

B. Environmental assessment

This appendix comprises the assessments for the following environmental criteria:

- B.1 Nature Conservation and Biodiversity
- B.2 Landscape and visual amenity
- B.3 Historic Environment
- B.4 Land and Water Quality
- B.5 Carbon emissions
- B.6 Noise
- B.7 Air Quality
- B.8 Odour

B.1 Nature Conservation and Biodiversity

Assessment methodology

- B.1.1 For Stage 4 – Final Site Selection, an assessment was carried out to identify the potential impacts of the WWTP development on nature conservation and biodiversity within and around each of the shortlisted site areas and the corridors for the treated effluent transfer tunnel or pipeline, waste water transfer tunnel, Waterbeach transfer pipeline, potential discharge location, diversions of the existing waste water transfer network, and site access areas.
- B.1.2 The methodology for assessing the potential impacts on nature conservation and biodiversity was informed by the Chartered Institute of Ecology and Environmental Management's (CIEEM) Guidelines for Preliminary Ecological Appraisal³⁰
- B.1.3 The following constraints were assessed:
- Ordnance survey (OS) maps, aerial imagery, and designated site citations were used to identify potential impact pathways during the construction and operation of each proposed site area and their associated corridors and access areas on:
 - all statutory designated sites within 10km Ecological Zone of Influence (EZoI); and
 - all non-statutory designated sites within a 5km EZoI.
- B.1.4 Pathways identified were generally natural routes for wildlife migration, such as hedgerows, woodland or watercourses, but also included a review of potential hydrological and air quality connections. Sites of Special Scientific Interest (SSSI) impact risk zones³¹ were also reviewed. Where the designated site is within 500m of the WWTP development, it was considered that increased levels of noise, vibration, light and vehicular movement during construction could lead to habitat disruption and species displacement (i.e. potential for impact and effects due to proximity despite lack of physical pathway).
- Use of aerial imagery, Master Map (OS high detail base mapping to determine Phase 1 habitats), and Natural England's open source data set for Priority Habitat Inventory³² to assess broad habitat types and to identify the presence of Habitats of Principal Importance (HPI; listed under Section 41 of the Natural Environment & Rural Communities (NERC) Act 2006), local Biodiversity Action Plan (LBAP) habitats³³, and ancient woodland inventories within each of the indicative proposed site areas and their associated corridors and access areas.
 - Use of the extended Phase 1 habitat survey data, which mapped and identified broad habitat types in accordance with the Joint Nature Conservation Committee (JNCC) Handbook for Phase 1 Habitat Survey³⁴ within 100m of the scheme extent. The Phase 1 habitat survey was undertaken between July and November 2020. The October and November 2020

³⁰ CIEEM Guidelines for Preliminary Ecological Appraisal, second edition, December 2017, <https://cieem.net/wp-content/uploads/2019/02/Guidelines-for-Preliminary-Ecological-Appraisal-Jan2018-1.pdf>

³¹ Natural England (2019) Natural England's Impact Risk Zones for Sites of Special Scientific Interest, (For use by Local Planning Authorities to assess planning applications for likely impacts on SSSIs/SACs/SPAs & Ramsar sites and determine when to consult Natural England), The Impact Risk Zones (IRZs) are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts. The IRZs also cover the interest features and sensitivities of European sites, which are underpinned by the SSSI designation and "Compensation Sites", which have been secured as compensation for impacts on European/Ramsar sites. Available online: https://magic.defra.gov.uk/Metadata_for_magic/SSSI%20IRZ%20User%20Guidance%20MAGIC.pdf

³² <https://data.gov.uk/dataset/4b6ddab7-6c0f-4407-946e-d6499f19fcde/priority-habitat-inventory-england>

³³ Cambridgeshire and Peterborough Biodiversity Group, (2020). Priority Species and Habitats. Available online: <http://www.cpbiodiversity.org.uk/habitats>

³⁴ JNCC (2010) Handbook for Phase 1 Habitat Survey, A Technique for Environmental Audit. Available online: <https://data.jncc.gov.uk/data/9578d07b-e018-4c66-9c1b-47110f14df2a/Handbook-Phase1-HabitatSurvey-Revised-2016.pdf>

habitat surveys were completed outside the recommended season for Phase 1 habitat surveys, which is April to September (in accordance with the JNCC Handbook for Phase 1 Habitat Survey). However, most of the survey coverage was completed during the optimal season (July-September) and sub-optimal surveys were completed when vegetation was still visible to undertake an assessment of habitat types and a suitable species list was recorded.

