance: Analysing Significance in Heritage Assets (Historic England, 2019);

- IEMA/ CIfA/ IHBC, Principles of Assessment for Cultural Heritage in the UK (IEMA, CIfA and IHBC, 2021);
- Historic England, Conservation Area Appraisal, Designation and Management, Historic England Advice Note 1 (Historic England, 2019b); and
- Design Manual for Roads and Bridges (DMRB), Cultural Heritage Assessment (Highways England, 2020).

2.4 Resources Consulted

2.4.1 For the production of this report and the ES chapter information has been gathered from the following sources:

- The National Heritage List for England (NHLE);
- The Cambridgeshire Historic Environment Record (CHER);
- Conservation Area Appraisals and mapping, available from South Cambridgeshire District Council, Cambridge City Council and Greater Cambridge Shared Planning;
- Archaeological reports, fieldwork reports and building surveys obtained from CHER and other online sources including the Archaeological Data Service (ADS);
- Geological mapping and borehole information as held by the British Geological Survey (UKRI, 2022);
- LiDAR data held by the Environment Agency, as available online (Environment Agency, 2022)
- Aerial photographs and satellite images held by Historic England and available online through the Cambridge University Collection of Aerial Photography (CUCAP);
- Documentary, cartographic and other resources as deposited within local studies libraries, county and national records libraries and archives. This includes the Cambridge University Library; and
- Archive materials including mapping, images and records held by Cambridgeshire County Council Archives.

2.5 Surveys

2.5.1 The historic environment baseline has been informed by surveys undertaken specifically for the Proposed Development. These have been assigned a unique project reference number formatted EV123, which can be cross-referenced with all historic environment documents produced for the ES. These include:

- Archaeological walkover surveys of the area within the Scheme Order Limits (EVT047);
- Asset specific surveys of all accessible historic environment assets within the respective 500m and 1km study areas and selected assets within the 10km

ZTV study area (see section 2.2 above), including assessment of their settings (EVT048);

- Targeted geophysical survey of areas within the Scheme Order Limits (EVT049 and EVT050), as agreed through consultation with the Cambridgeshire Historic Environment Team (CHET); and
- Targeted archaeological trial trenching of areas within the Scheme Order Limits (EVT051 and EV052), as agreed through consultation with the Cambridgeshire Historic Environment Team (CHET).

2.6 Methodology for defining HLCAs

2.6.1 Understanding of the baseline relating to historic landscape included undertaking a historic landscape characterisation exercise for the 1km study area. This defined historic landscape character areas (HLCAs).

2.6.2 The methodology for this characterisation exercise was developed in accordance with the appropriate national guidance (Historic England, 2022) and included the following steps:

- consultation of historic maps and historic and modern aerial imagery, supported by additional desk-based research. Information has been obtained from the sources described above in section 2.4 above with particular focus on the following:
- Natural England 250m grid Landscape Characterisation (Natural England , 2020);
- Conservation Area information for Fen Ditton Conservation Area (SCDC, 2005), Horningsea Conservation Area (SCDC, 2006), Baits Bite Lock Conservation Area (SCDC, 2006b) and Waterbeach and Milton Conservation Areas (SCDC, 2022).
- Historic maps as described below in section 4.4, especially including enclosure maps where available.
- placename information, as available from historic mapping, Open Domesday and other online sources;
- Cambridgeshire Historic Environment Record Data, Cambridgeshire County Council; and
- National Heritage List for England data, Historic England.

2.6.3 Definition of polygon areas using this information, which are;

- typically over 2 hectares in rural areas and 1 hectare in settlements and complex areas; and
- broad rather than granular – defining the dominant character of each area.

2.6.4 Drawing of these polygons in GIS:

- assignation of a Broad and Narrow HLCA type to each polygon. The HLCA uses the types defined in the 2015 Historic Characterisation Thesaurus by the Forum on Information Standards in Heritage (FISH); and
- assigning of value based on the assessment detailed in section 2.7.

2.6.5 Creation of a record for each of these character areas. Within reporting, this has been captured as a table and associated maps (Appendix 13.3, App Doc Ref 5.4.13.3). Within the digital EIA, this information will be available via interactive mapping. The record includes the following:

- Name;
- Broad and Narrow Type;
- Previous Type (if known/Applicable);
- Period information;
- Source;
- Designation (if applicable); and
- Value.

2.7 Assessment of Value

2.7.1 Assessment of effects on the historic environment is based on an understanding of the heritage value (termed as significance where it is defined in the NPPF, paragraph 195) of receptors (referred to hereafter as assets or heritage assets). Within national planning policy and guidance, the value attributed to the heritage asset is referred to as its 'significance' or 'importance'. To prevent confusion with EIA terminology, the definition of 'heritage value' or 'value' equates to 'significance' and 'importance' as used in national planning policy and guidance.

2.7.2 Heritage value is assessed against the five value categories as defined in the Design Manual for Roads and Bridges (DMRB): very high, high, medium, low and negligible. Assessment of the value of heritage assets is based on guidance from Historic England. In particular, heritage value is defined in relation to the three interest categories outlined in this guidance: archaeological, architectural and artistic, and historic.

2.7.3 Assessment also accounts for the contribution to value made by a heritage asset's setting, in accordance with NPPF Paragraph 194 and the DMRB. Setting is the surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the heritage asset and its surroundings evolve. A setting, or elements of a setting, may make a positive, negative or neutral contribution to the value of an asset.

2.7.4 The group value of assets has also been considered, where appropriate. The extent to which the exterior of the building contributes to the architectural or historic interest of any group of buildings of which it forms part is generally known as group value. This is of particular relevance where buildings comprise an important

architectural or historic unity or a fine example of planning (e.g. squares, terraces or model villages), or where there is a historical functional relationship between the buildings. Sometimes group value is be achieved through a co-location of diverse buildings of different types and dates (Department for Digital, Culture, Media and Sport, 2018).

2.7.5 Value assessment has been informed by the designation of assets, however the designation of an asset may not determine its value in every instance. Table 2-2 describes the value of assets discussed within this report and within the ES chapter. This is used as a guide and all assets have been reviewed individually to determine if these values are appropriate. Information on the value of all assets in the study areas is available in Appendix 13.2, App Doc Ref 5.4.13.2, with key assets discussed in Section 9.

Table 2-2: Value of Heritage Assets

Value/ Sensitivity	Typical description	Typical criteria
Very High	Very high importance and rarity, international scale and very limited potential for substitution.	World Heritage Sites, assets of acknowledged international importance, assets that can contribute to acknowledged international research objectives.
High	High importance and rarity, national scale, and limited potential for substitution.	Scheduled monuments, Grade I, II* and II listed buildings, registered parks and gardens, registered battlefields, non-designated assets of schedulable quality, non-designated monuments, sites, or landscapes that can be shown to have specific nationally important qualities, and heritage assets that can contribute to national research objectives.
Medium	Medium importance and rarity, regional scale, limited potential for substitution.	Conservation areas, non-designated sites of medium importance identified through research or survey, monuments or sites that can be shown to have important qualities in their fabric or historical association.
Low	Low importance and rarity, local scale.	Non-designated assets – monuments or archaeological sites with a local importance for education or cultural appreciation, and which add to local archaeological and historical research. Very badly damaged heritage assets that are of such poor quality that they cannot be classed as high or medium, parks and gardens of local interest.
Negligible	Very low importance and rarity, local scale.	Heritage assets identified as being of little historic, evidential, aesthetic or communal interest; and resources whose importance is compromised by poor preservation or

	survival, or by contextual associations to justify inclusion into a higher Grade.

Source: Mott MacDonald (2022) (based on Historic England guidance and DMRB, LA 104 Revision 1)

2.7.6 An assessment of value for all assets within the study area is provided in Gazetteer of Assets Appendix 13.2 (App Doc Ref 5.4.13.2). Key assets are further described in Chapter 13: Historic Environment of the ES (App Doc Ref 5.2.13).

2.8 Assessment of Impact

2.8.1 Temporary and permanent construction effects and operational effects on the historic environment have been considered in this assessment, in accordance with Section 13.8 of the scoping report. These can result from:

- Temporary construction effects from related activities, such as the presence of plant or traffic associated with construction, and could include effects on an asset's heritage value due to changes in its setting through increased noise or visual intrusion, including lighting, from the presence of machinery, traffic and construction compounds;
- Permanent construction effects from either physical effects on the integrity of the assets or effects on an asset's heritage value due to changes in its setting resulting from the presence of the proposed WWTP and other elements of the CWWTPR project; and
- Operational effects, which could include effects on an asset's heritage value due to changes in its setting resulting from the movement of vehicles accessing the proposed WWTP and the use of lighting.

2.8.2 In accordance with the methodology set out in the ES; where the details of the Proposed Development cannot be defined precisely, a realistic worst-case scenario (also known as 'maximum design scenario') will be used for assessment. The maximum design scenario relating to the Historic Environment is described in Table 5-1 of chapter 13 of the ES.

2.8.3 Assessment of impacts considers embedded (or 'primary') mitigation to be present. The assessment of impact for historic environment does not consider that 'secondary' mitigation, such as the Construction Code of Practice (Appendix 2.1 & 2.2, App Doc Refs 5.4 2.1 & 5.4 2.2), and 'tertiary' mitigation measures are present.

2.8.4 The degree of impact on the heritage asset from the CWWTPR project has been assessed based on the criteria outlined in Table 2-3.

Table 2-3: Criteria for assessing magnitude of impact

Magnitude of impacts	Criteria	Examples
Major	Adverse: Total loss or fundamental alteration	Total demolition of a building or complete removal of an archaeological features.

	to a heritage asset's value and/or setting.	Fundamental change to all key aspects of an asset's setting.
	Beneficial: Changes which entirely restore the setting of a heritage asset or substantially better reveal its value	Total restoration of a heavily altered historic setting. Comprehensive and historically appropriate repair, restoration and/or re-use.
Moderate	Adverse: Partial loss or alteration a heritage asset's value and/or setting.	Complete removal of a key aspect of a building's architecture or heavy alterations so it cannot be understood. Partial removal of an archaeological feature. Setting changes which substantially alter how an asset is understood, but do not change the entire historic setting.
	Beneficial: restoration of key parts of the setting of an asset or changes that better reveal its value	Restoration of key parts of a setting, changes to return key parts of a building to their historic layout or function, excellent and informed interpretation to allow better public appreciation.
Minor	Adverse: Minor loss of an element of a heritage asset and/or its setting.	Small changes in setting or small changes to the asset itself which make it harder to appreciate its value.
	Beneficial: small changes to an asset or its setting which result in better revealing of its value.	Small changes in setting or small changes to the asset itself which make it easier to appreciate its value.
Negligible	Adverse: Very minor loss of elements of a heritage asset's setting.	Very small changes in setting or very small changes to the asset itself which make it harder to appreciate its value.
	Beneficial: Very minor positive change within a heritage asset's setting.	Very small changes in setting or very small changes to the asset itself which make it easier to appreciate its value.
No Change	No change to the heritage asset or its setting.	

Source: Mott MacDonald (2022) (based on Historic England guidance and DMRB, LA 104 Revision 1)

2.8.5 The assessment process has considered the relative importance of the component of the heritage asset that is being affected. It has also considered the ability of the heritage asset to absorb change without compromising the understanding of appreciation of the resource.

2.8.6 An assessment of impact for all assets within the study area is provided in Gazetteer of Assets (Appendix 13.2 App Doc Ref 5.4.13.2). Key assets are also assessed in Chapter 13: Historic Environment (App Doc Ref 5.2.13).

2.9 Assessment of the Significance of Effects

2.9.1 The significance of effects has been established by combining the assessment of the value of a heritage asset with the magnitude of the impact. This allows the prediction of the significance of the effect, as shown in Table 2-4. These effects can be beneficial or adverse and temporary or permanent depending on the nature of the development, mitigation measures and any enhancement measures proposed. In accordance with DMRB, moderate, large or very large effects are considered significant. Where there are two potential effects highlighted in the table, professional judgement has been used to identify the appropriate effect.

Table 2-4: Significance Matrix

Magnitude of impacts	Sensitivity/Value of Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
Major	Very Large	Large/ Very Large	Moderate/ Large	Slight/ Moderate	Slight
Moderate	Large/ Very Large	Moderate / Large	Moderate	Slight	Neutral/ Slight
Minor	Moderate / Large	Slight/ Moderate	Slight	Neutral/ Slight	Neutral/ Slight
Negligible	Slight	Slight	Neutral/ Slight	Neutral/ Slight	Neutral
No Change	None	None	None	None	None

Source: Mott MacDonald (based on DMRB, LA 104 Revision 1)

2.9.2 Significant effects are highlighted in Chapter 13: Historic Environment of the ES (App Doc Ref 5.2.13).

2.10 Assumptions and Limitations

2.10.1 The following assumptions and limitations apply to the production of the baseline and assessment methodology of the Proposed Development.

2.10.2 Data sources on the historic environment can be limited by the dependence on opportunities for historical and archaeological research, fieldwork, and discovery. Where nothing of historical interest is shown in a particular area, this can be down to a lack of prior research or investigation, rather than to an absence of heritage assets. The following sources have known limitations:

- Information provided by the CHER can be limited as it is reliant on previous archaeological and historic research.
- Documentary sources are rare before the Post-Medieval period, and many historical documents are inherently biased. Older primary sources often fail to accurately locate sites and interpretation can be subjective.

- Historic maps provide a glimpse of land-use at a specific moment. It is therefore possible that short-term structures or areas of land-use are not shown and therefore not available for assessment.
- The Cambridge University Collection of Aerial Photographs (CUCAP), which holds the largest collection of aerial photographs of the Cambridge area, includes photographs of known heritage assets. These sources have only been available for reference online and have not been accessed in person. This has affected the quality of image available for reference in some instances.
- The study area has not been included within the National Mapping Programme by Historic England or any other known comprehensive programme of aerial investigation.
- Cambridgeshire has not published a historic landscape character assessment. Assessment of the historic landscape is reliant on the sources and methodology outlined in Section 2.6.

3 Legislation and Policy

3.1.1 This section provides an overview of the legislation and local and national planning policy pertinent to the Proposed Development with regard to the Historic Environment.

3.2 Legislation

3.2.1 The following legislation is pertinent to the Proposed Development.

The Planning (Listed Buildings and Conservation Areas) Act (1990)

3.2.2 This Act sets out the protection given to buildings of special architectural or historic interest through listing. It also sets out the process for designation and protection of conservation areas, which are recognised as areas of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance.

The Ancient Monuments and Archaeological Areas Act (1979)

3.2.3 This Act sets out the legal protection given to archaeological remains in England, Scotland and Wales. The Act outlines the process for scheduling and the protections afforded to scheduled monuments and other archaeological remains.

3.3 National Policy

3.3.1 Both the National Policy Statement (NPS) for wastewater and the National Planning Policy Framework (NPPF) are of relevance to the Historic Environment and pertinent to the Proposed Development. The relevant portions of these are described below.

NPS for wastewater

3.3.2 The NPS for wastewater sets out a framework for planning decisions on nationally significant waste water infrastructure (Department of Environment, Food and Rural Affairs, 2012). The following is of particular relevance:

- Paragraph 4.10.7 As part of the ES the applicant should provide a description of the significance [value] of the heritage assets affected by the Proposed Development and the contribution of their setting to that significance. The level of detail should be proportionate to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset. As a minimum the applicant should have consulted the relevant Historic Environment Record and assessed the heritage assets themselves using expertise where necessary according to the Proposed Development's impact.
- Paragraph 4.10.8 Where a development site includes, or the available evidence suggests it has the potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation. Where the Proposed

Development will affect the setting of a heritage asset, representative visualisations may be necessary to explain the impact.

- Paragraph 4.10.9 The applicant should ensure that the extent of the impact of the Proposed Development on the significance of any heritage assets affected can be adequately understood from the application and supporting documents.
- Paragraph 4.10.18 Applicants should aim to design the proposal to avoid unnecessary damage but also ensure that any unavoidable losses are recorded.
- Paragraph 4.10.19 A documentary record of our past is not as valuable as retaining the heritage asset and therefore the ability to record evidence of the asset should not be a factor in deciding whether consent should be given.
- Paragraph 4.10.21 Where the decision maker considers there to be a high probability that a development site may include as yet undiscovered heritage assets with archaeological interest, they should consider requirements to ensure that appropriate procedures are in place for the identification and treatment of such assets discovered during construction.

NPPF

3.3.3 The NPPF sets out the Government's planning policies for England and how these should be applied, it provides a framework within which local planning documents can be produced (Ministry of Housing, Communities and Local Government, 2021). Section 16: Conserving and Enhancing the Historic Environment, is of greatest relevance. Much of policy here contained echoes that given in the NPS. The following paragraphs are of particular relevance to the Proposed Development:

- Paragraph 189. Heritage assets range from sites and buildings of local historic value to those of the highest significance, such as World Heritage Sites which are internationally recognised to be of Outstanding Universal Value. These assets are an irreplaceable resource, and should be conserved in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of existing and future generations.
- Paragraph 194. In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes, or has the potential to include, heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.

- Paragraph 195. Local planning authorities should identify and assess the particular significance of any heritage asset that may be affected by a proposal (including by development affecting the setting of a heritage asset) taking account of the available evidence and any necessary expertise. They should take this into account when considering the impact of a proposal on a heritage asset, to avoid or minimise any conflict between the heritage asset's conservation and any aspect of the proposal.
- Paragraph 197. In determining applications, local planning authorities should take account of:
  - a) the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
  - b) the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and
  - c) the desirability of new development making a positive contribution to local character and distinctiveness.
- Paragraph 199. When considering the impact of a Proposed Development on the significance of a designated heritage asset, great weight should be given to the asset's conservation (and the more important the asset, the greater the weight should be). This is irrespective of whether any potential harm amounts to substantial harm, total loss or less than substantial harm to its significance.
- Paragraph 200. Any harm to, or loss of, the significance of a designated heritage asset (from its alteration or destruction, or from development within its setting), should require clear and convincing justification. Substantial harm to or loss of:
  - a) Grade II listed buildings, or Grade II registered parks or gardens, should be exceptional;
  - b) assets of the highest significance, notably scheduled monuments, protected wreck sites, registered battlefields, Grade I and II* listed buildings, Grade I and II* registered parks and gardens, and World Heritage Sites, should be wholly exceptional.
- Paragraph 201. Where a Proposed Development will lead to substantial harm to … a designated heritage asset, local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm or total loss is necessary to achieve substantial public benefits that outweigh that harm or loss.
- Paragraph 202. Where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal including, where appropriate, securing its optimum viable use.