- Protected and notable species recorded within a 5km EZoI around each of the proposed site areas. Data³⁵ provided by Anglian Water were used to identify species (flora and fauna) with one or more of the following designations, records are provided in Appendix H. The desk study records were considered historic if they are more than 10 years old and unlikely to provide relevant information to inform the baseline for the assessment:
 - Species of Principal Importance (SPI) in England for the Conservation of Biodiversity listed under Section 41 of the Natural Environment & Rural Communities (NERC) Act 2006;
 - LBAP species; Cambridgeshire and Peterborough Biodiversity Partnership, have developed their own local list of SPI, which are selected based upon the National Biodiversity Action Plan which is now known as the "UK Priority Habitats and Species" and the LBAP list of species available from the Cambridgeshire and Peterborough Biodiversity Group website³.
 - Species listed on the schedules of the Wildlife and Countryside Act, 1981 (as amended);
 - Red List species that are designated as "Nationally rare" (i.e. occurring in 15 or fewer hectads in Great Britain) or "Nationally scarce" (i.e. occurring in 16-100 hectads in Great Britain), excluding rare species qualifying under main IUCN criteria.
- Data collected during the extended Phase 1 habitat survey, which covered features of potential significance for protected or notable species and were recorded as target notes. These included habitats of potential significance to support protected species and or evidence of presence such as field signs.
- Use of Defra's MAGIC website to review historical European Protected Species (EPS) licence applications within 5km of the site areas (see Appendix H).
- The review of great crested newt (GCN) environmental DNA (eDNA) pond surveys for district level licensing, and GCN Class licence survey returns within a 0.5km EZoI around each of the proposed site areas and their associated corridors and access areas. This assessment was conducted because there is Natural England open source data for GCN unlike for other EPS. This included, where required an assessment of the likelihood of GCN being present within a 0.5km EZoI around each of the proposed site areas and their associated corridors and access areas if records were absent. Ordnance Survey maps and aerial imagery were used to assess the extent of potential GCN habitats within 0.25km of the indicative site areas and their associated corridors and access areas.
- Green infrastructure strategies or initiatives and other biodiversity opportunities were also reviewed.

B.1.5 The RAG definitions provided in Table B.1 were defined to assess the potential ecological constraints for each of the three shortlisted site areas (1, 2 and 3).

B.1.6 Finally, the RAG scores for the individual components of the Stage 4 Final Site Selection were combined to provide an overall assessment of the potential ecological constraints at each of the proposed site areas. The overall RAG rating corresponds to the highest level of risk across the components of the assessment.

³⁵ This data was limited to 5km around the site area boundaries only.