- Paragraph 203. The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset.
- Paragraph 205. Local planning authorities should require developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible. However, the ability to record evidence of our past should not be a factor in deciding whether such loss should be permitted.

3.4 Local Planning Policy

3.4.1 The Scheme Order Limits are covered by two local planning authorities; Cambridge City Council (CCC) and South Cambridgeshire District Council (SCDC). There are therefore two local plans of relevance to the Proposed Development with regard to the historic environment.

South Cambridgeshire District Council (SCDC) Local Plan (2018)

3.4.2 The SCDC Local Plan sets out the planning policies and land allocations to guide the future development of the district up to 2031 (SCDC, 2018). It contains one policy pertinent to the historic environment. The relevant portions of this policy are detailed below.

Policy NH/14: Heritage Assets

3.4.3 Development proposals will be supported when:

- They sustain and enhance the special character and distinctiveness of the district's historic environment including its villages and countryside and its building traditions and details;
- They create new high quality environments with a strong sense of place by responding to local heritage character including in innovatory ways.
- Development proposals will be supported when they sustain and enhance the significance of heritage assets, including their settings, as appropriate to their significance and in accordance with the National Planning Policy Framework, particularly:
  - Designated heritage assets, i.e. listed buildings, conservation areas, scheduled monuments, registered parks and gardens;
  - Non-designated heritage assets including those identified in conservation area appraisals, through the development process and through further supplementary planning documents;
  - The wider historic landscape of South Cambridgeshire including landscape and settlement patterns;

- Designed and other landscapes including historic parks and gardens, churchyards, village greens and public parks;
- Historic places;
- Archaeological remains of all periods from the earliest human habitation to modern times.

Cambridge City Council (CCC) Local Plan (2018)

3.4.4 The CCC local plan sets out how CCC aim to meet the development needs of the city, by defining its planning policies (CCC, 2018). It contains two policies pertinent to the historic environment. The relevant portions of these policies are detailed below.

Policy 61: Conservation and enhancement of Cambridge's historic environment

3.4.5 To ensure the conservation and enhancement of Cambridge's historic environment, proposals should:

- preserve or enhance the significance of the heritage assets of the city, their setting and the wider townscape, including views into, within and out of conservation areas;
- retain buildings and spaces, the loss of which would cause harm to the character or appearance of the conservation area;
- be of an appropriate scale, form, height, massing, alignment and detailed design which will contribute to local distinctiveness, complement the built form and scale of heritage assets and respect the character, appearance and setting of the locality;
- demonstrate a clear understanding of the significance of the asset and of the wider context in which the heritage asset sits, alongside assessment of the potential impact of the development on the heritage asset and its context; and
- provide clear justification for any works that would lead to harm or substantial harm to a heritage asset yet be of substantial public benefit, through detailed analysis of the asset and the proposal.

Policy 62: Local Heritage Assets

3.4.6 The Council will actively seek the retention of local heritage assets, including buildings, structures, features and gardens of local interest as detailed in the Council's local list and as assessed against the criteria set out in Appendix G of the plan. Where permission is required, proposals will be permitted where they retain the significance, appearance, character or setting of a local heritage asset. Where an application for any works would lead to harm or substantial harm to a non-designated heritage asset, a balanced judgement will be made having regard to the scale of any harm or loss and the significance of the heritage asset.

3.4.7 The CCC Local Plan also includes *Appendix G: Local Heritage Assets Criteria and List* which provides criteria for the identification of locally important heritage assets. The pertinent portions of this are as follows:

- the Council maintains a list of local heritage assets, including buildings of local interest. This list may be updated from time to time.
- A local heritage asset is one that is not already statutorily listed, but is of significant architectural interest within the context of Cambridge. An asset may be included on the list for its architectural qualities alone, or because it has additional historical or social interest. Assets may be important in the social, political, industrial, economic or architectural history of Cambridge (for example, meeting places, social venues, places of entertainment, banks, places of worship, factories, alms houses, workhouses, transport-related buildings) or have a strong connection with a notable person.
  - The following criteria define significant interest for the purpose of the list. An asset may fulfil one or more of the criteria:
  - age and integrity – any building dating from before 1840 which exists in a style, form and construction similar to the original;
  - architectural quality – very high quality design and use of materials, and strong aesthetic appeal;
  - architectural style – typical or rare surviving examples of particular architectural styles, building materials or building forms;
  - well-known architect – high quality work of notable architects, local or otherwise;
  - innovation – show considerable innovation in the use of materials or techniques, or very early examples of styles that became popular later;
  - group or street scene value – contribute to a terrace, square, crescent or other group of buildings planned as a whole. Make a significant contribution to the streetscape, because of uniformity or contrast, or because they enclose or define an area or create a view. Groups of buildings that together fulfil one of the other criteria, architectural or historic;
  - landmark value – landmarks in the street scene, whether because of size, height, architectural style, unusual building materials, a specific feature or any other reason;
  - historic interest – assets may also be included on the list if they are of substantial historic interest, provided they are also of architectural/design interest;
  - designed landscapes - relating to the interest attached to locally important designed landscapes, parks and gardens.

3.4.8 These criteria have been considered in the defining and assessment of non-designated heritage assets within this report.

Cambridgeshire and Peterborough Minerals and Waste Local Plan 2021

3.4.9 Policy 21: The Historic Environment requires development proposals to comply with the NPPF and provide an assessment of the significance of impacted assets and clear justification for any works which would lead to harm or substantial harm. It also requires development proposals directly affecting heritage asset/ or its setting to include a heritage statement which covers as a minimum the significance of the asset/its setting, the impact of the development on the character of the asset, and a justification for any harm or loss of the asset.

4 Baseline Overview

4.1 Introduction

4.1.1 This section provides an overview of the baseline of the area within the Scheme Order Limits and the 500m, 1km and ZTV study areas as relevant. This information aims to contextualise the sections which focus on archaeology (Section 4.6), built heritage (Section 0) and historic landscape (Section 7) which follow.

4.1.2 All assets within the study areas have been assigned a unique referencing number for the project, formatted HE0123. This is in order to amalgamate the various referencing systems used by, for example, the CHER and NHLE, and aid in ease of cross-referencing. The system also aims to prevent repetition and duplication where assets appear in multiple data sets. All asset numbers can be cross-referenced in the Gazetteer of Assets (Appendix 13.2, App Doc Ref 5.4.13.2).

4.2 Geology, topography and landform

4.2.1 The Scheme Order Limits lie over varying geology and topography, incorporating the southern edge of the Fens and gravel river terraces around the Cam as well as chalk lowlands on the northern fringes of Cambridge around the fen edge. The 500m and 1km study areas also includes villages within this rural landscape, such as Horningsea, Fen Ditton and Waterbeach. The ZTV study area also incorporates parts of Cambridge, more of the Fens to the north, north-east and north-west and other South Cambridgeshire villages and their districts such as Little Wilbraham, Bottisham and Cottenham.

Topography and landform

4.2.2 The site of the proposed WWTP is currently large agricultural fields, divided by low hedgerows within a predominantly rural, agricultural landscape. It is situated on a slight rise, Honey Hill, on the edge of the very flat landscape of the Cambridgeshire Fens. This former wetland has mostly been reclaimed for agricultural use in the last 400 years and changes within its topography are very subtle. Its adaption for agricultural use included the creation of artificial drainage ditches and planting of hedgerows, dividing up the landscape and forming a regular field pattern (see also section 5.2.9). However, earlier attempts at reclamation are evident with features such as Car Dyke (see also section 5.3.1). Other watercourses cross the landscape, including the River Cam which flows roughly north to south, to the east of Horningsea and Fen Ditton, where the land dips into a subtle valley. The river has been a vital communication and trade route through the wetland landscape since at least the Roman period (see also section 5.2.6). The Cam Valley has four identified terraces (BGS, 2022).

4.2.3 Small settlements are dispersed across the study area, but are mostly located close to the River Cam. These settlements tend to be located on slight rises, where the bedrock sits higher, or gravel terraces carved out by rivers during the Pleistocene. These terraces are well draining and therefore more attractive locations for settlement and agricultural land. This can be seen at Fen Ditton, Horningsea and

Stow-cum-Quy. To the south of the proposed WWTP, the modern, busy A14 crosses the landscape from east to west. It is a heavily urbanising feature, a source of noise and light, and severs the Fen edge landscape around Fen Ditton from that around Horningsea. South of the A14, the land rises gently towards central Cambridge. The existing Cambridge WWTP is located to the south of the A14 and west of the River Cam, on the outskirts of the settlement. To the east, the Scheme Order Limits include part of the remains of a dismantled railway, which is now a footpath lined with hedgerows. This provides a boundary between the location of the proposed WWTP and the landscape to its east.

Geology

4.2.4 The underlying geology (also known as bedrock geology) of the Scheme Order Limits includes sedimentary chalk and mudstone formations. These bedrocks are mostly indicative of a local environment previously dominated by shallow, warm seas (UKRI, 2022). Their formation would have been during the period where the study area was entirely under a marine environment in the Cretaceous Period. The bedrock geology also relates to the geoarchaeological baseline and potential of the area. This is discussed below in sections 4.3 and 8.

4.2.5 The underlying geology of the proposed WWTP and its associated landscaping is the West Melbury Chalk Formation. This formed approximately 94 to 101 million years ago in the Cretaceous Period. This chalk also underlies Horningsea, the area around Biggin Abbey (including part of the treated effluent corridor) and the eastern bank of the Cam at Fen Ditton (including part of the wastewater transfer tunnel corridor). This marly chalk is a fossil debris limestone which would have formed in a marine environment. The areas it underlies are often slightly raised in the subtle topography of the study areas and can offer better drainage, which reduces the likelihood of flooding (British Geological Survey, 2022).

4.2.6 Around the River Cam and into the Fens around Waterbeach, the bedrock geology is instead comprised of Gault Formation Mudstone. This formed approximately 101 to 113 million years ago in the Cretaceous Period. The gault formation, sometimes referred to as ‘Gault Clay(s)’ is a sequence of clay, mudstone and silt deposits that were created by sediment in former seas. The deposits are prone to landslides, but also to shrinking and swelling based on factors such as the ground water level (British Geological Survey, 2020).

4.2.7 The transition between these two bedrocks is indefinite. The southern part of the Waterbeach Pipeline and the rest of the treated effluent corridor, including the outfall, are located within somewhat transitional areas with inclusions of both these bedrocks.

4.2.8 The interface of the Greensand (which underlies the Melbury Chalk) and gault clay deposits is also known for being rich in coprolites: phosphate nodules that can be formed from fossilised dinosaur faeces, but which in Cambridgeshire are cretaceous sediment which often contains fossils (Smith R. A., 2020). This resource was heavily exploited in the post Medieval period within the study area (see paragraph 5.2.47 below).

4.2.9 The superficial geology (the soils and deposits overlying the bedrock) is not recorded for much of the study area by the British Geological Survey. However, borehole data and archaeological evaluation, both that undertaken previously and for the Proposed Development, have informed the understanding of superficial geology of the Scheme Order Limits. The superficial geology also relates to the geoarchaeological baseline and potential of the area. This is discussed below in Sections 4.3 and 8.

4.2.10 The superficial geology of the proposed WWTP and landscaping area can be understood from nearby borehole data, which indicates gravelly and sandy superficial geology at a depth of around 0.3 – 1.2m, overlain by topsoils (Cementation Ground Engineering, 1971). Trial trenching within this area indicates silty, sandy and clayey soils are present throughout at a thickness of up to around 0.6m. This is overlain by dark brown topsoils which are also clayey and silty (Network Archaeology, 2022).

4.2.11 Around Waterbeach WRC and in the northern part of the Waterbeach Pipeline the superficial geology is comprised of peat deposits which formed up to 3 million years ago in the quaternary period (the present geological era). This peat is formed from organic material which accumulated into beds within bogs and swamps. The historically waterlogged conditions of the Fens are an ideal environment for the formation of these deposits. Further inclusions of peat are seen throughout the study area and also underlie the existing Cambridge WWTP.

4.2.12 The superficial deposits at the southern end of the Waterbeach Pipeline comprise a small area of Second Terrace Sand and Gravel. Between this and the pocket of peat at the northern end of the Waterbeach Pipeline (discussed above), the superficial deposits are alluvial, comprising clay, silt, sand and gravel along the valley bottom (Cotswold Archaeology, 2022).

4.3 Geoarchaeological Background

4.3.1 Geoarchaeology is the study of natural physical processes to understand the archaeological record (Historic England, 2015). This section presents a stratigraphic overview of the deposits laid down during the late Pleistocene and Holocene eras, in relation to the archaeological record. The Pleistocene is defined as the geological epoch of the Quaternary period between 2 million BP (before present) and 11,700 BP. This is related closely to the archaeological Palaeolithic period (see section 5.2 below).

4.3.2 During the Pleistocene, several phases of river terrace deposits were laid down and predominantly survive along the western side of the River Cam. There are also deposits east and north of Horningsea, although their survival is patchy due to mineral extraction in the area (see paragraph 5.2.47 below). These river terrace deposits are thought to have been laid down during the Late Pleistocene era (Worssam, 1969), although this has been questioned (Wymer, 1999).

4.3.3 Although undated, it is likely that the alluvium deposited along the course of the River Cam dates to the Holocene. The flow of the River Cam is likely to have been fairly dynamic and its course would have altered gradually to form what is its route

today. The route of the Cam has also been altered over time through man made canalisation, implemented to make the river more navigable. The Scheme Order Limits lie within the southern extent of the Fenland Basin, an area that was frequently subject to marine flooding which deposited silts and clays during the prehistoric period. This wetland environment was also subject to peat formation, as described in section 4.2. However, the presence and depth of these deposits varies greatly across the Fenlands.

4.3.4 The Scheme Order Limits largely escaped the marine transgressions, although there is evidence for shallow deposits (c.0.6m) close to the River Cam (BGS, 2022). There is evidence for uninterrupted peat growth from the Neolithic onwards in the deepest areas around Waterbeach (Hall D. , 1996).

4.3.5 The peat around Horningsea is much shallower, and its formation began in the Late Roman/Early Medieval period (Hall D. , 1996). Extensive drainage of the Fens during the Post Medieval period has affected the uppermost deposits of peat, shrinking or removing them entirely. Deeper deposits are present closer to the River Cam. There is also evidence for alluvial deposits sealing the peat (BGS, 2022), suggesting the presence of a former course of the river, or extensive flooding.

4.4 Cartographic and Air Photo Evidence

4.4.1 The following cartographic sources, aerial photographs and LiDAR (Table 4-1) have been consulted, providing information on the development of the study area. Relevant commentary from these maps has been incorporated into the below archaeological and historical development section (Section 5.2). The analysis of aerial photo evidence and historic cartographic evidence undertaken for the Wicken Vision Project (Cambridge Archaeological Unit, 2007) has also informed this baseline.

Table 4-1: Cartographic and Air Photo Evidence

Title	Date	Description
J. Moor, A Map of the Great Levell of the Fenns, showing the full extent of the Fens.	1684	The northern part of the study area is shown in this early map.
Smith, G. J., Plan of the parish of Horningsea, made on the enclosure, 1 inch: 1 chain (66')	1810	This map shows the site and its immediate surroundings, and the area around Horningsea.
Collison, W., Plan of the parish of Fen Ditton, made on the enclosure, 1 inch: 1 chain (66')	1807	This map is approximately contemporary with that above; however, it shows the parish of Fen Ditton, capturing a part of the study area not shown in the above.
Ordnance Survey, Cambridgeshire Sheet XL.SE, six inch: mile	1886	This map shows the centre of the study area, around the proposed WWTP and Horningsea.
Ordnance Survey, Cambridgeshire Sheet XL.SE, six inch: mile	1901	This map shows the centre of the study area, around the proposed WWTP and Horningsea.

Title	Date	Description
Ordnance Survey, Cambridgeshire Sheet XL.SE, six inch: mile	1925	This map shows the centre of the study area, around the proposed WWTP and Horningsea.
Ordnance Survey, Cambridgeshire Sheet XL.SE, six inch: mile	1938	This map shows the centre of the study area, around the proposed WWTP and Horningsea.
Historic England Archive Aerial Images RAF_106G_UK_1490_RP_3262 and RAF_106G_UK_1490_RP_3326	1946	These aerial images show the site of the proposed WWTP
Ordnance Survey, Cambridgeshire Sheet XL.SE, six inch: mile	1950	This map shows the centre of the study area, around the proposed WWTP and Horningsea.
Historic England Archive Aerial Image RAF_540_822_V_5002	1952	This photo shows the northern part of Waterbeach, around the WWTW and RAF Waterbeach.
Ordnance Survey National Grid Maps TL46SE-A, 1:10,000	1957	This map shows the centre of the study area, around the proposed WWTP and Horningsea.
Historic England Archive Aerial Image RAF_543_T_899_F22_0116	1960	This image shows the existing Cambridge WWTP and Milton, prior to construction of the A14.
Ordnance Survey Plan, 1:2,500	1971	This more detailed map shows the area around the proposed WWTP in greater detail.

4.5 Previous Investigation and Survey

4.5.1 This section details archaeological events undertaken in the study areas prior to surveys relating to the Proposed Development. For ease of cross reference, previous surveys within the study areas and those undertaken for the Proposed Development have been assigned a consistent reference number for the project, these are formatted EVT123 and can be referenced to the Gazetteer of Events (Appendix 13.7, App Doc Ref 5.4. 13.7).

4.5.2 There are eight previous archaeological events recorded on the CHER within the Scheme Order Limits. This includes four air photographic surveys (EVT001, EVT002, EVT003 and EVT004). The results of these are recorded as assets in the CHER and have been included as assets for consideration within this technical appendix. A programme of extensive fieldwalking (EVT005) was undertaken in 1999 in a 1km route either side of the A45 (now the A14) between Girton and Stow cum Quy, ahead of possible road expansion or realignment. Artefacts dating from the Bronze Age to modern periods were recovered within the Scheme Order Limits, but none were identified as relating to additional archaeological features or deposits. It is

likely some of these finds were ploughed into the area, but some may relate to the archaeological activity identified through trial trenching undertaken for the CWWTPR project (see section 4.6 below).