Table B.1: Nature conservation and biodiversity RAG definitions

Potential ecological constraint	Green	Amber	Red
Impact pathways between proposed site areas, their associated corridors and access areas and statutory / non-statutory designated sites – all statutory designated sites within 10km EZol; – all non-statutory designated sites within a 5km EZol.	No national, regional or local designations likely to be adversely affected, or effect likely to be positive. i.e. no pathways from proposed site areas and their associated corridors and access areas.	Designation of regional or local importance likely to be adversely affected, i.e. a pathway from the proposed site areas and their associated corridors and access areas was identified e.g. County Wildlife Sites and City Wildlife Sites (CWS). Site option within SSSI impact risk zone for a relevant construction category and there is potential for a likely significant effect. If effects are judged likely or uncertainty exists at this stage without further work and or consultation, a precautionary approach will be applied.	National and/or international designated sites likely to be significantly adversely affected, i.e. potential impact pathway from indicative proposed site areas and their associated corridors and access areas e.g. Ramsar, Special Area Conservation (SAC), SSSIs, Local Nature Reserves (LNRs). Site option within SSSI impact risk zone for a relevant construction category and there is likely to be a significant effect. If effects are judged likely or uncertainty exists at this stage without further work and or consultation, a precautionary approach will be applied.
Habitat types	No Habitats of Principal Importance (HPI) within the proposed site areas. HPI within associated corridors and access areas. Habitats present considered unlikely to support protected species. Potentially suitable habitat and or evidence of protected species found within the associated corridors and access areas.	HPI within site areas, including the indicative WWTP footprint. Ancient woodland (AW) within 5km of the proposed site areas and their associated corridors and access areas. Potentially suitable habitat and or evidence of protected species found within the site areas.	Ancient woodland within the site area and their associated corridors and access areas.
Protected and notable species recorded within 5km of the shortlisted site areas EZol	Confirmed records of notable species without specific legal protection (e.g. nationally rare or nationally scarce) recorded within indicative WWTP boundary or within a 0.5km EZol of the site areas; and/or Confirmed records of EPS within 1.0km – 5.0km of the site areas.	Confirmed records of protected species (e.g. SPI and species listed on the Wildlife and Countryside Act 1981) within a 5.0km EZol of the indicative WWTP boundary; Confirmed presence of badger setts outside of the indicative WWTP footprint, but inside the site area; Confirmed records of EPS species within 0.5km – 1.0 km of the indicative WWTP boundary.	Confirmed records of protected species (e.g. SPI and species listed on the Wildlife and Countryside Act 1981) within the site area; Confirmed presence of badger setts within the indicative WWTP footprint; Confirmed records of EPS species within the site area, associated corridors and access areas or within a 0.5km EZol of the indicative WWTP boundary.

Potential ecological constraint	Green	Amber	Red
Records of GCN and potential for site areas and their associated corridors and access areas to support GCN	No GCN recorded within the site areas and their associated corridors and access areas or within a 0.5km EZol; and Lack of suitable GCN habitat within the site areas and their associated corridors and access areas or within 0.5km.	GCN recorded between 0.25km and 0.5km of the indicative corridors and access areas EZol; and Identification of habitat within the indicative proposed site areas and their associated corridors and access areas or within a 0.5km EZol that has the potential to support GCN (e.g. ponds, ditches, drainage network).	GCN recorded within the site areas and their associated corridors and access areas or within a 0.25km EZol.
Landscape scale initiatives (green infrastructure strategies or initiatives)	No proposed or confirmed green infrastructure strategies or initiatives within the proposed site areas and their associated corridors and access areas.	Proposed or confirmed green infrastructure strategies or initiatives adjacent to the proposed site areas and their associated corridors and access areas and or within the associate corridors and access areas. Proposed green infrastructure strategies or initiatives within the proposed site areas and their associated corridors and access areas.	Confirmed green infrastructure strategies or initiatives within the proposed site areas and their associated corridors and access areas.

Assessment of unmitigated options

- B.1.7 A summary of the unmitigated assessments for nature conservation and biodiversity and the resulting RAG scores for each option are provided below. The full assessment tables are provided in Appendix H.
- B.1.8 Maps of the features discussed in the following assessment are provided in the Drawings section at the rear of Appendix B.1. These are as follows:
- 409071-MMD-00-XX-GIS-Y-0455 Statutory designated nature conservation sites considered within the assessment
 - 409071-MMD-00-XX-GIS-Y-0456 Non-statutory designated nature conservation sites considered within the assessment
 - 409071-MMD-00-XX-GIS-Y-0457 – Legend for Phase 1 habitat survey maps, listed below
 - 409071-MMD-00-XX-GIS-Y-0458 Results of the extended Phase 1 habitat survey for site area 1 and associated infrastructure corridors
 - 409071-MMD-00-XX-GIS-Y-0459 Results of the extended Phase 1 habitat survey for site area 2 and associated infrastructure corridors
 - 409071-MMD-00-XX-GIS-Y-0460 Results of the extended Phase 1 habitat survey for site area 3 and associated infrastructure corridors
 - 409071-MMD-00-XX-GIS-Y-0461 All ponds and water bodies within 250m of the site areas and associated infrastructure corridors