4.5.3 An evaluation at Kings Farm, Eye Hall, Horningsea (EVT006) revealed evidence of tree clearance, modern disturbance and some undated ditches. This evaluation was undertaken partly within the route of the Waterbeach Pipeline. More extensive evaluation of the pipeline was undertaken for the CWWTPR Project and is described below in section 4.6. Trenching at Cowley Road (EVT007) revealed little of archaeological interest, comprising only one Post Medieval ditch.

4.5.4 Extensive evaluations were undertaken at Cambridge Rowing Lake, Milton. These were based on a sub-surface deposit model that was created for the site. This model identified 9 sediment types and subsequent excavations supported this. In situ remains were identified in the upper peat, silt, clay and subsoil levels. Remains from the Holocene, including environmental remains from the prehistoric and remains from the Roman period, were identified as surviving well in the soils. The study area for this model extends into the edge of the Scheme Order Limits at the River Cam by Baits Bite Lock.

4.5.5 The evaluation for Cambridge Rowing Lake (EVT008) was undertaken in 2003 and the study area for this intersects a small part of the Scheme Order Limits within the area of the final effluent outfall. As part of this, a sub-surface deposit model was created. This identified layers of fluvial gravels overlain by multiple depositions of peat. The third layer (lower alluvium) through to the eighth layer (subsoil) contained in situ remains. An evaluation was also undertaken and identified a pit containing Bronze Age pottery, along with middle Iron Age and Roman features.

4.5.6 An additional 38 events (EVT009-EVT046) are recorded within the 500m study area in the CHER. The findings of which have been used to inform the archaeological baseline (see section 5). These are detailed in the Gazetteer of Events (Appendix 13.7, App Doc Ref 5.4.13.7).

4.6 Results of surveys undertaken for the Proposed Development

Archaeological Walkover Survey (EVT047)

4.6.1 Initial walkover surveys of the site and surroundings were undertaken by Mott MacDonald in 2020 and 2021 during the site sifting process. Further walkover surveys of the Scheme Order Limits were undertaken in 2021 and 2022 once the site selection process was finalised and during monitoring of the trial trenching. These have informed understanding of the archaeological potential, geology and conditions of the site. These results have been incorporated into this baseline.

Setting Assessment Surveys (EVT048)

4.6.2 Setting assessment and survey of all assets within the 1km study area and selected assets within the ZTV (see paragraph 2.2.5) were undertaken by Mott MacDonald between January and March 2022. The results of these surveys have informed understanding of the value of assets and the contribution to this value made by their

settings. Setting assessments and/or summary statements as proportionate are provided for each asset in the Gazetteer of Asset (Appendix 13.2, App Doc Ref 5.4. 13.2).

Geophysical Survey – proposed WWTP, Treated Effluent Corridor and Waste Water Transfer Tunnel (EVT049)

4.6.3 Geophysical survey of several areas was undertaken by Headland Archaeology in March 2021. This area included the proposed WWTP and surrounding landscaping. It also included an area south of Biggin Abbey near the proposed FE and Outfall construction corridor. Also surveyed was an area west of the dismantled railways line and south of the A14, around High Ditch Road. The latter is not within the Scheme Order Limits. The majority of anomalies identified related to agricultural activity. Features possibly relating to the Medieval occupation of the site were identified to the South of Biggin Abbey. A cluster of anomalies were also identified within the location of the proposed WWTP. These were targeted for trial trenching (EVT052) and revealed to be the remains form Post Medieval coprolite mining. Cropmarks of a Roman site north of the A14, identified in 1972, were not identified within the results of the geophysical survey (Headland Archaeology, 2021a).

Geophysical Survey – Waterbeach Pipeline (EVT050)

4.6.4 Geophysical survey of the construction corridor for the pipeline to Waterbeach and the wastewater transfer tunnel corridor to the existing Cambridge WWTP was undertaken by Headland Archaeology in September 2021.

4.6.5 The majority of anomalies identified related to agriculture. South of the A14 two curvilinear ditches were believed to represent a trackway. East of Horningsea a cluster of anomalies, possibly relating to coprolite mining, was identified (Headland Archaeology, 2021b).

Trial Trenching - proposed WWTP and Treated Effluent Corridor (EVT051)

4.6.6 Trial trenching of the proposed WWTP and surrounding landscaping area and FE and Outfall pipeline corridor was undertaken by Network Archaeology in November 2021 to January 2022.

4.6.7 Trial trenching identified some evidence of Late Mesolithic or Early Neolithic activity, identified through stone artefacts (see section 5.2). Within the location of the proposed WWTP and its associated landscaping, four areas of Late Bronze Age to Early Iron Age activity were identified. This included two cremations, as well as pits and ditches containing pottery and animal bones. Plant remains from a posthole also indicate the presence of cereals. These indicate a probable Late Bronze Age to Early Iron Age settlement (see section 5.2). The Roman site identified on the HER (HE1006) was not present and was concluded to have been removed by a borrow pit for the A14. Evidence of Medieval and Post Medieval agriculture was identified throughout the trenched area, including ridge and furrow and field boundaries (see section 5.2). There was evidence of late Post Medieval coprolite mining within the treated effluent corridor south of Biggin Abbey (see also section 5.2).

4.6.8 The results of this trial trenching are discussed in full in Geophysical and trail trenching surveys (Appendix 13.5, App Doc Ref 5.4.13.5). These results have fed into the understanding of the archaeological background and research potential discussed below.

Trial Trenching – Waterbeach Pipeline and Waste Water Transfer Tunnel (EVT052)

4.6.9 Trial trenching of the route for the pipeline to Waterbeach and the wastewater transfer tunnel corridor to the existing Cambridge WWTP was undertaken by Cotswold Archaeology in November 2021 to March 2022.

4.6.10 This trial trenching identified three distinct areas within the route. Within the northernmost part of the route the overburden was mostly comprised of peat and the trenches were devoid of archaeological finds and features. Within the pipeline corridor area south and east of Horningsea, there was substantial evidence of late Post Medieval coprolite mining (see also section 5.2). This activity would have removed any earlier remains, if present. To the south of the proposed WWTP, in the areas relating to the waste water transfer tunnel, sparce archaeological features were identified. There was some evidence of prehistoric and Roman activity (including evidence of the trackway identified by the geophysical survey), alongside Medieval and Post Medieval features (see section 5.2).

4.6.11 The results of this trial trenching are discussed in full in Geophysical and trail trenching surveys (Appendix 13.5, App Doc Ref 5.4.13.5). These results have fed into the understanding of the archaeological background and research potential discussed below.

5 Archaeology

5.1 Introduction

5.1.1 This section provides baseline information with regards to archaeology relevant to the CWWTPR project. Archaeology relates primarily to buried remains but may also encompass earthworks and other aspects, such as palaeoenvironmental information, relating to past human activity. Archaeological remains include designated and non-designated assets. A study area of 500m for non-designated assets and 1km and those within a 10km ZTV for designated assets has been used to inform this baseline (see section 4 above).

5.1.2 The chronological periods used in this analysis are set out in Table 5-1.

Table 5-1: Archaeological and historic periods

Prehistoric Periods	Historic Periods
Palaeolithic 500,000 to 10,000 BC	Roman AD 43 to 410
Late Glacial / Mesolithic 10 000 to 4,000 BC	Early Medieval AD 410 to 1066
Neolithic 4,000 to 2,200 BC	Medieval AD 1066 to 1540
Early - Middle Bronze Age 2,200 to 1,200 BC	Post Medieval AD 1540 to 1900
Late Bronze Age 1,200 to 800 BC	Modern AD 1900 to present
Early Iron Age 800 to 300 BC	
Middle Iron Age 300 to 100 BC	
Late Iron Age / Roman Transition 100 BC to AD 43	

Source: Historic England Periods List, Forum on Information Standards in Heritage (FISH) Archaeological and historic overview.

5.2 Archaeological and historical development overview

Palaeolithic

5.2.1 The Palaeolithic period involved climatic fluctuations known as stadials (when Britain was covered by ice) and warmer interstadials, when early hominids may have occupied parts of Britain. These early, tool-using hominids lived in hunter-gatherer groups which were mostly nomadic (Bahn, 2001). As described above in section 4.3, river terrace deposits (sands and gravels) may have been laid down in the late Pleistocene, although on the eastern bank of the Cam this seems to relate to the first river terrace only. It islikely that most of the deposits within the Scheme Order Limits had not formed by the end of the period and most likely represent deposits laid down in the early Holocene.

5.2.2 Evidence for Palaeolithic activity, when recovered, is in the form of knapped flint hand tools; flint occurs as natural nodules in the regions chalk beds. This chalk underlies the site of the proposed WWTP. These finds are typically recovered from secure geological deposits, for example deep river terrace deposits where these have not been previously disturbed, or are redeposited in glacial fluvial deposits.

Glacial action, including freeze/ thawing of the permafrost and subsequent fluvial erosion, would have impacted the survival of these glacial fluvial deposits within most of the study area. The clay and chalk areas seen within the study area, including within the site of the proposed WWTP, indicate that remains of this period are not likely to be present.

5.2.3 The evidence within the 500m study area includes two findspots for Palaeolithic artefacts. These are both located near Milton, approximately 580m south-west of the existing Cambridge WWTP and approximately 375m south-west of the Scheme Order Limits. One of these records (FS059) relates to an artefact scatter, including hand axes and flakes. This was identified in the late 19th century, through an excavation that also identified a pit. This may or may not have been potentially, but not conclusively, related to the Palaeolithic artefact scatter. The pit was claimed to contain the remains of Palaeolithic fauna, such as mammoth and woolly rhinoceros. This assemblage is unlikely due to the broad variety of species and its location, as well as the early date of excavation which makes its results less reliable. However, it remains possible that the feature may have been a refuse pit for animal remains. The record is identified in an area underlain with gravel river terraces, however although the location provided is not exact so cannot be linked to a particular terrace. Near this pit, a single small, ovate handaxe (FS064) was recovered in a private garden.

Late Glacial/Mesolithic

5.2.4 The Mesolithic period is defined by the end of the last glaciation and a warming climate. Evidence of Mesolithic activity within the Cambridgeshire Fens is similar in pattern to the Palaeolithic: isolated lithics with occasional larger scatters indicating temporary camps. Therefore, within the region the recovery of small quantities of lithics is fairly common, but larger discoveries are rare (Billington, 2021). The latter are typically found on fen 'islands' such as the flint scatter at Peacock's Farm, Shippea (Clark, 1935) which is outside the study area. On the fen edge and chalk lowlands, such as the site of the proposed WWTP, the better drainage would have offered a drier environment for temporary camps inhabited by Mesolithic peoples. The majority of river terrace deposits of the Cam likely formed during the early Holocene (as discussed above in section 4.3). The rivers and waterways crossing the Fens also likely emerged in the early Holocene and could be exploited for fishing and other resources.

5.2.5 There is evidence of Mesolithic activity throughout the study area. Stone artefacts, including Mesolithic axes, have been recovered within the 500m study area. This includes one in Horningsea (FS046), one in Waterbeach (FS054) and two from Quy Fen (FS056). The axe found in Horningsea is nearest to the Scheme Order Limits, approximately 70m west of the Waterbeach Pipeline area. All of the axes were tranchet style, typical of the Mesolithic period, and made of flint. They were formed by removing flakes parallel to one long cutting edge and the blade would have been hafted to a wooden handle (which rarely survives). These are typically interpreted as tree-felling tools. These axes are the only confirmed stone tools from the period within the study area. However, some flint scatters tentatively identified as later stone age, could be attributed to the Late Mesolithic (see FS065 and FS049).

5.2.6 During trial trenching of the proposed WWTP, final effluent corridor and waste water transfer tunnel, worked Mesolithic and early Neolithic flints were recovered from a few discrete locations. These flints confirm some use of the study area in this period, although their density mostly likely indicates infrequent, peripheral activity. The majority were not in situ; it is possible that they have been removed from their original context by Post Medieval coprolite mining and modern agricultural activity (Network Archaeology, 2022). One pit (HE1308) identified within the area of the proposed WWTP contained in-situ deposits indicating that flint working may have happened in the immediate area (Network Archaeology, 2022). There is evidence of activity at this location (HE1308) extending into later prehistoric periods (refer below).

Neolithic

5.2.7 The Neolithic period saw the arrival of the first farmers to Britain from continental Europe, as well as evidence for permanent settlement. Evidence of human activity typically includes flint scatters and the earliest known use of pottery. It is likely that people continued to occupy small camps. The Early Neolithic also saw environmental

5.2.8 change. Two distinctive episodes of sea level rise in the Fens (Wash III/IV, c. 3400–2500BC; Wash V, c.2200–1300BC) deposited intertidal clays well inland. This created a wetland environment which would subsequently be exploited - particularly in the Roman, Medieval and Post Medieval periods. The fen landscape remained a focus for wetland resource exploitation with occupation on higher, drier areas. The chalk lowlands and gravel terraces of the Cam valley would have provided better drainage than the low-lying fens and been more attractive for habitation.

5.2.9 There is a precedent for Late Mesolithic camps in the region showing continued occupation through the Neolithic, for example at Peacock's Farm (outside the study area). Neolithic activity within the Fens and at the fen-edge around the chalk lowlands is characterised by scatters of stone tools. Within the 500m study area, there are a few instances of this. Scatters of Mesolithic or Neolithic burnt flints (FS008) and worked flints (FS056) were identified during a programme of fieldwalking (EVT005) undertaken between 1985 and 1986, approximately 330m south-east of the Scheme Order Limits. Another group of flint implements (FS065) was identified during the same fieldwalking survey (EVT005) approximately 320m south of the Scheme Order Limits, near Fen Ditton. This artefact scatter has only officially been dated as 'prehistoric', but likely also relates to the Mesolithic, Neolithic, or possibly Early Bronze Age periods as it includes a scraper. Within the Scheme Order Limits, at the location of the proposed WWTP, the fieldwalking survey (EVT005) recovered multi-period finds (FS008). These comprised 11 sherds of prehistoric pottery and two areas where concentrations of burnt flint were recovered. These most likely relate to the Neolithic or Bronze Age, but their date is not confirmed. They may relate to further Neolithic and Bronze Age activity identified within the Scheme Order Limits through trial trenching (EVT051), the results of which are, where relevant, described below within this section.

5.2.10 Additional findspots relating to the Neolithic period recorded in the study area demonstrate the continued use of the wider landscape. The nearest to the Scheme

Order Limits are a stone axe (FS044) which was recovered at Biggin Abbey, approximately 70m north of the Scheme Order Limits, and an axe head (FS063) at Low Fen Drove Way, approximately 50m west of the Scheme Order Limits. Isolated finds like these may suggest exploitation of resources within these areas for activities such as hunting and gathering, or travelling between sites, rather than settlement. The evidence from the study area demonstrates a diverse range of activities near the site in the Neolithic.

5.2.11 This evidence, combined with the Mesolithic and Early Neolithic flints recovered within the Scheme Order Limits (Network Archaeology, 2022), is indicative of the continuing use of the study area from the Mesolithic into the Early Neolithic periods. This is especially relevant to the pit (HE1308), which contained evidence of Mesolithic flint working (see above). Distinct fills demonstrate the use of this pit over a longer period of time. A Neolithic struck flint was also recovered from a palaeochannel (HE1305) within the wastewater transfer tunnel (Cotswold Archaeology, 2022). This evidence may demonstrate a low level of passing activity around the study area during the Neolithic. There is a lack of evidence for intense occupation of the Scheme Order Limits; however, there is evidence of their temporary occupation, such as sporadic use for exploiting the Fens resources. Although no occupation site has been identified, temporary camps may have been sited within the study area during the Mesolithic and Early Neolithic.

5.2.12 No specific evidence has been identified for later Neolithic activity, especially settlement activity. All securely dated evidence recovered within the Scheme Order Limits and the study area is in the form of isolated finds or small artefact scatters, not features associated with early farmsteads. Some pits (HE1308) within the proposed WWTP containing burnt bone and flint could be Neolithic, but more likely relate to the Bronze Age activity described below (Network Archaeology, 2022).

Bronze Age

5.2.13 Bronze Age activity in the region is varied and its nature continues to be dependent on the local geology and landform. Therefore, the activity in the Fens and the northern half of the study area is somewhat different to that of the chalklands in the south.

5.2.14 In the Fens, occupation is focused on the fen ‘islands’: gravel terraces around the Cam and fen-edges where the ground would have been less waterlogged. These are typically evidenced by artefact scatters, of which there are none within the study area. Where other remains of Early Bronze Age settlements do exist within the Fens and on the fen-edge they are typically of regional importance due to their rarity and fragility in terms of survival (Brown N. a., 1997). There are some examples of extensive middle to later Bronze Age settlements recorded in the Fens. This includes platform settlements, constructed by driving wooden piles into silts to create a raised dwelling, which demonstrate how the inhabitants of the wetland environment adapted to its conditions. The waterlogged preservation conditions have resulted in nationally important examples of these settlements being recorded at Must Farm (Must Farm, 2017) (Historic England, 2022). There is also evidence of trade and economy in the region, such as metalwork.

5.2.15 There is the potential that the River Cam and its immediate environs were exploited during the Bronze Age. Excavations at Must Farm revealed the presence of an ancient,

5.2.16 now silted, river (River Nene). Within the silts, well-preserved wooden boats were found (Must Farm, 2011). Movement of peoples appears to have been along river valleys in Bronze Age Cambridgeshire. It is therefore possible that those occupying the site(s) at the proposed WWTP used the River Cam and other watercourses for the transportation of goods, people and trade. Tracks and drove ways would have connected fen-edge settlements across the dry and wet landscape (Malim, 2001). Despite this known sporadic Bronze Age activity in the Fens, none has been identified within the northern part of the Scheme Order Limits, which lies in the Fen edge.

5.2.17 Bronze Age activity has been identified on the well-drained slopes of the slight chalk hill which forms the site of the proposed WWTP (HE1307 and HE1308). Trial trenching has identified four areas of Late Bronze Age to Iron Age activity, including post holes, pits and ditches. These remains could represent continuous or distinct phases of settlement (Network Archaeology, 2022). Many of these pits contained bones of a variety of animal species, including a dominance of horses. Horses were considered to represent higher status and this may, therefore, reflect a higher status of the settlement (Network Archaeology, 2022). The presence of cattle, pigs and deer bones suggests a varied and terrestrial diet. Environmental samples and the presence of quern stone fragments show that the inhabitants were likely farming and processing crops, including cereals, at this location (Network Archaeology, 2022).