Site area 1

Designated sites

- B.1.9 There are two statutory designated sites of international importance that are relevant to the assessment. Site area 1 is within 10km of Wicken Fen Ramsar site and Fenland SAC. The Ramsar and SAC share the same site boundary and are also designated as a SSSI and NNR (under the name Wicken Fen). The following potential impact pathways have been identified and will be subject to a Stage 1 Screening Habitat Regulations Assessment (HRA) for the Ramsar and SAC to determine likely significant effects (LSE):
- Discharge³⁶: no discharge risk is anticipated from site area 1 during operation as there will be no waste water discharged to ground or surface water; it will be treated and transferred to the discharge point on the river. Potential impacts during operation of the WWTP development, for example due to excessive variations in discharge, or discharge of effluent of an unacceptable quality to the River Cam, will be controlled by engineering features and operational practices included in the design and management of the scheme. An improvement in the quality of the effluent discharge is foreseen as a consequence of operating the new WWTP, although inclusion of the effluent discharge from the WWTP at Waterbeach would increase the proportion of effluent in the river upstream of Waterbeach. Overall, however, an improvement in water quality is anticipated throughout the River Cam

³⁶ Includes discharge of treated effluent and waste of more than 20m³/day to surface water of the River Cam. Any discharge of water or liquid waste that is discharged to ground (i.e. to seep away) or to surface water, such as a beck or stream (NB This does not include discharges to mains sewer which are unlikely to pose a risk at this location) - Description may vary to specify volume thresholds for discharges or to include discharges to main sewer. Most foul water is removed from a development site by a mains sewer. Where this is not the case, foul water is usually treated on site and then discharged either to ground to filter away from the site, or into a nearby watercourse. If the treated water flows towards a SSSI, it has the potential to impact on water quality sensitive features.

downstream of the outfall from the existing WWTP. As a result, no special mitigation measures are likely to be needed for these downstream sites.

- All general combustion processes³⁷: potential for air quality impact on designated site qualifying features. The WWTP development will include Combined Heat and Power (CHP) engines, standby boilers and backup generators, in case of emergencies. Energy plant emits pollutant emissions, which may have adverse impacts on air quality and significant effects on nearby ecological receptors. The WWTP will comply with environmental permitting regulations, as required, and emissions will be regulated and mitigated accordingly. Therefore, it is highly unlikely to result in an adverse significant effect.

B.1.10 Site area 1 falls within the impact risk zones of seven SSSIs, one NNR (Wicken Fen), and one LNR (Worts Meadow) that are of potential relevance to the assessment. However, there are no anticipated LSE from either construction of the WWTP or associated infrastructure and this is detailed in Appendix H. Potential impacts from discharge and combustion will be controlled as detailed in the two bullet points above under Section B.1.9. Consideration was given to the SSSIs downstream of the potential discharge locations at Options A and B. For example, the Cam Washes SSSI, which is approximately 7.1km from Option A and 5.6km from Option B. The Cam Washes SSSI is highly dependent on surface water and is subject to winter flooding. During construction, there is potential for pollution or discharge of sediment-laden water to the River Cam, which could affect downstream sites. During operation, treated water that flows towards the SSSI has the potential to impact on water quality sensitive features. However, any significant adverse impacts will be avoided either by standard mitigation measures included in a Construction Environmental Management Plan (CEMP) or in the scheme design. Potential impacts during operation of the scheme, for example due to excessive variations in discharge, or discharge of effluent of an unacceptable quality, will be controlled by engineering features and operational practices included in the design and management of the scheme. An improvement in the quality of the effluent discharge is foreseen as a consequence of operating the new WWTP, although inclusion of the effluent discharge from the WWTP at Waterbeach would increase the proportion of effluent in the river upstream of Waterbeach. Overall, however, an improvement in water quality is anticipated throughout the River Cam downstream of the outfall from the existing WWTP. Comparison of existing river quality with the prediction of quality resulting from operation of the new WWTP will be the subject of a separate assessment. As a result, no special mitigation measures are likely to be needed for this downstream site. Furthermore, the effluent outfall and any watercourse crossings will be designed to maintain flows at current levels and have no significant impact on flooding.