5.2.18 Funerary activity from the Bronze Age to Iron Age transition was also identified during evaluation of the proposed WWTP site. Two cremations contained within urns (HE1309 and HE1310) were recovered from pits within the site, towards the A14. The cremations are believed to have been separate and not part of the same burial site. However, each was found associated with the evidence of potential Bronze Age and Iron Age settlement activity, set slightly apart from the domestic features. These could indicate the possible presence of further funerary remains within the Scheme Order Limits (Network Archaeology, 2022). Cremations have been found included with settlement sites elsewhere in the county, such as at Fordham (outside the study area to the north and within the Fens) (Malim, 2001). Funerary and ritual activity of the period and region is otherwise typified by barrows. These are raised burial mounds, usually of earth, which are typically located with far reaching views and therefore tend to be in upland environments. These monuments are recorded across the Fens, located on ‘islands’. There are barrows within the wider study area covered by the ZTV, including a cluster approximately 8km west around Hare Stud (HE171, HE176), which are positioned on higher ground with far-reaching views over the flat landscape.

5.2.19 Evidence of Bronze Age activity within the 500m study area continues the pattern from earlier prehistoric periods of primarily isolated find spots, including flints and pottery. This likely indicates temporary, sporadic activity across most the study area,

similar to that of the earlier prehistoric periods. However, there are exceptions such as at Milton

5.2.20 Recreation Ground, approximately 800m to the west of the Scheme Order Limits, where sparse remains from the 2nd millennium BC are present (HE001). These comprise Early Bronze Age pits and middle to Late Bronze Age ditches, which could be indicative of increasing activity within the west of the study area during the Bronze Age. This may have been a settlement site, with early evidence of farming and land division. This demonstrates wider activity within the study area in the period, not only at the location of the proposed WWTP. As with other sites of the period, the site at Milton Recreation Ground is on a rise above the wetter landscape, but is located on mudstone and gravel rather than chalk. The Bronze Age settlement (HE1308, HE1309, HE1328 and HE1329) identified within the Scheme Order Limits would also be an exception to this otherwise sporadic activity.

Iron Age

5.2.21 The Iron Age was the period when iron surpassed copper and tin-based metals for tools and weapons. It was also characterised by the emergence of production and trade centres, as well as structured social hierarchies and sometimes larger, centralised settlements. Iron Age activity was limited within the Cambridgeshire Fens, but the fen edge shows sporadic, locally distinct clusters of settlements. Most activity has been identified on drier ground in the fen edge and onto the chalk lowlands. This pattern is identifiable within the Scheme Order Limits, where Iron Age activity has only been identified at the site of the proposed WWTP and surrounding area at Honey Hill. Early Iron Age activity is observed continuing from the Bronze Age sites within Scheme Order Limits (HE1307, HE1308, HE1328 and HE1329) (Network Archaeology, 2022). A distinct period of activity has also been identified towards the end of the Iron Age, into the Early Roman period (Cotswold Archaeology, 2022) (see below).

5.2.22 Activity is also seen elsewhere in the study area and isolated farmsteads appear to characterise its settlement pattern during this period. At Limes Farm, at the west of the study area, two phases of Late Iron Age settlement on the gravel river terrace have been identified, and were later supplanted by Roman settlement and a cemetery. This area is now scheduled as part of the multi-phased settlement east of Milton (HE001). This pattern may reflect that seen with regard to the Iron Age and Roman activity elsewhere within the Scheme Order Limits. An archaeological evaluation at Greenhouse Farm, Fen Ditton (EVT026) also identified Iron Age activity. A number of pits and post holes were revealed with an assemblage of finds dating from the Early to Late Iron Age (HE1076). This site is approximately 450m south of the Scheme Order Limits, near Fen Ditton. This is likely to be an isolated farmstead and was associated with two and four-post structures, which are relatively common in the region (Bryant, 1997). Other evidence of Iron Age activity within the study area relates to isolated findspots of coins, flints and pottery, including some recovered within the site during the A45 Stow cum Quy fieldwalking survey.

5.2.23 There are also examples of unique exploitation of the wetland environment to the north of the study area and into the Fens, as well as adaptation of practices and

patterns seen elsewhere in England. For example, islands in the River Ouse at Over Narrows were utilised for funerary purposes in the Iron Age. However, the site was used predominantly in the preceding periods and was falling out of use by the middle Iron Age (Bryant, 1997).

5.2.24 A more hierarchical society emerged in the Iron Age and this is indicated by fortified settlements known as hillforts such as the Belsar's Hill ringwork at Willingham and the Arbury Camp (both outside the study area). These sites comprise earthwork ditches and banks which enclose a central area. These sites demonstrate the changing use of spaces in the period, likely reflecting the evolving hierarchies of Iron Age society. They required considerable organisation and communal effort to achieve, due to the earthworks, and so can demonstrate emerging communities.

5.2.25 Isolated farmsteads continued throughout the Iron Age, including within the study area. The relationship between the farmsteads and centralised sites is not known definitively, but this indicates that not all groups lived in large communities. By the middle Iron Age, isolated farmsteads would typically be enclosed (Brundell, 2021). By the Late Iron Age an established settlement pattern had emerged, primarily consisting of these small enclosed farmsteads within the 500m and 1km study areas. Many of the settlements identified in this period continued to be occupied in the Roman period (see 4.5.5). These sites were frequent, typically located approximately every 500m. It is therefore unusual that evidence of a Late Iron Age site has not been identified by trial trenching within the Scheme Order Limits (Network Archaeology, 2022). This could suggest that the Roman site, which was removed by a borrow pit for the A14 (HE1006), had Late Iron Age origins and that this evidence has been removed.

Roman

5.2.26 The arrival of Romans into Britain for the occupation, after AD 43, led to the creation of new towns, military installations and infrastructure. Roman Cambridgeshire had a series of minor towns, including Cambridge itself. These were joined by Roman Roads, such as that at Akeman Street/Mere Way (outside the study area to the west). The Roman conquest was a catalyst for change, although cultural and social change would have happened gradually. There is some evidence of Roman exploitation of the Fens landscape, especially in the use of waterways for transport (see within the study area below).

5.2.27 There is substantial evidence of Roman activity within the study area, including a significant area of Roman industry north of Horningsea. The Horningsea Kilns Scheduled Monument (HE002) were in use from the Flavian period (from the late 1st century AD) to the late 4th century and produced wares which were distributed throughout the region. Pottery and tile were transported using the nearby River Cam and the man-made Car Dyke (Oxford Archaeology East, 2017) (HE003). Car Dyke was constructed in the first and second centuries AD. The artificial waterway runs roughly northwards for 92km from the River Cam to the River Witham. It is typically interpreted as a navigable waterway for transporting people and goods. However, there has been some argument for its interpretation as a drainage channel (Historic England , 2022). Lodes, such as Quy Lode (see also HLCA69) may have been

constructed in the Roman period to control water in the Fens. These, usually straight, channels typically connect settlements to villages. As with Car Dyke, it is unclear whether their purpose was for transport as well as drainage. Some sections of larger Lodes are navigable today but have been recut over time.

5.2.28 The pattern of rural settlement, including within the study area, appears to suggest continuity from the Iron Age into the Roman period. This relates both to a broader pattern of isolated farmsteads and to individual sites which show continuous indigenous settlement following the Roman invasion. This includes Roman activity at the Multi-phased settlement at Milton (HE001). A Roman farmstead (HE1006) is also believed to have once been present within the Scheme Order Limits, identified from cropmarks of a farmstead and enclosures on aerial imagery. Surveys undertaken for the CWWTPR Project have identified that the site was removed by a borrow pit during the construction of the A14. A trackway (HE1304) identified south of the A14 is contemporary in date and likely led to the settlement, but this is now the only surviving evidence (Cotswold Archaeology, 2022).

Early Medieval

5.2.29 The Early Medieval period (sometimes called 'Anglo-Saxon') encompasses the gradual decline of Roman influence in Britain, coinciding with the collapse of the Roman Empire, post Roman rule and subsequent migration by groups including the Angles, Saxons, Jutes and Vikings (Hills, 2021). Comparatively little information survives from the period, known colloquially as the 'dark ages'. This trend continues within the Fens, where the limited evidence available is related to the emergence of settlements and Christianity later in the period, a pattern observable in the study area (see below). Early Medieval sites identified within the Waterbeach parish have mostly been recognised by small quantities of pottery and bone, mostly as isolated findspots. In situ remains are especially rare, although a sunken-featured building was excavated near Car Dyke (HE003) in 1972. This could have been a store or larder and may indicate a permanent settlement was present.

5.2.30 The transition between the Roman and Early Medieval periods was complex and archaeological evidence can be difficult to recognise and understand, where it survives (Evans et al, 2008). There is limited understanding of how the study area was used during the Early Medieval period, as the period is less well-understood than others on a national level. Large scale excavations around Cambridge have revealed substantially less evidence relating to the 5th - 7th centuries AD than to the Roman and prehistoric periods (Evans et al, 2008). However, there is emerging evidence of continuing Roman trends in the fifth century (Hills, 2021) and there is some evidence of Early Medieval occupation within the study area.

5.2.31 Many of the villages and small settlements in the study area have their origins in the Early Medieval period. These are later recorded in the Domesday Survey of 1086, capturing their existence at the very beginning of the Medieval period (see also below). For example, Horningsea is recorded in the Domesday Survey as a large settlement of 51 households. It is therefore likely to have already been established in the Early Medieval period. It is recorded as being within the Hundred (administrative subdivision) of 'Fleamdyke' (Powell-Smith). This is named for Fleam Dyke (HE1016),

which passes through the study area along the north side of High Ditch Road (as can be seen on historic maps, see section 4.2). The dyke was constructed in phases dating between the Late Roman and Early Medieval. Its function is somewhat debated but it may have formed a boundary. Fleam Dyke, and several other comparable earthworks which run parallel outside the study area, cross over the Roman Roads at Street Way and Ickneild Way (also outside the study area). This may be deliberate and could indicate an alternative interpretation of these earthworks as defensive structures in the region at the time of Roman retreat (Malim et al , 1997). An Early Medieval inhumation (HE1046) is also recorded within the study area, at the junction of Fen Ditton and Newmarket Roads.

5.2.32 There are records relating to other settlements in the study area in Domesday, likely indicating Early Medieval origins for these settlements. Quy is recorded as having 20 households, Stow having three and Milton having 36 (Powell-Smith). East of Milton, evaluation of the scheduled monument (HE001) also revealed evidence of Early Medieval occupation. A range of pottery and bone dating from the 8th to 12th centuries AD was recovered. This appears to relate to an enclosed settlement site (Malim et al , 1997).

5.2.33 Although evidence within the study area relating to the Early Medieval period is limited, what is present does provide some information from which likely trends can be extrapolated. The pattern of isolated farmsteads dispersed across the area likely continued from the Roman period into the 5th and maybe 6th centuries. Defensive or

5.2.34 perhaps boundary earthworks delineated areas of settlement and may have marked a point of transition between the native inhabitants and various invaders. By the 10th century, the settlement cores of most local villages had been established and there would have been some agricultural use of the surrounding landscape, where conditions allowed, to support these households.

Medieval

5.2.35 The Medieval captures the period from the Norman Conquest of England, by William the Conqueror from 1066, to the reformation of the English church in 1540. In the Fens the peat formation reached its maximum extent (3.5m AOD) during the Medieval period. Settlements lay near the River Cam, which remained a key transport route, on higher areas of ground between wetland areas (East Anglian Archaeology, 1996). Settlements outside of the Fens, in the south of the study area, also focused around the River Cam. The study area as a whole was sparsely developed, occupied by small settlements associated with local manors or monastic houses, which were the principal landowners in this area during this period. Cambridge was a well-established settlement but the development on its northern fringes, extending into the study area, was not yet constructed. The built heritage surviving in the study area from the Medieval period is discussed in section 4 below.

5.2.36 The pattern of Medieval settlements in the study area included the villages of Horningsea, Waterbeach, Milton and Fen Ditton. The settlement at Horningsea expanded during the period, under the influence of the Bishops of Ely. The church of St Peter in Horningsea (HE005, see also section 6 below), now Grade I listed, was first

constructed in the early 12th century (Historic England, 2022). The parish churches at Waterbeach and Fen Ditton also date to the Medieval period. These settlements were established after Horningsea but were likely similarly influenced by the church, given they also lie within the land which belonged to the bishops. The importance of Christianity in the developing settlements is also evidenced by the remains of

5.2.37 Waterbeach Abbey (a scheduled monument, HE0004, see also section 6) was inhabited by nuns of a branch of the Second Order of St. Francis called Minoresses, from 1293. Some records indicate that it may have been constructed as a manor house several decades prior, but it was abandoned and in a state of decay by the 1350s. Today, extensive earthworks of the house and grounds still survive (Salzman, 1948). The importance of Christianity in the Medieval landscape is further demonstrated by the presence of crosses, such as the one formerly located at the existing Cambridge WWTP (HE1184).

5.2.38 The bishop's residence or grange at Biggin Abbey was first used at the beginning of the Medieval period, at least as early as the 12th century. Possible evidence of an earlier moated site and of earlier garden features have been identified through the presence of cropmarks and the results of geophysical survey. None of this evidence was identified within the Scheme Order Limits. If remains relating to the Medieval grange had been present within the treated effluent corridor, they would have been removed by Post Medieval coprolite mining (Network Archaeology, 2022). It is believed that Henry III and Edward II both stayed at a property in this location in 1238 and 1315 respectively. The present Grade II* listed building (HE011, see also section 6 below) was constructed in the 14th century as the summer home of the Bishops of Ely (Historic England , 2022). It was used by the Bishops of Ely until at least 1478, when it was occupied by the bishop's physician (Wright, 2002). The monastic presence would have influenced the development of the small village of Horningsea, to the north.

5.2.39 The land surrounding these settlements, manors and halls was farmed in order to support their populations. Farming in the Medieval period utilised an open field system, in which the land was not divided by hedgerows or boundaries but communally farmed in strips on a rotation (Hall D. , 2014). The gradual expansion of settlements between the 9th and 13th centuries resulted in irregular enclosure of land for these open field systems, which were initially dominated by pasture (Historic England, 2006). Medieval agricultural activity in the study area is evidenced by Medieval ridge and furrow present throughout the fen edge, including in High Ditch Field (HE1087) and near Horningsea (HE1135, HE1146, HE1209, HE1207). This survives both as buried remains and as earthworks. In parts of the study area, including within much of the Scheme Order Limits, modern agricultural activity such as ploughing has removed the earthworks.

5.2.40 Although above ground earthworks of ridge and furrow are not identified within the Scheme Order limits, trial trenching within the site of the proposed WWTP and final effluent corridor identified the buried remains of plough furrows. The site of the proposed WWTP is located on the fringes of the parishes of Horningsea, Fen Ditton and Stow cum Quy. As such it may not have been the focus of Medieval agricultural

activity. Some field drains have been identified in the former wetlands of the study area, but drainage of farmland, where needed, was on a small, localised scale. There was no attempt to drain wetland areas of the Fen on a large scale in the Medieval period. Finds from these drainage ditches within the Scheme Order Limits indicate use between the 12th and 15th centuries (Network Archaeology, 2022), during which it is likely that they served Biggin Abbey and the nearby settlements at Horningsea and Fen Ditton. In the south of the study area the chalk bedrock would have provided natural drainage, therefore these features would not have been required. The land between the Horningsea and Fen Ditton would have been uninterrupted chalk lowland and river bank farmland, crossed by tracks and droveways.

5.2.41 There is also some evidence for the re-use or continued use of earlier features in the period. The Roman trackway (HE1304) within the waste water transfer tunnel was re-cut in the Medieval period.

Post Medieval

5.2.42 The Post Medieval period captures the era from the dissolution of the monasteries by King Henry VIII to the 20th century. It includes both the industrial and agricultural revolutions, where changes in technology led to rapid change, increased outputs and resultant population booms. The built heritage surviving in the study area from the Post Medieval period is discussed in section 6.

5.2.43 The study area continued to be a predominantly rural agricultural landscape with small villages and hamlets in the 16th and early 17th centuries. In the 17th century Horningsea and Waterbeach are shown on the earliest mapping of the study area as small settlements, connected by the River Cam. Some of their surroundings would have been drained on a small scale to create farmland, however early mapping still shows many fens at this time. This is demonstrative of the continued importance of waterways in connecting fenland settlements into the Post Medieval period.

5.2.44 Drainage of the Fens commenced on a large, organised scale in the 17th century, and continued through the 18th century. This was in stark contrast to the small-scale attempts of the Medieval and early Post Medieval periods, and was instead a deliberate, organised effort to free up more land for farming. For example, the 'Adventurer's Fen', to the north and outside the study area, was created by a group (the 'Adventurers') who were given lands within the fens in exchange for paying for their drainage. The wetlands were crossed with a series of man-made drainage channels to make it more suitable for farming. In some instances, drainage was maintained by windpumps. The levelled remains of a windmill mound (HE1050) has been identified within the Scheme Order Limits (Cotswold Archaeology, 2022). Management of the formerly waterlogged land has continued into the modern period. This change in water levels has resulted in peat shrinkage as the land has dried, which has lowered the level at which it sits. This revealed features such as roddons, the raised beds of earlier waterways where more waterlogged soils persist.

5.2.45 By the early 19th century, the available map evidence shows the enclosure of the parishes of Fen Ditton, Horningsea and Waterbeach. This process formalised the land

ownership within the area, creating individual fields from common fields and fens. Enclosure resulted in a field pattern of larger fields, both new and amalgamated from smaller, earlier fields. As farming technology improved, larger fields became more common. The site of the proposed WWTPR itself was one exceptionally large field by 1810 (Smith G. J., 1810). The site may have been used for growing hops and a hop ground building is shown in the field in 1886 (Ordnance Survey, 1886). The time depth of the agricultural landscape within the study area is also discussed in section 7.2 below.

5.2.46 In the Post Medieval period a number of halls with parks and gardens were created throughout the study area. The former Post Medieval park and gardens to Eye Hall, Horningsea (HE1010) were established in the early 19th century, although most features are now lost, with the exception of occasional hedgerows. The landscaped parkland (HLCA62) survives at Quy Hall (HE016) (see section 6 below), which originated in the 8th century as an Early Medieval deer park, but was expanded in the 19th and 20th centuries. The extensive landscape grounds (HE181) also survive well at Anglesey Abbey, developed on an earlier, Medieval, site (also see section 6).