B.1.11 There is the potential for impact on three non-statutory designated sites, referred to as CWSs:

- Cottenham Moat CWS: although there is no obvious direct surface water connection evident from OS mapping and the moat is shown by British Geological Survey (BGS) to be located on Kimmeridge Clay, the CWS is adjacent to the contact with the aquifer known as lower Greensand outcrop, which overlies the Kimmeridge Clay. It is possible, therefore, that a connection might exist between the moat and the lower Greensand aquifer. Potential impacts of temporary dewatering in the lower Greensand aquifer during shaft construction may need to be considered at this CWS, which supports GCN.
- Milton Road Hedgerows City Wildlife Site (CWS): this site is on the boundary of the waste water transfer tunnel. There is potential for habitat loss from construction.

³⁷ Includes: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/combustion - Description may vary to specify thresholds for energy input. Emissions from combustion can cause air pollution affecting the habitats and species on SSSIs. More than 500m away from a SSSI, only combustion processes over a certain minimum size are likely to have an impact. A very large project and could cause air pollution on SSSIs up to 10km away.

- River Cam CWS: there is potential for habitat loss on the banks of the River Cam due to the treated effluent transfer tunnel or pipeline and discharge location.

Habitats

- B.1.12 There are no HPI within the indicative WWTP footprint. There are HPI within site area 1 and its associated infrastructure corridors and access areas. These include deciduous woodland HPI (c 1.5ha is within the site area, with other stands falling within the treated effluent transfer tunnel or pipeline and waste water transfer tunnel), floodplain grazing marsh HPI (which fall within the within the treated effluent transfer tunnel or pipeline and Waterbeach transfer pipeline), and traditional orchard HPI (a stand is present within the treated effluent transfer tunnel or pipeline and waste water transfer tunnel).
- B.1.13 There is more deciduous woodland HPI within site area 1 Option A (6.4ha) than Option B (3ha), whereas there is more floodplain grazing marsh HPI within site area 1 Option B (9.8ha) than Option A (3.5ha).
- B.1.14 There is 2.5km species-rich hedgerow (0.4km is present within the site area 1) and 7.9km species-poor hedgerows (1km within the site area 1, of which 0.4km falls within the indicative WWTP footprint) in site area 1 Option A. Whereas, the total length of hedgerows in site area 1 Option B includes 4km species-rich hedgerow and 8.8km species-poor hedgerow.
- B.1.15 Habitats recorded from the extended Phase 1 habitat survey were dominated by arable land within site area 1 (55.8ha). The arable land was used for polytunnels, which were positioned over entire fields. However, habitats also included 1.5ha of broadleaved plantation woodland (falls within the same area as the deciduous woodland HPI referenced above), 3km line of scattered broadleaved trees, 7.4ha semi-improved grassland, 2km of dry ditch, as well as small areas of improved grassland and amenity grassland within the site area 1. Within the indicative WWTP footprint there is 19.3ha of arable land, 2.7ha of semi-improved grassland, small areas of amenity grassland and hardstanding, and 1.7km line of scattered broadleaved trees, and a small section of dry ditch with a larger length of 0.7km standing water within a wet ditch.
- B.1.16 The habitats within the site area, infrastructure corridors and access areas have the potential to support protected species including bats, badgers, barn owls, breeding birds, terrestrial invertebrates for woodland habitats; breeding birds and reptiles for grassland habitats; water voles, otters, GCN, aquatic invertebrates, spined loach for wetland habitats. Ecological site walkover surveys including Phase 1 habitat surveys and scoping surveys to identify the potential for protected species are ongoing and the results will be provided in a Preliminary Ecological Appraisal report.