5.2.47 Open cast quarrying industries grew to dominate the local economies by the 19th century, which included clay and coprolite extraction. The pottery industry continued the practice of exploiting the clays that was in practice since the Roman period. However, clay pits were now also serving the brick-making industry and influencing the local vernacular architecture (see section 6.2 below). A number of these sites have been identified within the study area, such as a former clay pit recorded on 19th century mapping (HE1047).

5.2.48 Even more dominant was open-cast quarrying for coprolite. Coprolite was dug out of the ground in large pits for use in fertiliser. Initially this appears to have been incidental, with coprolites found through panning and in clay pits. However, over time the industry developed more deliberate practices (Cambridge Archaeology Field Group, 2015). The interface between the greensand deposits and the gault clay (see section 4.2 on geology) is where the phosphate nodules (coprolites) are formed. Within the study area, this geological zone lies south and east of Horningsea. This placed the small village at the centre of the newly dominant industry.

5.2.49 In the heyday of the coprolite mining industry, test pits and shafts were dug to inform the location of new mines, such as HE1114. Once a mine was opened, it would be dug down to around 3 to 6m to collect the resource, removing the overburden of greensand. Coprolite pits would be linear, dug and refilled in sections, thereby disturbing huge areas over time (Cambridge Archaeology Field Group, 2015). The mined coprolite would be spread on adjacent fields, but also exported out of the area for wider use. A tramway was constructed near Horningsea to serve the extensive coprolite mines (HE1001). The features would also sometimes require drainage. For example, a windmill can be seen within the site of the proposed WWTP serving a coprolite pit on the 1st edition Ordnance Survey map (Ordnance Survey, 1886). This is no longer extant.

5.2.50 Several former coprolite pits survive as ponds and depressions within the study area, where they were not infilled. Others have been identified from historic mapping

through the surveys undertaken for the CWWTPR project. These include a cropmark site in Fen Ditton (HE1170) and a known former coprolite pit near Horningsea (HE1122). The extent of the industry in the Scheme Order Limits has been demonstrated through

5.2.51 evaluation undertaken for the Proposed Development. The extent of the area subject to coprolite mining within the study area has been mapped and can be seen in Appendix 12.1. Trial trenching and geophysical survey identified a notable concentration of coprolite quarries east of Horningsea (Cotswold Archaeology, 2022) as well as within the route of the treated effluent pipeline corridor, south of Biggin Abbey (Network Archaeology, 2022). Coprolite mining features were also identified south of the A14, where a series of post holes may indicate a temporary quarrying camp (Cotswold Archaeology, 2022). The combined understanding of this from surveys undertaken for the CWWTPR project has allowed the extent of the area believed to be affected by coprolite mining (HE1303) to be mapped; this can be seen on figures 13.10-~~16~~17 (Book of Figures, Historic Environment).

5.2.52 Towards the end of the 19th century this industrial activity promoted improved transport infrastructure in the study area. The Great Eastern Railway (Cambridge Line) (HLCA34) and Barnwell Junction to Mildenhall Railway (HLCA65) were both constructed in addition to the above-mentioned tramway (HE1001).

Modern

5.2.53 The modern period is typically interpreted as the turn of the 20th century to the present day, including both the First and Second World Wars. The built heritage surviving in the study area from the modern period is discussed in section 6 below.

5.2.54 Early modern mapping shows general continuation of the trends from the later Post Medieval period: agricultural activity, interspersed by open-cast quarries between small, rural, agricultural settlements. New clay pits are shown on mapping from 1901 (Ordnance Survey, 1901), indicating that the industry continued to thrive. This activity would gradually decline throughout the modern period, leading to the decline of some associated infrastructure, such as the Barnwell Junction to Mildenhall railway (HLCA65) which was dismantled in the 1960s.

5.2.55 Cambridge expanded significantly in the modern period, through new suburbs and infrastructure. By 1925, there is considerable indication of population expansion, especially north of Cambridgeshire around Milton. New suburbs are laid out on historic mapping and other features such as allotments indicate rising populations (Ordnance Survey, 1925). This expansion of Cambridge is reflected in the similar, although much smaller scale, expansion of the settlements within the study area. Small housing developments have been gradually added to the villages' outskirts, but the core of the settlements remained largely unaltered. The settlements at Horningsea and Fen Ditton remained smaller, with minimal expansion throughout the modern period compared to Waterbeach and Milton.

5.2.56 The increasing population also increased the demand for civic provisions and communal infrastructure. A sewerage farm is shown on historic mapping from 1901,

owned by the Cambridge Corporation, indicating the expanding population of Cambridge (Ordnance Survey, 1901). Initially, this was comprised of an open air 'sewerage farm'. This site gradually developed throughout the modern period to the present day Cambridge Waste Water Treatment Plant.

5.2.57 During the Second World War, the flat fenland landscape was exploited for use as airfields and for other military activities. A Second World War vehicle depot was located at Trinity Farm, Milton (HE1009) and north of Waterbeach, a RAF base was constructed. To service this base, a wastewater treatment works was constructed by 1950 to the east (Ordnance Survey, 1950). This has since developed into the works which now services all of Waterbeach. The General Headquarters Line (GHQ Line), which was a heavily defended route that was intended to impede and repel invading forces, ran through Cambridgeshire on the Cam (Brown A. , 2015). Many of the anti-gun emplacements, pillboxes and other defenses in the study area relate to this route.

5.2.58 The Cambridge Northern Bypass section of what was then the A45 was constructed in 1977, and in the 1990s the route was improved and incorporated into the new A14. This severed the villages and farmland of Horningsea and Milton to the north from Fen Ditton and Cambridgeshire to the south.

5.3 Key Archaeological Assets

Designated Assets

5.3.1 There are no scheduled monuments within the Scheme Order Limits. There are four scheduled monuments within the 1km study area, as follows: A Multi-phased settlement east of Milton (HE001), the site of Horningsea kilns (HE002), a section of Car Dyke (HE003) and the site of Waterbeach Abbey (HE004). The nearest of these to the Scheme Order Limits is the site of the Horningsea Kilns (HE002), which is approximately 200m south-west of the proposed route of the Waterbeach Pipeline, near Eye Hall.

5.3.2 There are nine scheduled monuments situated outside of the 1km study area but within, or partially within, the ZTV study area. Desk-based analysis of the potential impacts that would be caused by the Proposed Development narrowed down this group of assets to four scheduled monuments. These assets were each subject to a site survey and setting assessment. Through this process, no assets within the ZTV were identified as having the potential to be impacted by the Proposed Development. The reason each asset has been scoped out is detailed in the Gazetteer of Assets (Appendix 13.2, App Doc Ref 5.4.13.2).

5.3.3 The designated archaeological assets of greatest relevance to the Proposed Development are discussed in greater detail below.

Multi-phased settlement east of Milton (HE001)

5.3.4 The scheduled monument comprises a six hectare area east of Milton. It has occupation evidence spanning from the prehistoric to Medieval periods, focused on a gravel terrace which provides better drainage in the wetland landscape. Prehistoric

activity includes artefact scatters and Iron Age settlement remains of at least two phases. There is also a concentration of Roman activity representing almost continuous occupation from the 1st to 4th centuries. Early Medieval features, dated to the 8th century onwards by pottery, show an enclosed settlement which has been interpreted as possibly proto-manorial. This settlement also extends into at least the 13th century and includes fishponds which may relate to a proposed manor here (Historic England, 2022). The site includes subtle earthworks and more extensive cropmarks and buried remains across two agricultural fields. It was initially identified as crop-marks through aerial survey, additional evidence comes from geophysical survey and systematic field-walking (outside the 500m study area for events) undertaken in 2006-8 (Booth, 2009). A topographical survey (outside the 500m study area) was also undertaken in 2016 (Historic England, 2022).

5.3.5 Archaeological features within the site include of a complex of ditches, possible foundations and tracks. An L-shaped feature at the site is displayed on late 19th century mapping, where it is marked "supposed site of Hall" (Booth, 2009). There is significant evidence for Roman activity, including the recovery of much Horningsea grey ware pottery (see paragraph 5.3.6 below). The earliest Roman artefacts at the site date to the 1st century BC (Booth, 2009). There is some evidence of activity in the Early Medieval period. Several identified features are believed to correspond to a Medieval Hall, grounds and fishponds. Therefore, this may have been the location of the first hall at Milton (Booth, 2009). There is evidence that this was destroyed in 1266. There appears to be little activity at the site following this, although one midden contains 14th century refuse (Booth, 2009). In recent years the land has had an arable use.

Horningsea kilns (site of) (HE002)

5.3.6 The scheduled monument captures an area north of Horningsea, adjacent to the River Cam, which was used for the production of local pottery in the Roman period. Seven kilns have been identified, including some rebuilt and one built on top of another, indicating long-term use of the site. They are believed to date to approximately the late-2nd to 3rd centuries (The Royal Commission on the Historical Monuments of England, 1972). The kilns were excavated in 1911-12 (EVT010). As such, the archaeological methods employed and subsequent records relating to the excavation may be less reliable than if excavated in the modern period. The site is the source of the local style of Roman pottery, Horningsea Wares, as well as tiles.

5.3.7 Horningsea wares have characteristically blue/grey fabric due to their gault clay composition and are sometimes known are Horningsea Grey Wares. The prevalence of Horningsea Wares in the surrounding area of South Cambridgeshire is indicative of how prolific these kilns were. It is likely that the kilns relate to the large number of other known Roman sites in the area and the Roman town at Duroliponte (Cambridge).

Car Dyke (HE003)

5.3.8 Car Dyke is a Roman artificial waterway, which cuts through the Fens for approximately 92km (Historic England, 2022). It only remains legible in certain

sections, including that covered by this scheduling, which runs from Car Dyke Road to the Cam. This section of the dyke is intersected by the Fen Line Railway. The traditional interpretation of the Dyke has been as a means of transport, but may have also had drainage purposes (Historic England, 2022).

Waterbeach Abbey (site of) (HE004)

5.3.9 This scheduled monument is the site of a former abbey which was established by 1293. It housed nuns of a branch of the Second Order of St. Francis called 'Minoresses'. By 1359 the abbey had been abandoned and was in a significant state of disrepair (Salazman, 1949). Today it survives as earthworks.

Non-designated Assets

5.3.10 There are 22 monuments recorded in the CHER within the Scheme Order Limits, which can be summarised as follows:

- A former Roman cropmark system (HE1006) which covers a large area adjacent to the proposed WWTP. Trial trenching has confirmed this asset has been removed by a borrow pit which was created for the construction of the A14 (Network Archaeology, 2022);
- A record relating to the historic navigation of the River Cam since at least the Roman period (HE1232);
- The site of a Medieval cross, the cross itself has been removed (HE1184);
- The site of a windmill mound which may be Medieval, but is more likely to be Post-Medieval (HE1050). Trial trenching confirmed that, although the earthworks have been ploughed out, the remains survive below ground (Cotswold Archaeology, 2022);
- Ridge and furrow in High Ditch Field (HE1087) and near Horningsea (HE1135, HE1146, HE1209) and ridge and furrow associated with other Medieval earthworks near Horningsea (HE1207);
- Former field boundaries (HE1283);
- Two former coprolite pits (HE1222 and HE1248) which survive as ponds, and the site of a large area of coprolite extraction (HE1400). These all relate to the identified area of coprolite extraction (Cotswold Archaeology, 2022), which is shown in Appendix 12.1;
- A former clay pit, also surviving as a depression and recorded on 19th century mapping (HE1117);
- The site of a former tramway (HLCA65) and the still active fen line railway (HLCA13);
- The north-easternmost corner of the area of a former 19th century park and gardens to Eye Hall, Horningsea (HLCA24);
- Four possible trackways (HE1244, HE1253, HE1263 and HE1278);

- A linear feature west of Poplar Hall, which could be a water channel from the Cam but is undated (HE1250);
- Second World War Bombing Craters (HE1264); and
- A record relating to Waterbeach WRC, which was first constructed in the Second World War for the Royal Air Force base at Waterbeach (HE1268).

5.3.11 There are also 15 find spots (FS001 - FS009) recorded in the CHER within the Scheme Order Limits. These range from the Bronze Age to modern periods. In most instances, either the find has been removed and does not relate to an asset, or the asset is separately recorded. The exception is a scatter of worked flints near Horningsea which may be representative of a Bronze Age site and has therefore been included as an asset (HE1185). This is within the coprolite mining area and is therefore likely to have been redeposited rather than indicating an area of activity. An additional 57 findspots (FS010 – FS067) are identified within the 500m study area, these are detailed in the Gazetteer of find spots (Appendix 13.8, App Doc Ref 5.4.13.8).

5.3.12 An additional 192 assets are identified by the CHER within the 500m study area. These are detailed in the Gazetteer of Assets (Appendix 13.2, App Doc Ref 5.4.13.2).

5.3.13 The surveys undertaken for the project have identified additional archaeological assets within the Scheme Order Limits. The key assets are summarised below. All assets are discussed within Gazetteer of Assets (Appendix 13.2, App Doc Ref 5.4.13.2).

- An extensive area of coprolite mining (HE1303) to the south-west and north-west of Horningsea. This area captures many of the other recorded features relating to coprolite mining in the study area. It is mapped in Appendix 12.1.
- A Roman trackway (HE1304), possibly relating to the former site at HE1006, which was later re-cut in the Medieval period.
- A paleochannel, from which a Neolithic handaxe was recovered (HE1305).
- A series of Medieval and Post Medieval enclosure ditches (HE1306).
- An area of settlement activity which captures some in-situ Late Mesolithic or Early Neolithic deposits containing evidence of flint working. The area also contained and pits and ditches relating to the Late Bronze Age to Early Iron Age (HE1308).
- Three further areas of Late Bronze Age to Early Iron Age settlement activity (HE1307, HE1328 and HE1329).
- Two cremations (HE1308 and HE1309), both of which contained urns and which likely relate to the Late Bronze Age and Early Iron Age activity.

6 Built Heritage

6.1 Introduction

6.1.1 This section sets out the built heritage baseline for this assessment using a 1km study area and a 10km ZTV. It provides an overview of the built heritage character of the study area, which is predominantly rural villages, isolated farms and the north-eastern edge of Cambridge. This section also outlines the designated assets in the 1km study area and non-designated built heritage assets located in the 500m study area and those in the 10km ZTV study area.

6.1.2 The study area, including within the Scheme Order Limits, has largely retained its rural character throughout history, though it is situated within relatively close proximity to a number of settlements, including Fen Ditton, Milton, Horningsea and Cambridge.

6.2 Built heritage overview

Medieval

6.2.1 During the Medieval period, the 1km study area was sparsely developed and occupied by small settlements associated with local manor or monastic houses, which were the principal landowners in this area during this period. These houses form a large proportion of the surviving Medieval buildings within the 1km study area.

6.2.2 The Bishops of Ely owned the land presently occupied by Fen Ditton and Horningsea, overseeing the area through manors in both settlements. Biggin Abbey (HE11), the bishop's summer residence, is situated close to the River Cam north of Fen Ditton and dates to the 14th century, though an earlier residence occupied the site from the 13th century. The remains of Benedictine Abbeys at Denny Abbey (HE101), Swaffham Bulbeck (HE102) and an Augustinian priory at Anglesey Abbey have been integrated into Post Medieval houses.

6.2.3 The oldest surviving built heritage assets within the 1km study area are also ecclesiastical, comprising: the Church of St Peter, Horningsea (HE005), which dates to the 12th century; the Church of St John, Waterbeach (HE007), which dates to the 13th century; and the Parish Church of St Mary the Virgin, Fen Ditton (HE009), which dates to the 14th century. Though all three churches were subsequently altered, their appearance and form still retain their Gothic Medieval character. The Church of St Peter is constructed of limestone, while the Churches of St John and St Mary the Virgin are both composed of flint and limestone. Other churches in the surrounding area are composed of local clunch, a chalky limestone.

6.2.4 Few other Medieval buildings survive within the 1km study area and, like the churches, have all been subsequently altered and extended. A notable residential example is

6.2.5 Riverside Cottage, Fen Ditton (HE024), which is a timber-framed and plastered cottage that dates to the early 14th century. Seventeenth century extensions have partially obscured the building's Medieval heritage, but the original small scale of the building allows for an understanding of the Medieval appearance of the village and the surrounding area. Two 15th century barns in Fen Ditton (HE015) and Waterbeach (HE076) reflect the agricultural heritage of these settlements.

6.2.6 The layout of the settlements was established during the Medieval period, with development largely focused on crossroads or key routes between larger settlements.

Post Medieval

6.2.7 The built environment within the 1km study area is predominantly Post Medieval and modern in character, with the majority of built heritage assets dating to the Post Medieval period. Fen Ditton, Horningsea, Stow cum Quy and Waterbeach have largely retained their Post Medieval village character despite peripheral development during the 20th century. The earliest houses date to the 17th and 18th centuries. They are typically low-rise, one-and-a-half or two storey houses, predominantly constructed with timber-frames infilled in brick or plaster. Thatch and plain tile are both common roofing materials. From the mid-18th century onwards, dwellings were more typically constructed in brick and were of a larger scale, particularly notable in North Horningsea and Waterbeach. Some of the brick was likely sourced locally from gault clay pits in the area. Milton suffered a devastating fire in 1735, necessitating the widespread reconstruction of assets in the village (Oldham, 2021).

6.2.8 Agriculture was the dominant industry in the area throughout this period. During the 15th and 16th centuries, there was piecemeal enclosure of the village and surrounding farmland. This prompted the development of a number of new farmhouses, some of which survive today, though most are no longer in agricultural use. During this period, there were three main farms in Horningsea, which provided the majority of employment to local people. Some of the settlements in the 1km study area also developed under the patronage of a local landowner. For example, Stow cum Quy developed in close association with Quy Hall (HE016), with over 30 cottages that belonged to the estate situated in the village in 1839 (Wright, Stow cum Quy , 2002).

6.2.9 From the mid-19th century onwards, many churches across England underwent substantial restoration works, following a period of widespread neglect from the reformation onwards. Within the 1km study area, all of the churches were altered during this period, including the replacement of the roof at St Peter's Church in Horningsea, and rebuilding following partial collapse at St John's Church in Waterbeach. The street pattern in Fen Ditton and Horningsea, established during this period, references the importance of the River Cam for trade and travel. In Horningsea in particular, St John's Lane and Dock Lane led to the river, where there were once hithes (landing places) and wharves for transport.

Modern

6.2.10 Today, the 1km study area is predominantly a commuter zone for Cambridge. Milton, Waterbeach and Horningsea were all extended by large residential developments during the 20th century due to high demand for housing in this area.

6.2.11 The most significant change in the immediate vicinity of the site was the construction of the Cambridge northern bypass, now known as the A14, which began in 1977. This road bisected the countryside to the south-west of the site, separating the site from Fen Ditton.

6.2.12 Cambridge also expanded substantially to the north and east from the 19th century onwards. Notably, the area surrounding the site of the existing Cambridge WWTP, a 'sewage farm' from the late 19th century, has become increasingly urbanised throughout the 20th century as Cambridge subsumed the formerly separate village of Chesterton and expanded to the north and east towards Milton. Similarly, the mid-20th century development of Barnwell to the east of Cambridge on Fen Ditton Fields substantially reduced the area between Cambridge and Fen Ditton, though due to the inward-looking nature of Fen Ditton it has retained its largely rural character.

6.2.13 Fen Ditton village has resisted various Proposed Developments for extensive developments throughout the 20th century. This means that, with the exception of some modern infill development along Green End Lane and the 1920s development along the B1047 Horningsea Road, the village has retained its historic character. In Horningsea, a small development of housing was constructed during the 1980s, set back from the High Street. Both Fen Ditton and Horningsea have largely retained their Post Medieval character.

6.2.14 Milton grew slowly throughout the Medieval and Post Medieval period but, like Cambridge, expanded substantially during the 20th century. Milton's population more than doubled between the 1981 and 1991 census, demonstrating the extent of growth that has completely changed the character of the formerly small and spaciously developed village (Oldham, 2021). Additionally, infill development in the historic core of the village has diminished its historic character.

6.2.15 Waterbeach is recorded as being a small settlement during the Medieval period before growing steadily throughout the 19th century, with the population almost tripling between 1801 and 1871. The construction of the Great Eastern Railway in 1845 and a station at Waterbeach by 1851 contributed to this growth. A large area to the north of the village was requisitioned during the Second World War for the construction of an RAF airfield. The area is now undergoing major redevelopment to provide up to 6500 dwellings.

6.2.16 From the 1970s onwards, the Cambridge Science Park was constructed to the west of the existing Cambridge WWTP. The Cambridge Business Park to the south of the existing Cambridge WWTP developed from the 1990s. Cambridge North Station, to the south-east of the Business Park, was completed in 2017.

6.3 Key Built heritage assets

Designated Assets

6.3.1 There are 98 designated built heritage assets situated within the 1km study area. They comprise 93 listed buildings and five conservation areas. Of these listed buildings, one is listed at Grade I, 11 are Grade II* and 81 are Grade II. The Grade II listed buildings have been grouped within the ES chapter where they share a setting and are therefore likely to experience similar impacts as a result of the scheme. They are assessed individually within the Impact Assessment. The full list of Grade II listed buildings can be found in Gazetteer of Assets (Appendix 13.2, App Doc Ref 5.4.13.2). There are no World Heritage Sites within the 1km study area. Figures showing the location of these heritage assets are shown in Appendix 12.1

6.3.2 There are no listed buildings situated within the Scheme Order Limits. However, one listed building is surrounded by the Scheme Order Limits. Poplar Hall, a grade II listed early 17th century timber-framed farmhouse, is the nearest listed building to the Scheme Order Limits. Although enclosed by the Scheme Order Limit, the works near Poplar Hall will be limited to temporary activities associated with the tunnelling of the wastewater transfer tunnel. It is located approximately 900m south-west from the proposed WWTP. Biggin Abbey, a Grade II* listed building (HE011) is also in close proximity, approximately 110m north of the Scheme Order Limits, although it is located approximately 850m west of the proposed WWTP. This asset is a particular consideration for the Proposed Development.

6.3.3 There are two conservation areas within the Scheme Order Limits: Baits Bite Lock Conservation Area (HE095), which contains the treated effluent corridor and outfall, and Fen Ditton Conservation Area (HE096), which contains part of the waste water transfer tunnel. Conservation areas are also discussed within regard to historic landscape in section 7 below.

6.3.4 There are 305 listed buildings and 19 conservation areas situated outside of the 1km study area but within, or partially within, the ZTV. There are no world heritage sites within the ZTV study area. Desk-based analysis of the potential impacts caused by the scheme narrowed down this group of assets to 69 listed buildings and four conservation areas, which have the potential to be impacted. These assets were each subject to a site survey and setting assessment. Through this process, no assets within the ZTV were identified as having the potential to be impacted by the scheme. The reason each asset has been scoped out is detailed in Gazetteer of Assets (Appendix 13.2, App Doc Ref 5.4.13.2).

6.3.5 The designated assets of greatest relevance to the Proposed Development are discussed in greater detail below.

Biggin Abbey (HE011)

6.3.6 This Grade II* listed building, late-14th century asset comprises of a two-story main range farmhouse executed in cement-rendered limestone and clunch, with 17th century extensions of local brick. It replaced an earlier, mid-13th century dwelling, for which permission to enclose and crenellate was granted in 1276, demonstrating that

the site had high status. Though called 'Abbey', it was never occupied by a monastic community. The main range is roofed with modern pantiles, while the lower extensions are clay plain tile. The farmhouse is a surviving part of the summer residence of The Bishops of Ely and was visited by King Henry III, Edward I and Edward II. The Abbey was once moated.

Poplar Hall (HE040)

6.3.7 Poplar Hall is a Grade II listed early 17th century timber-framed farmhouse. It is composed of a hall and cross-wings, forming an H-plan, with a gable in the centre of the façade. A range of ancillary buildings adjoin the northern elevation and further farm buildings are located in the vicinity to the north.

Eye Hall, Barn to East South East of Eye Hall and Granary to East of Eye Hall

6.3.8 Eye Hall (HE080), Barn to East South East of Eye Hall (HE081) and Granary to East of Eye Hall (HE082) are a group of Grade II listed buildings. Eye Hall is a 16th century farmhouse, considerably updated in the early 19th century to a manor house. The 16th century barn and 18th century granary originate from the building's original use as a farmstead. The barn and granary are set with other former agricultural buildings around a yard. This group stands to the east of Eye Hall, which lies within its gardens (HLCA24). The gardens originate in the 19th century but have been considerably altered from their historic planting. Nonetheless, they remain as designed grounds surrounding the building. There is evidence for the building being on the site of a deserted Medieval settlement, which may have included a Medieval manor pre-dating the hall. The former lodge house to the hall and its own gardens lie west of Horningsea Road.

Church of St Peter (HE005)

6.3.9 This asset is a Grade I listed parish church dating to the early 12th century, within the context of Horningsea village. The church has been much altered, including extensions in the 13th and 14th centuries and restoration work in the 18th century. The extent of alterations is visible in the range of materials evident on the exterior including cement render on the four-stage tower, Barnack limestone, limestone ashlar, flint and clunch (chalky limestone rock) rubble, and red brick infill repairs.

Milton House (HE006)

6.3.10 This asset is a Grade II* listed 17th century house situated within Milton village, which is located to the north-east of Cambridge. It is predominantly composed of timber-framed and plaster construction with 18th century local brick and reused Medieval limestone infill visible on the gable of the kitchen wing, which faces the street. The carved Medieval stones are believed to have been taken from Archbishop Rotherham's Gateway (1480-1500) to the Old University Schools at Cambridge University (Historic England, 2022).

Church Of St John (HE007)

6.3.11 This asset is a Grade II* listed church has its origins in a small 13th century church and is located on the southern edge of Waterbeach village. Two bays of the original

church survive following substantial extensions during the 15th century and further reconstruction work in the 19th century. The church walls are composed of flint rubble and lime render with Barnack limestone and clunch dressings. The church is situated within a small churchyard, which is bounded by a low gault brick wall.

Non-designated Assets

6.3.12 There are no non-designated built heritage assets within the Scheme Order Limits. One Asset, Red House Close (HE1404), is surrounded by the Scheme Order Limits. A further 20 non-designated built heritage assets (for a total of 21) have been identified within the 500m study area. These are detailed in the Book of Figures – Historic Environment (App Doc Ref 5.3.13). The non-designated built heritage assets of greatest relevance for the Proposed Development are summarised below.

Red House Close (HE1404)

6.3.13 Red House Close is a 19th century farmhouse which is surrounded by the Scheme Order Limits. It is set in farmland on the outskirts of Fen Ditton within Fen Ditton Conservation Area (HE096).

Osier Cottage (HE1403)

6.3.14 Osier Cottage is a 20th century dwelling that was identified as having potential heritage value by Fen Ditton parish Council. It is set on the edge of the village with views of the Cam, within Fen Ditton Conservation Area (HE096).

24 Green End (HE1402)

6.3.15 24 Green End is a 19th century dwelling that was identified as having potential heritage value by Fen Ditton parish Council. It is set on the edge of the village with views of the Cam, within Fen Ditton Conservation Area (HE096).

Baits Bite Lock

6.3.16 Baits Bite (HE1201) is a 19th century canal lock along the river cam, north of the A14. It is set in relation to a former lock keepers' cottage (HE1407), modern footbridges, river navigation infrastructure and the Cam itself. It is a central focus of the Baits Bite Lock Conservation Area (HE095).

7 Historic Landscape

7.1 Introduction

7.1.1 This section provides baseline information with regard to the historic landscape relevant to the CWWTPR project. Historic Landscapes are landscapes as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. This includes world heritage sites, registered parks and gardens, registered battlefields, conservation areas and other historic parks, gardens and landscapes and includes designated and non-designated assets. A study area of 500m for non-designated assets and 1km and those within a 10km ZTV for designated assets has been used. In addition, a 1km study area has been used to undertake a characterisation exercise, as described below.

7.1.2 No county level Historic Landscape Characterisation exercise has been completed for Cambridgeshire. Therefore, a characterisation exercise has been undertaken to better understand the nature of the historic landscape within the 1km study area. The methodology for this exercise is described in section 2.6. A summary of the trends identified through this characterisation is included below. Identified Historic Landscape Character Areas (HLCAs) are described in Appendix 13.3, App Doc Ref 5.4. 13.3.

7.1.3 This assessment process differs from, but complements, the approach taken within the Landscape and Visual ES chapter (Chapter 15, App Doc Ref 5.2.15), which is focused on the present form of the landscape.

Designated Assets

7.1.4 There are no registered parks and gardens within the Scheme Order Limits. There are two conservation areas, as described above (see section 6.3) within the Scheme Order Limits. There are no registered parks and gardens within the 1km study area. The nearest to the Scheme Order Limits is Anglesey Abbey, Grade II* registered park and garden (HE181), which is located approximately 1.08km north-east. There are a further four conservation areas within the 1km study area (as described in section 6.3). There are no other designated historic landscape assets within the 1km study area.

7.1.5 There are 19 conservation areas and 15 registered parks and gardens situated outside of the 1km study area but within or partially within the ZTV. Desk-based analysis of the potential impacts caused by the scheme narrowed down this group of assets to four conservation areas and two registered parks and gardens which have the potential to be impacted. These assets were each subject to a site survey and setting assessment. Through this process, no assets within the ZTV were identified as having the potential to be impacted by the scheme. The reason each asset has been scoped out is detailed in the Gazetteer of Assets (Appendix 13.2, App Doc Ref 5.4. 13.2).

Non-Designated Assets

7.1.6 Historic Landscape Character Areas, with the exception of conservation areas, described within this report are not designated heritage assets (although they can contain designated heritage assets). An overview of the character of the historic landscape within the 1km study area is provided below.

7.2 Historic landscape overview

7.2.1 The characterisation exercise has identified 69 distinct areas within 1km of the Scheme Order Limits, these are detailed in the Historic Landscape Character and Impact Assessment (Appendix 13.3, App Doc Ref 5.4.13.3). They fall into a few broad types these are summarised below. The Historic Landscape Character process is described the report and figures showing these character areas are also available in this Appendix.

Agricultural Landscape

7.2.2 The dominant character of the 1km study area is a rural agricultural landscape; very flat in the north and very gently rolling to the south. The northern part of this landscape was originally formed when the Fens were formally drained in the large-scale efforts of the Post Medieval period. This landscape lies across most of the north of the study area, especially north of the A14, and also includes the Cam and its tributaries. Some higher areas of land had open field systems prior to this, supporting the Medieval villages. To the south of the study area, including at the site of the proposed WWTP, the Fens give way to chalk lowlands. These areas are also in agricultural use but, due to better natural drainage, sometimes have greater time depth. Honey Hill was likely in use as agricultural land prior to much of the fenland to the north due to its better drainage and the Medieval settlement in its proximity.

7.2.3 The present field patterns throughout the study area mostly date to the late Post Medieval and modern periods. As agricultural improvements in this period encouraged larger field sizes hedgerows were removed and fields replanned. Therefore, the present field pattern has straight line boundaries and large, amalgamated or planned fields. Most of the field pattern dates to the 19th and 20th centuries and lacks greater historic time depth. There are some earlier, but still Post Medieval, character areas and evidence of the Medieval open fields in the surviving ridge and furrow. There has been expensive coprolite mining in these areas, which is typically infilled and indistinct from the rest of fields, but sometimes survives as ponds or depressions.

Settlement Pattern

7.2.4 The 1km study area also includes several small settlements, most of which are liner with their historic cores recognised as conservation areas, such as Horningsea, Waterbeach and Fen Ditton. These settlements lie on slightly higher islands and terraces within the Fens and on its limits. They are Medieval, or Early Medieval, at their cores and the central street pattern, plot boundaries and places of worship sometimes reflects this. However, most of the built environment dates to the Post Medieval period (see also section 6). Modern suburban fringes have grown around

the historic cores, altering the pattern away from central roads and linear form into more nucleated settlements.

7.2.5 In the south and south-west of the study area, the character is more suburban and urban, with much more recent housing, industrial and commercial estates. The development around the north-eastern fringe of Cambridge is almost entirely modern, except for isolated surviving Post Medieval farmsteads. The street patterns, plots and character of the built environment is most mid to late 20th century.

Designed Landscapes

7.2.6 The non-designated parkland (HLCA62) for the Grade II* listed Quy Hall (HE016) is of particular relevance, having been raised by multiple stakeholders as an important consideration. The parkland, although degraded, retains some of its layout and key features. It also forms an essential part of the setting of the hall with a surviving avenue of trees framing views to the house on arrival from the south. Throughout the park, some elements of the layout have degraded over time, especially from the loss of parkland trees and overgrowth of wooded copses. The parkland retains key Post Medieval features that allow its time depth to be understood, with some modern additions and degradation.

7.2.7 The Grade II* registered park and garden of Anglesey Abbey (the building itself is outside the study areas) was redesigned from the former grounds of the Medieval Augustinian Abbey when the principal building was adapted into a county home. The formal garden and pleasure grounds still include the earthwork remains of the Medieval fishponds, drains and buildings. The consideration of this asset has also been raised by stakeholders. The asset does not fall within the 1km study area for designated assets nor the 1km area in which landscape characterisation is being undertaken. However, the ZTV indicates the potential for broken lines of sight from the very western edge of the park and garden towards the proposed WWTP site. However, site survey identified no intervisibility with the site from the end of the avenue at this western edge. The time-depth of the site can be understood from surviving earthworks of Medieval features such as fish ponds. The Post Medieval pleasure grounds can be easily read with many surviving features and little modern alteration.

Infrastructure

7.2.8 Post Medieval and Modern infrastructure has altered the primarily rural landscape of the study area. The straight lines of Post Medieval railways are evident, even where the lines themselves have been dismantled. However, the modern roads have caused the greatest change. The A14 has urbanised and severed the rural, agricultural Fen edge and introduced a new dominant landscape feature. These assets have little time depth with none pre-dating the 19th century.

8 Archaeological and Research potential

8.1 Introduction

8.1.1 The archaeological, built heritage and historic landscapes baseline above (Sections 4, 5 and 6) provide an overview of the known historic environment present within the study area. Most archaeological remains are below ground and there remains the potential for unknown discoveries that may be impacted and lost (wholly or in part) by construction work. The NPPF states in paragraph 205 that "local planning authorities should require developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible".

8.1.2 The East of England Regional Research Framework (EERRF) introduces the key research themes in the region by period. This has been combined with the existing baseline to reflect the potential for unknown archaeological remains in the study area. This has been reviewed in conjunction with the baseline to understand the research potential for further archaeological investigation.

8.2 Survival Potential

8.2.1 The survival of archaeological remains can be affected by later activities which remove or truncate them, as well as by the conditions of their environment, such as the acidity of soils and ground water levels. Key considerations that will have affected the survival of remains within the Scheme Order Limits are summarised here and should be understood in conjunction with the below sections on geoarchaeological potential (8.34) and archaeological potential (8.45).

8.2.2 Modern infrastructure within the Scheme Order Limits will have affected the survival of remains. The construction of the A14 is likely to have removed or truncated remains within the route. Associated activities will also have affected the survival of remains, as is demonstrated by the borrow pit that has removed a likely Roman site (HE1006) (Network Archaeology, 2022).

8.2.3 Within the existing Cambridge WWTP and Waterbeach WRC the survival potential is also considered to be much lower. This is especially relevant to buildings and infrastructure like settlement tanks, where foundations will have removed earlier remains. In areas of undisturbed greenspace within the facilities there is potential for archaeological remains to survive, but this represents a minimal amount of the area.

8.2.4 Within much of the Scheme Order Limits, especially to the south, east and north-east of Horningsea, extensive coprolite mining in the 19th century has been identified (HE1303). The extent of this area is mapped in Appendix 12.1. On a slightly smaller scale, clay pits and gravel pits are also present throughout (see also section 5.2). These open cast mining activities would have removed topsoils and subsoils, destroying any earlier in situ remains which may have been present in the process. Therefore, where these activities have been identified there is very low potential for remains pre-dating the 19th century to survive. These activities have also removed

remains such as peat deposits near the River Cam within the RLB. This is supported by the results of trial trenching, especially within the Waterbeach Pipeline (Cotswold Archaeology, 2022).

8.3 Geoarchaeological Potential

8.3.1 Between Horningsea and Fen Ditton, the superficial geology is not mapped. However, borehole data suggests that these consist of river terrace gravels. The geoarchaeological potential is lower within these areas, although these deposits are well draining and therefore attractive locations for activity of all periods. The geoarchaeological potential is higher around the immediate environs of the River Cam, where there are preserved sequences of Pleistocene river terrace deposits and Holocene peats, marine clays and alluvium.