Protected and notable species

- B.1.17 There are GCN records within 0.25km of the Waterbeach transfer pipeline and the diversion of the existing waste water transfer network. There are no records within the site area or within 0.5km of the boundary.
- B.1.18 There are 13 waterbodies (ditches) within site area 1, of those three are within the indicative WWTP footprint. Five of the 13 ditches had some standing water present at the time of the survey visit in August 2020 and will require further surveys to determine the presence or likely absence of GCNs. It is possible that the eight ditches recorded as dry at the time of the survey visit in August 2020 may be wet during the spring months. There are no ponds within site area 1 and only two within 0.25km of site area 1 Option A. These two ponds will require further surveys to determine the presence or likely absence of GCNs. There is suitable terrestrial habitat for GCN within site area 1.

- B.1.19 Ecological site walkover surveys including Habitat Suitability Index (HSI) assessment surveys to identify the potential for waterbodies to support GCN are ongoing and the results will be provided in a Preliminary Ecological Appraisal report.
- B.1.20 No badger setts were recorded within the indicative WWTP footprint. However, there is a possible outlier and subsidiary badger sett in site area 1. There is one active main badger sett (bedding, footprints and spoil present) adjacent to the site area 1. Further detailed badger surveys will be required to survey for additional setts and to inform the requirement for avoidance and mitigation strategies.
- B.1.21 The indicative WWTP footprint has potential to support reptiles on the boundary of the site due to the grassland habitats and the presence of suitable refugia. All three common species of reptile have been recorded within 5km of the scheme boundary.
- B.1.22 Site area 1 has the potential to support breeding birds in the hedgerows and scattered broadleaved tree line such as SPI farmland bird species and Schedule 1 bird species (e.g. quail, red kite, hobby, and barn owl). The tree line may have potential roosting features for barn owl, which have been recorded within 5km of the scheme boundary. Other Schedule 1 bird species have also been recorded within 5km of the scheme boundary, such as hobby. These habitats are also of high suitability for commuting and foraging bats and may provide potential roosts within the trees. Breeding bird surveys will be required to survey for evidence of Schedule 1 breeding bird species and notable and rare breeding bird species. Bat surveys required will comprise preliminary bat roost assessment surveys and bat activity transect surveys.
- B.1.23 Habitats such as hedgerows and broadleaved plantation woodland (although limited in area and connectivity) across the site area 1 have the potential to support hazel dormouse. However, no records were returned within 5km of the site area 1 boundary and, therefore have been scoped out of further assessment.
- B.1.24 Further invertebrate surveys will be required along the hedgerows on Mere Way, which falls within site area 1, and the diversions of the existing waste water transfer network. Two Nationally Scarce species of flea beetles (*Podagrica fuscipes* and *Longitarsus ballotae*) along the hedgerow on Mere Way were recorded during a site visit in September 2020. Further terrestrial invertebrate surveys are also recommended for the northern extent of the Waterbeach transfer pipeline; a pond west of Milton Cemetery, Landbeach Road, a hedgerow east of the Cambridge FootGolf Centre, Ely Road, within the Option B treated effluent tunnel or pipeline; and the woodland south-west of the landfill, which is within the diversion of the existing waste water transfer network. Further invertebrate surveys will be required at site area 1 and its associated corridors³⁸.
- B.1.25 Where there is physical disturbance of the ditches to the west of the railway line within the treated effluent corridor for the site area 1 option B, and there is potential for negative impact to these habitats and aquatic species populations. Therefore, it is recommended that further surveys for fish, aquatic invertebrates, macrophytes and white clawed crayfish be required, to undertake an impact assessment and recommend suitable mitigation measures for the works.

³⁸ Please refer to the Steve Lane (2020) Scoping Survey (Invertebrates) Relocation of Waste Water Treatment Plan, Cambridge, September 2020 Report.

Landscape scale initiatives (green infrastructure strategies or initiatives)

- B.1.26 The proposed site area and associated corridors for site area 1 partially fall within the Cambridgeshire Strategic Green Infrastructure Network³⁹ (strategic network area 6 Cambridge and Surrounding Areas).
- B.1.27 The Natural England Network Enhancement Zone 1⁴⁰ falls within the Waterbeach transfer pipeline. Therefore, there are opportunities to incorporate the network enhancement zone into the landscape and ecology post-construction enhancement/habitat creation and restoration proposals. However, the Natural England Network Enhancement Zone 1 appears to relate to traditional orchard HPI west of the Waterbeach transfer pipeline. The Waterbeach transfer pipeline is likely to be restored to the baseline habitat recorded and returned to its original land use following construction. Therefore, creation of orchards within the pipeline area itself is likely to be unsuitable. However, opportunities to plant orchards within the WWTP site could be explored.