8.3.2 There is no potential to recover evidence of Palaeolithic activity from the sands and gravels within the Scheme Order Limits. A small area of sands and gravels is present, but substantial parts of this have been quarried. Furthermore the remaining sands and gravels are likely to be early Holocene deposition and, therefore, do not have the potential to contain Palaeolithic deposits.

8.3.3 The greatest potential for survival of palaeoenvironmental remains lies in areas closest to the River Cam, mainly to the west of Horningsea and east of Waterbeach. The layers of alluvium can help to preserve evidence of human activity as well as past landscapes through palaeoenvironmental remains. The clays and silts of the salt marshes and intertidal mudflats, formed during the marine transgression, have moderate potential for the survival of palaeoenvironmental remains. However, these deposits are relatively shallow where recorded. The peat deposits have high potential for the survival of palaeoenvironmental remains. There is also potential for the survival of palaeochannels and relict courses associated with the River Cam. However, the majority of the area within the Scheme Order Limits lies on chalk beds and clays where these deposits have been disturbed and it is, therefore, unlikely that they will be survive intact. However, a surviving paleochannel with Neolithic deposits was identified near Fen Ditton (HE1305) (Cotswold Archaeology, 2022).

8.3.4 The potential for geoarchaeological remains within the Scheme Order Limits is low. Geoarchaeological remains may be encountered near the Cam, both by Biggin Abbey and at the Waterbeach Crossing of the Cam. However, coprolite mining present throughout the study area is known to have extended well into the gravel beds adjacent to the Cam. This includes near the FE/Outfall corridor, where trial trenching has identified extensive coprolite mining. Any remains recovered are anticipated to be of low or negligible value.

8.4 Archaeological potential

Palaeolithic

8.4.1 There is no potential for the area within the Scheme Order Limits to contain in-situ Palaeolithic remains, as described above in relation to geoarchaeological potential

(see below). There is very low potential to recover Palaeolithic tools as isolated finds outside their original context within the Scheme Order Limits. There is some precedent for the recovery of these artefacts within the south of the study area (FS064 and FS059). There is also evidence of exploitation of the wider landscape within this period, including hunting activity around rivers.

Late Glacial / Mesolithic

8.4.2 In situ Late Mesolithic remains (HE1308) were recovered from one feature within the site of the proposed WWTP. This area has moderate potential for further remains. This potential does not extend to the rest of the Scheme Order Limits.

8.4.3 There have been isolated handaxes recovered throughout the study area (FS046 and FS054), but there is no confirmed further activity from the period within the study area and no other activity identified within the Scheme Order Limits. Within the Waterbeach pipeline, there is no potential for Mesolithic deposits due to later coprolite mining. South of the A14, there is considered to be very low potential for Mesolithic remains due to the lack of evidence for activity.

8.4.4 The environment at the time is likely to have been dominated by deciduous forests (see below). Palaeoenvironmental remains can help reconstruct the past environment and may survive sealed in layers of alluvium, clays and peat around the River Cam. This may contribute to answering some of the aims outlined in the EERRF, including increasing recognition of Mesolithic features, improving chronological resolution of the period and improving representation in the regional HER data. However, within the Scheme Order Limits there has been extensive mining of these deposits, which affects their survival.

Neolithic

8.4.5 Within the site of the proposed WWTP, there is moderate potential for further remains relating to the Early Neolithic as an in-situ deposit containing evidence of flint working (HE1308) was identified through trial trenching (Network Archaeology, 2022). Artefactual evidence indicates continuous but limited use of the area around Honey Hill and Fen Ditton from the Mesolithic to Early Iron Age. This is consistent with the use of areas of higher ground in the study area for occupation. There may be additional remains, especially artefactual evidence, relating to this within the Scheme Order Limits around the site of the proposed WWTP. This may contribute to answering some of the aims outlined in the EERRF, including understanding ploughed Neolithic remains, continuation of Neolithic sites into the Bronze Age and characterising variability in the Neolithic landscape.

8.4.6 The area within the Scheme Order Limits south of the A14 has low potential relating to the Neolithic. A single struck flint was recovered from a Palaeochannel (HE1305) near Fen Ditton and there have been isolated finds from the period elsewhere in the 500m study area (such as FS012, FS013 and FS014). However, evidence of in situ remains is limited. Within the northern extent of the Waterbeach Pipeline, there is no potential for Neolithic remains due to extensive later coprolite mining.

Bronze Age

8.4.7 Within the site of the proposed WWTP and associated landscaping there is high potential for Late Bronze Age remains. This relates especially to four areas of settlement activity (HE1307, HE1308, HE1328 and HE1329) which indicate the likely presence of further associated remains in the area. There is also evidence of funerary activity associated with these sites, including two urned cremations (HE1309 and HE1310) which were recovered during trial trenching. This indicates that there may be further cremations present, or the remains of associated features such as pyres. Environmental samples have also demonstrated the presence of pollen remains which can inform on the subsistence of those occupying the site (Network Archaeology, 2022). These remains have the potential to be of regional importance. In particular, they may contribute to the objectives within the EERRF to better establish the Late Bronze Age to Early Iron Age chronology, whether settlements were permanently or periodically occupied and what crops were grown in the period.

8.4.8 Within the Scheme Order Limits south of the A14 there is low potential for Bronze Age remains. Within the Fens, remains from this period are typically well-preserved where they have been silted over. Within features such as paleochannels, the remains are sealed by later alluvium. Peat within waterlogged areas also has the potential to seal Bronze Age remains. However, the area within the Waterbeach pipeline to the north, which lies within the Fen edge in these conditions, has been subject to extensive coprolite mining which will have removed earlier remains. Therefore, areas within the Scheme Order Limits outside of the proposed WWTP and associated landscaping areas have no potential relating to the Bronze Age.

Iron Age

8.4.9 Within the site of the proposed WWTP and associated landscaping, there is high potential for Early Iron Age remains. The identified Bronze Age settlement and funerary activity (HE1307-10) shows evidence for continuation into the Early Iron Age. Further remains relating to this settlement and to the funerary activity are anticipated within the Scheme Order Limits round Honey Hill. These have the potential to contribute to objectives of the EERRF, as identified above.

8.4.10 The Roman site recorded within the site of the proposed WWTP (HE1006) may have had Late Iron Age origins. However, the removal of this site by a borrow pit for the A14 has removed the Late Iron Age potential of this area. North of the site of the proposed WWTP, within the Waterbeach pipeline construction corridor, later coprolite mining has removed all potential relating to the Iron Age.

8.4.11 South of the A14 within Scheme Order Limits, the potential for Iron Age remains is low. Surveys have identified no remains of this period. Therefore, the potential is considered to be low.

Roman

8.4.12 There is high potential for remains relating to the Roman trackway (HE1304) identified south of the A14, within the waste water transfer tunnel construction corridor. This is believed to relate to the former Roman site north of the A14

(HE1006). Remains of this site itself have been entirely removed by a borrow pit associated with the A14 (Network Archaeology, 2022). Therefore, there is no potential for in situ Roman remains within the site of the proposed WWTP. Similarly, no other evidence of Roman activity has been identified within the Scheme Order Limits. An area of potential Roman activity was identified east of the Horningsea Kilns scheduled monument (HE003), within the route of the Waterbeach Pipeline, during geophysical survey (Headland Archaeology, 2021b). However, trial trenching has confirmed that this related to coprolite mining and no surviving Roman remains were identified (Cotswold Archaeology, 2022). Therefore, it is considered that there is no potential for Roman remains within the Waterbeach Pipeline.

Early Medieval

8.4.13 There is low potential for remains relating to the Early Medieval period within the Scheme Order Limits at the site of the proposed WWTP and south of the A14. Evidence for activity lies outside these boundaries, especially around High Ditch Road. However, surveys identified no evidence of this extending within the Scheme Order Limits. Settlement at Horningsea, Fen Ditton and Milton may have been established towards the end of the period. The surrounding areas would have been farmed and it is possible that some of the identified field boundaries and ridge and furrow date to the end of the period, but no evidence of this has been identified. In the Waterbeach Pipeline and Final Effluent Pipeline areas, Post Medieval coprolite mining has removed earlier remains. These areas, therefore, have no potential relating to the Early Medieval.

Medieval

8.4.14 There is high potential for Medieval remains relating to agricultural activity, but low potential for all other Medieval remains, within the Scheme Order Limits. This potential primarily relates to the agricultural use of the chalk lowland hills and gravel terraces around settlements as open fields serving Horningsea and Fen Ditton. There is some potential relating to the Medieval settlement of these villages themselves, but this was generally around the settlement core and not towards the Scheme Order Limits.

8.4.15 Although ridge and furrow are recorded extensively within the study area, survey has identified that within the Scheme Order Limits much of this is degraded or has been removed by coprolite mining. Some remains of ridge and furrow survive on Honey Hill (Network Archaeology, 2022). A series of Medieval and Post-Medieval enclosure ditches (HE1036) were also identified through trial trenching. This may contribute to answering some of the aims outlined in the EERRF, including improving understanding of Medieval agricultural practices. Any remains associated with Biggin Abbey within the Scheme Order Limits in the area of the FE outfall corridor have been removed by later coprolite mines (Network Archaeology, 2022).

8.4.16 There is evidence for the Roman trackway (HE1304) being re-cut in the Medieval period (Cotswold Archaeology, 2022). No other evidence of Medieval activity has been identified within the Scheme Order Limits.

Post Medieval

8.4.17 There is high potential for remains relating to post medieval agriculture and late Post Medieval industry within the Scheme Order Limits. Evidence of ridge and furrow, field boundaries and enclosure ditches (such as HE1306) continue into the Post Medieval period. In addition, a windmill mound (HE1050), which has been ploughed out but survives as ditches identified through trial trenching (Cotswold Archaeology, 2022), lies within the Scheme Order Limits (but outside the construction corridor).

8.4.18 There is high potential for evidence of open cast mining activities throughout the Scheme Order Limits, but especially south, east and north-east of Horningsea. These mines have removed earlier remains, as described above, but themselves have some archaeological interest due to their ability to inform on this central part of the local 19th century economy. Therefore, the Scheme Order Limits has high potential for remains relating to Post Medieval agriculture and industry. This may contribute to answering some of the aims outlined in the EERRF, including characterising the Post Medieval landscape and synthesising this knowledge with the work of built heritage specialists.

Modern

8.4.19 There is high potential for the Scheme Order Limits to contain remains relating to modern agriculture. Historic mapping indicates that this use of the site continued throughout the modern period. These remains may include former field boundaries, as well as the possible remains of a hop ground building in the north. Defence activity is common elsewhere in the study area, but appears absent from the area within the Scheme Order Limits and there is no evidence of settlement.

9 Assessment of Value

9.1.1 A proportionate assessment of value has been undertaken for every identified asset within the 500m, 1km and ZTV study areas in accordance with the methodology set out in section 2.7. These are available for each asset in the table in Gazetteer of Asset (Appendix 13.2, App Doc Ref 5.4 13.2).

9.1 Scheduled Monuments

9.1.1 Scheduled monuments, as follows:

Multi-phased settlement east of Milton

9.1.2 Multi-phased settlement east of Milton (HE001) is considered to be of high heritage value derived from the archaeological remains and their ability to inform on nationally important archaeological deposits, especially relating to the evolution of settled sites over time.

Horningsea kilns, site of

9.1.3 Horningsea kilns, site of (HE002) is considered to be of high heritage value derived from the archaeological remains and their ability to inform on Roman occupation of the Fens and the industrial use of this area during the period.

Car Dyke

9.1.4 Car Dyke (HE003) is considered to be of high heritage value derived from the archaeological remains and their ability to inform on the construction, management and use of an inland waterway during the Roman period.

Waterbeach Abbey

9.1.5 Waterbeach Abbey (site of) (HE004) is considered to be of high heritage value derived from the archaeological remains and their ability to inform on the religious history of the area and Medieval occupation of the Fens. The asset's setting contributes to its rural character, but does not aid understanding of the asset's heritage value. As such, setting is considered to make a neutral contribution to the asset's heritage value.

9.2 Non-designated Archaeology

9.2.1 Non-designated archaeological assets are as follows:

Roman Cropmark System

9.2.2 Roman cropmark system, Horningsea (HE1006) is considered to be of negligible value as the remains have been removed by later construction and, therefore, hold no archaeological value as they cannot inform on past human practices.

Windmill Hill (mound)

9.2.3 Windmill Hill, Fen Ditton (HE1050) is of low value, derived from the ability to inform on the widescale draining of the Fens and its transformation to an intensely farmed agricultural landscape.

Area of Coprolite Mining

9.2.4 Area of coprolite mining (HE1303) is considered to be of negligible value, derived from the archaeological interest and the ability to inform on the intensive extraction industries in the Fens during the Post Medieval period.

Trackway

9.2.5 Trackway (HE1304) is considered to be of low value, derived from the archaeological interest and the ability to inform on Roman activity in the chalk lowlands, as well as Medieval re-use of earlier features.

Palaeochannel

9.2.6 Palaeochannel (HE1305) is considered to be of low value, derived from the archaeological interest and the ability to inform on the geoarchaoelogical development of the area as well as Neolithic activity.

Enclosure Ditches

9.2.7 Enclosure Ditches (HE1306) is considered to be of low value, derived from the archaeological interest and the ability to inform on the development of the agricultural landscape around Fen Ditton and past field systems.

Four Areas of Bronze Age and Iron Age Settlement Activity

9.2.8 Area of Settlement Activity (HE1307) is considered to be of moderate value, derived from the archaeological interest and the ability to inform on early permanent settlements in the chalk lowlands and the continuation of sites through prehistoric periods.

9.2.9 Area of Settlement Activity (HE1308) is considered to be of moderate value, derived from the archaeological interest and the ability to inform on late stone age flint working, early permanent settlements in the chalk lowlands and the continuation of sites through prehistoric periods.

9.2.10 Area of Settlement Activity (HE1328) is considered to be of moderate value, derived from the archaeological interest and the ability to inform on late stone age flint working, early permanent settlements in the chalk lowlands and the continuation of sites through prehistoric periods.

9.2.11 Area of Settlement Activity (HE1329) is considered to be of moderate value, derived from the archaeological interest and the ability to inform on late stone age flint working, early permanent settlements in the chalk lowlands and the continuation of sites through prehistoric periods.

Two Cremations

9.2.12 Urned Cremations (HE1309) and (HE1310) are considered to be of moderate value, derived from the archaeological interest and the ability to inform on late Bronze Age to Early Iron Age funerary practices.

9.2.13 The following built heritage assets of particular relevance to the Proposed Development, as identified above in section 6.3, derive their value as below described.

9.3 Listed Buildings

9.3.1 Listed Buildings, as follows:

Biggin Abbey

9.3.2 Biggin Abbey (HE011) is a Grade II* listed building, which is considered to be of high value. It is the former summer residence of the Bishops of Ely and has origins in the 14th century or earlier. Its value is derived from its architectural and historic interest, as well as the archaeological interest of its fabric. The building is surrounded by farmland on the outskirts of Horningsea and banks of the River Cam and is encompassed by Baits Bite Lock Conservation Area (HE095). Biggin Abbey also has limited views over the farmland beyond B1047 Horningsea Road, approximately 400m to the east - a historic route which is today a fairly busy commuter route. The building has a historic relationship with the surviving agricultural land within the parish, which would have been farmed under the diocese and likely served the bishop's rural retreat. Views over the surrounding farmland contribute to an understanding of Biggin Abbey's role as part of a rural agricultural manor of the Bishops of Ely. The introduction of modern infrastructure has altered the rural character of the wider setting of the building. This is especially relevant to the A14, where the presence of light and noise from vehicles on this road reduces the contribution made by setting to the heritage value of the asset. Other modern elements, such as electricity pylons in the surrounding fields, have also altered the character of the rural setting, but to a lesser extent. Despite modern infrastructure, the setting makes a positive contribution to the heritage value of the building as it enables the asset to be understood in its historic context of rural fen-edge farmland.

Poplar Hall

9.3.3 Poplar Hall (HE040) is a Grade II listed building that is considered to be of high value. It is a 17th century, timber-framed farmhouse. Its value is derived from its architectural and historic interest, as well as the archaeological interest of its fabric. Poplar Hall is set in a farmyard within agricultural land on the outskirts of Fen Ditton. Outward views are mostly enclosed by agricultural outbuildings and mature trees, but there are views over the farmland to the east. The A14 is located 115m to the north, and the presence of noise and light pollution from this alters the otherwise rural character of the setting and reduces the contribution that this setting makes to heritage value. Despite this, the setting makes a positive contribution to heritage value, as the farmland allows the historical purpose and context of the asset to be appreciated.

Eye Hall, Barn to East South East of Eye Hall and Granary to East of Eye Hall

9.3.4 Eye Hall (HE080), Barn to East South East of Eye Hall (HE081) and Granary to East of Eye Hall (HE082) are a group of Grade II listed assets, which are considered to be of high value. They derive value from the archaeological interest of their historic fabric, especially surviving 16th century elements. They also derive value from the historic interest of the group, including how they demonstrate the changing use of countryside estates over time. Value is also derived from the architectural interest, which is especially relevant to the hall itself which has gault brick casing applied to the original timber-framed building, demonstrating the evolution of architectural styles. It also has deliberately decorative features, such as dentilled brick eaves, and is highly symmetrical. The assets have group value due to their associative relationship. The setting of the hall within the remnants of the former grounds aids in understanding its conversion to a rural manor. The setting of the barn and granary around the paved yard contextualise their historic agricultural use. The setting of the group in the wider agricultural landscape around Horningsea aids in understanding the historic use and development of the assets as a farm. This setting positively contributes to the value of the assets.

Church of St Peter

9.3.5 The Church of St Peter (HE005), Grade I listed, is considered to be of high heritage value due to its historic and architectural interest, derived from its early architectural form and fabric. The churchyard and surrounding village are key element of the asset's setting, which also contribute to its heritage value. In particular, the church's location on St John's Lane references the historic interest of the route to the River Cam. The dense residential development, tall hedgerows and narrow lanes in the vicinity impede long views towards the asset. This has reduced the positive contribution made to the asset's value by its setting. The church is within Horningsea Conservation Area (HE097).

Church of St John

9.3.6 The Church of St John (HE007), Grade II* listed, is considered to be of high heritage value due to its architectural interest, derived from its early architectural form and fabric. The village setting contributes significantly to the value of the church. The church is within Waterbeach Conservation Area (HE099).

9.4 Conservation Areas

9.4.1 Conservation Areas are as follows:

Baits Bite Lock Conservation Area

9.4.2 Baits Bite Lock Conservation Area (HE095) is considered to be of medium value. The conservation area includes: part of the River Cam around Baits Bite Lock (HE1201), including the riverbanks; an area of farmland containing a small number of farmhouses and cottages, some of which are Grade II listed; and the Grade II* Biggin Abbey (HE011, considered separately below). It is crossed by multiple public footpaths, including a historic routeway to a crossing of the Cam, which enable appreciation of the asset. The asset's value is derived from the architectural interest of buildings within it, like Biggin Abbey. It is also derived from the engineering and

architectural interest of Baits Bite Lock itself and how this demonstrates the manipulation of the Cam for transport. It also has archaeological interest from Medieval and Post Medieval agricultural remains, heightened by the continuing use of fields in the conservation area for this purpose. The character of the conservation area is rural, but its setting is dominated by the A14 which is a considerably urbanising feature. Despite this, views over the River Cam and surrounding farmland enable an understanding of the historic, rural and agricultural context of the conservation area. The relationship to the River Cam makes a substantial contribution to the asset's value, as the historic navigation of the river is closely tied to the historical development of the conservation area.

Fen Ditton Conservation Area

9.4.3 Fen Ditton Conservation Area (HE096) is considered to be of medium value. It comprises the core of the settlement of Fen Ditton and its surrounding farmland to the banks of the River Cam to the west. It retains the character of a rural agricultural settlement, containing Grade II listed historic houses and a Grade I listed church in the central residential streets, with Grade II listed farmhouses (including Poplar Hall (HE040), discussed separately below) and a Post Medieval hall and grounds on the periphery of the village. Its value is derived from the architectural interest of its buildings and its historic interest as the Medieval core of the settlement. It also has archaeological interest, especially relating to Early Medieval remains. Its setting includes farmland on the fringe of Cambridgeshire and the River Cam. To the north it is bounded by the A14 and Baits Bite Lock Conservation Area (HE095). To the south it meets the Riverside and Stourbridge Conservation Area (HE100). Despite the presence of the roads, the setting retains a rural character and makes a positive contribution to the value of the asset.

Horningsea Conservation Area

9.4.4 Horningsea Conservation Area (HE097) is considered to be of medium value. It encompasses the historic core of the village along the B1047 Horningsea Road and St John's Lane, as well as farmland to the west which extends to the banks of the River Cam. It has a rural character as a small agricultural settlement on the edge of the rural farmland of the south Cambridgeshire fens. Its value is derived from the architectural interest of its buildings and historical interest as the Medieval core of the settlement. Its setting includes the River Cam and farmland on the fen edge that make a positive contribution to its value, providing context to the history and development of the settlement.

Waterbeach Conservation Area

9.4.5 Waterbeach Conservation Area (HE099) is considered to be of medium value. It captures the historic core of the settlement, centered around the High Street, Chapel Street and Station Road. Its value is derived from the architectural interest of its buildings and historical interest as the historic core of the settlement. The conservation area is slightly busier than others in the study area, due to the larger settlement size, but retains a rural village character. The setting of the conservation area includes the modern suburban expansion of the settlement. It also includes

the former RAF Waterbeach to the north, with which the Waterbeach WRC is historically associated, and farmland on the fen edge. This setting makes a positive contribution to the conservation area's value.

9.5 Non-designated Built Heritage Assets

9.5.1 Non-designated built heritage assets are as follows:

Red House Close

9.5.2 Red House Close (HE1404) is considered to be of low heritage value. It is a late 19th century farmhouse with architectural interest as a landmark within the rural landscape north of Fen Ditton.

Osier Cottage

9.5.3 Osier Cottage (HE1403) is considered to be of low heritage value. It features traditional design and proportions but dates to the mid-20th century and as such has limited historic interest. Its rural village setting makes a positive contribution to the value of the asset.

24 Green End

9.5.4 24 Green End (HE1402) is of medium heritage value due to its historic and architectural interest as a Post Medieval house. The rural character of its setting contributes to the ability to understand it as a typical domestic village building, and therefore makes a positive contribution to its value.

Baits Bite Lock

9.5.5 Baits Bite Lock (HE1201) is considered to be of medium heritage value, due to its historic form as a river feature from the 19th century that is still in use today. Its river setting makes a positive contribution to the value of the asset, as it aids in understanding its function. It is a key feature of Baits Bite Lock Conservation Area (HE095).

9.5.6 The following historic landscape assets of particular relevance to the Proposed Development, as identified above in section 7.1, derive their value as described below. The value of individual Historic Landscape Character is given in Appendix 13.3, App Doc Ref 5.4.13.3.

Anglesey Abbey Registered Park and Garden

9.5.7 The Grade II* registered Anglesey Abbey Park and Garden (HE181) is considered to be of high value due to the integrity of the Post Medieval designed grounds and time depth of features like fishponds. It also has historic interest associated with the Medieval Augustinian Abbey and later country home, and group value with numerous statues and other built features as well as the principal building.

Parkland to Quy Hall

9.5.8 The non-designated parkland (HLCA62) for the Grade II* listed Quy Hall is of moderate value due to surviving layout, its contribution to the setting of the hall and surviving key Post Medieval features.

10 Summary

10.1.1 This report has described the baseline as understood for the historic environment within the study areas for the Proposed Development. Occupation of the study areas is evidenced from the palaeolithic period to the present day, with the nature of activity varying across the study areas with the geological and topographical conditions.

10.1.2 Within the site of the proposed WWTP remains relating to Bronze Age and Iron Age settlement (HE1307, HE1308, HE1328 and HE1329) have been identified by surveys undertaken for the scheme. It is likely that a Roman settlement (HE1006) was previously located within the associated landscaping area, but this is believed to have been removed by a borrow pit for the A14. South of the A14 a trackway (HE1304) has been identified which may have related to this settlement, before it was re-cut in the Medieval period. A windmill (HE1050) and some Medieval or Post Medieval enclosure ditches (HE1306) were also identified in the Scheme Order Limits south of the A14.

10.1.3 In the land required for the Waterbeach Pipeline route north of the proposed WWTP, treated effluent pipeline and for the outfall to the River Cam, the survival of any earlier archaeological remains has been heavily affected by Post Medieval coprolite mining.

10.1.4 Biggin Abbey (HE011) is a Grade II* listed building with origins in the 14th century. It is located approximately 110m north of the Scheme Order Limits and 840m west of the proposed WWTP. Poplar Hall is surrounded by the Scheme Order Limits where they relate to the waste water transfer tunnel, and is located approximately 1km south-west of the proposed WWTP. The settings of both buildings have been altered by the construction of the nearby A14 and other modern infrastructure, but retain their rural character.

10.1.5 The proposed WWTP is located within HLCA22, which relates to a Post Medieval pattern of fields on the chalk lowland hills, with occasional surviving ridge and furrow earthworks. The historic landscape character of much of the wider study area is of agricultural land and rural villages, interrupted by late Post Medieval and modern transport infrastructure and the expansion of Cambridge in the south-west.

10.1.6 All assets within the study areas are detailed in the Gazetteer of Assets (Appendix 13.2, App Doc Ref 5.4.13.2). These assets are shown spatially in the figures in Book of Figures – Historic Environment (App Doc Ref 5.3.13). All find spots and events within the 500m study area are given in Appendix 13.7 (App Doc Ref 5.4.13.7 and 5.4.13.8. The results of geophysical and trial trenching surveys undertaken for the proposed scheme are given in Appendix 13.5, App Doc Ref 5.4.13.5. An assessment of impact for each asset, in accordance with the methodology described above in section 2, is given in the Impact Assessment Tables (Appendix 13.4, App Doc Ref 5.4.13.4). The HLCA is given in Appendix 13.3, App Doc Ref 5.4.13.3. A summary of the significant

effect and effects on key assets is given in the Historic Environment ES chapter (App Doc Ref 5.2.13).

11 References

Bahn, P. (2001). *Penguin Archaeology Guide.* London: Penguin.

BGS. (2022). *Borehole TL46SE109 – Near the Old Tillage, Waterbeach.* Retrieved from http://scans.bgs.ac.uk/sobi_scans/boreholes/543001/images/12148579.html

BGS. (2022). *Borehole TL56NW6 – Fen End, Waterbeach. .* Retrieved from http://scans.bgs.ac.uk/sobi_scans/boreholes/545225/images/12151146.html

BGS. (2022). *The BGS Lexicon of Named Rock Units: Cam Valley Formation*. Retrieved from https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=CAMV

Billington, L. (2021). Retrieved from Palaeolithic to Mesolithic Resource Assessment. East of England Archaeological Research Framework. : https://researchframeworks.org/eoe/resource-assessments/palaeolithic-and-mesolithic/#section-4/.

Booth, W. D. (2009). A preliminary archaeological survey (b): ill Close, Milton, Cambridgeshire with particular reference to Crop Marks, Geophysical Survey and Fieldwalking.

British Geological Survey. (2020). *Engineering geological studies of bedrock formations: Gault Formation*. Retrieved from www.bgs.ac.uk/geology-projects/engineering-geology-maps/engineering-geological-studies-of-bedrock-formations/gault-formation/

British Geological Survey. (2022). *The BGS Lexicon of Named Rock Units — Result Details*. Retrieved from https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=WMCH

Brown, A. (2015). *Cambridge, its railways and Station: Part 4 The Second World War and Nationalism* . Retrieved from Disused Stations: www.disused-stations.org.uk/c/cambridge/index8.shtml

Brown, N. a. (1997). *Neolithic and Bronze Age. Research and Archaeology: A framework for the Eastern Counties.*

Brundell, M. (2021). Late Bronze Age to Middle Iron Age Resource Assessment. East of England Archaeological Research Framework.

Bryant, S. (1997). Iron Age. Research and Archaeology: A framework for the Eastern Counties.

Cambridge Archaeological Unit. (2007). The National Trust ' WIcken Fen Vision' Project: An Archaeological Desk-Based Assessment. University of Cambridge.

Cambridge Archaeology Field Group. (2015). Wimpole Coprolites.

CCC. (2018). *Cambridge Local Plan.*

Cementation Ground Engineering. (1971). *Cambridge Northern By-Pass Borehole Report no 8639/SFO.* British Geological Survey.

CHER. (2021). MCB19894: Iron Age features at Greenhouse Farm, Fen Ditton. .

CIfA. (2020). *Standard and guidance for historic environment desk-based assessment.*

Clark, J. G. (1935). Report on Recent Excavations at Peacock's Farm, Shippea Hill, Cambridgeshire. *The Antiquaries Journal. 15 (3).*

Cotswold Archaeology. (2022). *Mains Sewer Pipeline, Waterbeach, Cambridgeshire: Archaeological Evaluation (draft).*

Department for Digital, Culture, Media and Sport. (2018). *Principles of Selection for Listed Buildings.*

Department of Environment, Food and Rural Affairs. (2012). *National Policy Statement for Waste Water.*

East Anglian Archaeology. (1996). The Fenland Survey Project, Number 10: Cambridgeshire Survey, Isle of Ely and Wisbeach.

English Heritage. (2008). *Conservation Principles, Policies and Guidance.*

Environment Agency. (2022). *LiDAR Finder*. Retrieved from https://www.lidarfinder.com/.

Evans et al. (2008). Borderlands: The Archaeology of Addenbrooke's Environs, South Cambridge. Cambridge Archaeological Unit.

Evans, C. (2003). Power and Communities: Excavations at the Wardy Hill Ringwork, Coveney, ELy. East Anglian Archaeology.

Hall, D. (1996). *The Fenland Project, Number 10: Cambridgeshire Survey, The Isle of Ely and Wisbech. East Anglian Archaeology Report 79.*

Hall, D. (2014). The Open Fields of England. . Oxford University Press. .

Headland Archaeology. (2021a). *Cambridge Waste Water Treatment Plant, Cambridgeshire: Geophysical Survey Report.*

Headland Archaeology. (2021b). *Waterbeach Growth Pipeline, Cambridgeshire: Geophysical Survey Report.*

Highways England. (2020). *Design Manual for Roads and Bridges: LA 106 Cultural Heritage Assessment .*

Hills, C. (2021). Early-Anglo Saxon Resource Assessment.

Historic England . (2017). *Good Practice Advice in Planning Note 3 (GPA3) – the setting of heritage assets. .*

Historic England . (2022). NHLE: Biggin Abbey.

Historic England . (2022). NHLE: Section of the Car Dyke between Whitepost Road and Fen Bridge.

Historic England. (2006). Historic Farmsteads: preliminary Character Statement – East of England. .

Historic England. (2015). *Geoarchaeology: Using Earth Sciences to Understand the Archaeological Record.* Retrieved from Historic England 2015, Geoarchaeology: Using Earth Sciences to Understand the Archaeological Record. Available at: https://historicengland.org.uk/images-books/publications/geoarchaeology-earth-sciences-to-understand-archaeological-record/heag067-geoarchae

Historic England. (2015). *Good Practice Advice in Planning Note 2 (GPA2) – managing significance in decision taking in the historic environment.*

Historic England. (2019). *Statements of heritage signficance: Analysing signficance in Heritage Assets.*

Historic England. (2019b). . *Conservation Area Appraisal, Designation and Management. Second Edition. Historic England Advice Note 1. Second Edition.*

Historic England. (2022). *A Bronze Age post alignment and timber platform at Flag Fen and associated Bronze Age and later field systems and settlement to either side of the Northey Road.* . Retrieved from https://historicengland.org.uk/listing/the-list/list-entry/1406460

Historic England. (2022). *Historic Landscape Characterisation*. Retrieved from https://historicengland.org.uk/research/methods/characterisation/historic-landscape-characterisation/

Historic England. (2022). *NHLE: 1127351: Milton House.*

Historic England. (2022). NHLE: CHURCH OF ST PETER.

Historic England. (2022). *NHLE: Multi-phased settlement east of Milton* .

Historic England. (2022). NHLE: Section of the Car Dyke between Whitepost Road and Fen Bridge.

IEMA, CIfA and IHBC. (2021). *Principles of Cultural Heritage Impact Assessment in the UK.*

Malim et al . (1997). 'New Evidence on the Cambridgeshire Dykes and Worsted Street Roman Road'. Proceedings of the Cambridge Antiquarian Society Vol. 85, pp. 27 – 122.

Malim, T. (2001). Place and space in the Cambridgeshire Bronze Age. In J. Bruck, *Bronze Age Landscapes: Tradition and Transformation.*

Ministry of Housing, Communities and Local Government. (2021). *National Planning Policy Framework*. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf

Must Farm. (2011). *Bronze Age River: Archaeology*. Retrieved from http://www.mustfarm.com/bronze-age-river/archaeology

Must Farm. (2017). *Dig Diary 7: What is the Timber Platform? =*. Retrieved from http://www.mustfarm.com/progress/site-diary-7-what-is-the-timber-platform.

Natural England . (2020). *National Historic Landscape Characterisation 250m Grid (England)*. Retrieved from https://data.gov.uk/dataset/8b8c5df3-d7e3-484c-89d8-c7b819205002/national-historic-landscape-characterisation-250m-grid-england

Network Archaeology. (2022). *CAMBRIDGE WASTE WATER TREATMENT PLANT: Archaeological Trial Trench Evaluation .*

Oldham, P. (2021). *A Brief History of Milton*. Retrieved from www.milton.org.uk/history/brief_history.html

Ordnance Survey. (1886). Cambridgeshire Sheet XL.SE. 1st Edition.

Ordnance Survey. (1901). Cambridgeshire Sheet XL.SE. 2nd Edition.

Ordnance Survey. (1925). Cambridgeshire Sheet XL.SE. 3rd Edition.

Ordnance Survey. (1950). Cambridgeshire Sheet XL.SE. 4th Edition.

Oxford Archaeology East. (2017). The Horningsea Pottery collection in Context.

Powell-Smith, A. (n.d.). *Open Domesday: Horningsea.* .

Salazman, L. F. (1949). Houses of minoresses: Abbey of Waterbeach. A History of the County of Cambridge and the Isle of Ely: Volume 2. British History Online.

Salzman, L. F. (1948). Houses of minoresses: Abbey of Waterbeach. A History of the County of Cambridge and the Isle of Ely: Volume 2. Ed. L F Salzman. London: Victoria County History, 292-295.

SCDC. (2005). *Fen Ditton conservation area: draft council policy.*

SCDC. (2006). *Horningsea conservation area: draft council policy.*

SCDC. (2006b). *Baits Bite Lock conservation area: Draft council policy.*

SCDC. (2018). *South Cambridgeshire Local Plan.*

SCDC. (2022). *lanning Cosntraints Map: Conservation Areas*. Retrieved from https://www.scambs.gov.uk/planning/search-by-map/

Smith, G. J. (1810). Plan of the parish of Horningsea, made on the enclosure.

Smith, R. A. (2020). *Hurst Park Eastate History*. Retrieved from The lie of the land: river terrace, clay, chalk marl, coprolites, and bricks: https://hpehistory.uk/the-lie-of-the-land-river-terrace-clay-chalk-marl-and-coprolites/

The Royal Commission on the Historical Monuments of England. (1972). Horningsea. An Inventory of the Historical Monuments in the County of Cambridgeshire, Volume 2, North-East Cambridgeshire. British History Online.

UKRI. (2022). *British Geological Survey*. Retrieved from http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Worssam, B. a. (1969). *Geology of the Country around Cambridge. Sheet 188, Mem. Geol. Surv., London, HMSO.*

Wright, A. F. (2002). 'Fen Ditton: Manors', in A History of the County of Cambridge and the Isle of Ely: Volume 10, Cheveley, Flendish, Staine and Staploe Hundreds (North-Eastern Cambridgeshire) pp. 123-124.

Wright, A. F. (2002). Stow cum Quy . *A History of the County of Cambridge and the Isle of Ely: Volume 10, Cheveley, Flendish, Staine and Staploe Hundreds (North-Eastern Cambridgeshire)*. London.

Wymer, J. (1999). *The Lower Palaeolithic Occupation of Britain, Volume 1. .* Wessex Archaeology and English Heritage.

Get in touch

You can contact us by:

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Calling our Freephone information line on **0808 196 1661**

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