Site area 2

Designated sites

- B.1.28 Site area 2 is over 10km from Wicken Fen Ramsar and Fenland SAC and there are unlikely to be any LSE on the qualifying features from the site area 2 as a result of construction and operational activities. However, the potential impact pathway from the discharge to the River Cam is the same as site area 1 and will be subject to a Stage 1 Screening HRA to determine LSE. In addition the Waterbeach transfer pipeline and treated effluent transfer tunnel or pipeline associated with site area 2 are within 10km of the above designated sites and will be subject to a Stage 1 Screening HRA to determine LSE.
- B.1.29 Site area 2 falls within the impact risk zones of seven SSSIs, one NNR (Wicken Fen), and one LNR (2.2km from Worts Meadow) that are of potential relevance to the assessment. However, there are no anticipated LSE from either construction or operation of the WWTP or associated infrastructure.
- B.1.30 The same CWSs would be potentially affected as for site area 1 as detailed in Section B.1.11.

Habitats

- B.1.31 There are no HPI within the indicative WWTP footprint. There are HPI within site area 2 and its associated infrastructure corridors and access areas. These include deciduous woodland (of

³⁹ Cambridgeshire's Green Infrastructure Strategy has four objectives: 1. Reverse the decline in biodiversity, 2. Mitigate and adapt to climate change, 3. Promote sustainable growth and economic development, 4. Support healthy living and wellbeing. These four objectives were agreed by the Cambridgeshire Green Infrastructure Forum and supported through public consultation. They also reflect country-wide priorities as set out in 'Cambridgeshire's Vision 2007 – 2021 and the 'Cambridgeshire Quality Charter for Growth'. The Strategy is designed to assist in shaping and co-ordinating the delivery of Green Infrastructure in the County. Available online at: <https://www.cambridge.gov.uk/media/2557/green-infrastructure-strategy.pdf>
<https://www.cambridge.gov.uk/cambridgeshire-green-infrastructure-strategy#:~:text=The%20Cambridgeshire%20Green%20infrastructure%20Strategy.now%20and%20in%20the%20future.&text=To%20promote%20sustainable%20growth%20and%20economic%20development>

⁴⁰ From a spatial dataset that describes the geographic extent and location of Habitat Networks for 18 priority habitats based primarily, but not exclusively, on the priority habitat inventory with additional data added in relation to habitat restoration-creation, restorable habitat, plus fragmentation action, and network enhancement and expansion zones. The maps are created following a standardised process that incorporates a range of data layers and identifies specific locations for a range of actions to help improve the ecological resilience for each of the habitats/habitat networks. This is the combined habitat network map. The Habitat Networks (England) comprise a series of 23 individual habitat network maps for England plus a single 'Combined Habitat Networks Map' and 3 'Grouped Habitat Networks Map'. The habitat network maps seek to apply the best evidence and principles and to use the best available nationally consistent spatial data. The habitat network maps are developed around 4 distinct habitat components sets and include 4 distinct network zones where action may be undertaken to build greater ecological resilience. Land within close proximity to the existing habitat components that are more likely to be suitable for habitat re-creation for the particular habitat. These areas are primarily based on soils but in many cases has been refined by also using other data such as hydrology, altitude and proximity to the coast. This is termed the 'Network Enhancement Zone 1'. Information available at https://naturalengland.defra.opendata.arcgis.com/datasets/fceb93850462454ab3fb5acce2be35b_0?geometry=-29.930%2C48.013%2C25.573%2C57.298

which 0.2ha is within the site area, with other stands falling within the treated effluent transfer tunnel or pipeline, waste water transfer tunnel, and site access areas), floodplain grazing marsh (which fall within the within the treated effluent transfer tunnel or pipeline and Waterbeach transfer pipeline) and traditional orchard (a stand is present within the treated effluent transfer tunnel or pipeline and waste water transfer tunnel).

- B.1.32 There is more deciduous woodland within site area 2 Option A (c 10.1ha) than Option B (c 6.2ha), whereas there is more floodplain grazing marsh within site area 2 Option B (c 9.8ha) than Option A (c 3.5ha).
- B.1.33 There is 2.7km species-rich hedgerow and (0.1km is present within the site area, of which 0.04km within the indicative WWTP footprint) and 11.3km species-poor hedgerow (1.8km within the site area, of which 0.5km within the indicative WWTP footprint) in site area 2 Option A. Whereas, the total length of hedgerows in site area 2 Option B includes 12.5km species-poor hedgerow and 4.2km species-rich hedgerow.
- B.1.34 Habitats recorded from the extended Phase 1 habitat survey were dominated by arable land within site area 2 (45.3ha). However, habitats also included 1.9ha of woodland (which included a mix of semi-natural and plantation broadleaved woodland and mixed semi-natural woodland), 4.1ha improved grassland, 3.3ha of poor semi-improved grassland, 1.1km of dry ditch, as well as small areas of scattered broadleaved trees, dense and scattered scrub, semi-improved calcareous grassland, amenity grassland, and hard standing within the site area. Within the indicative WWTP footprint there is 21ha of arable land, 0.9ha of broadleaved woodland (comprising both semi-natural and plantation and likely to be an HPI), 0.5ha of poor semi-improved grassland and 0.4km length of dry ditch.
- B.1.35 The habitats within the site area, infrastructure corridors and access areas have the potential to support protected species including bats, badgers, barn owls, breeding birds, terrestrial invertebrates for woodland habitats; breeding birds and reptiles for grassland habitats; water voles, otters, GCN, aquatic invertebrates, spined loach for wetland habitats. Ecological site walkover surveys including Phase 1 habitat surveys and scoping surveys to identify the potential for protected species are ongoing and the results will be provided in a Preliminary Ecological Appraisal report.

Protected and notable species

- B.1.36 There is a GCN record within the site area (50m east of the indicative WWTP footprint⁴¹) and within 0.25km of the Waterbeach transfer pipeline. However, there are only seven waterbodies (ditches) within site area 2, of those two are within the indicative WWTP footprint. The seven waterbodies were dry at the time of the site visit in August 2020 and, therefore unlikely to be suitable for GCN. It is possible that the seven ditches recorded as dry at the time of the survey visit in August 2020 may be wet during the spring months.
- B.1.37 There are no ponds within site area 2 and only one within 0.25km of site area 2. The pond will require further surveys to determine the presence or likely absence of GCNs. There is suitable terrestrial habitat for GCN within site area 2. site area 2 is potentially the most constrained by recorded GCN presence, although as noted in footnote 17 the record does not appear to be linked to a waterbody or pond and, therefore, if further surveys do not identify presence of GCN, it will need to be discounted based on up to date survey data. If GCN are recorded as present

⁴¹ The record is from Natural England's Open Source data set GCN Class Licence Survey Returns. However, the grid reference and X and Y coordinates do not link to a waterbody or pond and therefore it is unknown what this positive record may relate to. During the extended Phase 1 habitat surveys there were no waterbodies with standing water recorded and no ponds.

within ponds or waterbodies, mitigation and compensation for ponds or waterbodies lost due to construction as well as the potential replacement of terrestrial habitat may be required.

- B.1.38 Ecological site walkover surveys including HSI assessment surveys to identify the potential for waterbodies to support GCN are ongoing and the results will be provided in a Preliminary Ecological Appraisal report.
- B.1.39 Within the indicative WWTP footprint there are two badger setts (likely to be a main sett and an outlier sett). There is also a potential outlier sett and subsidiary badger sett within site area 2, but these are outside of the WWTP footprint. Further detailed badger surveys will be required to survey for additional setts and to inform the requirement for avoidance and mitigation strategies.
- B.1.40 The indicative WWTP footprint has the potential to support reptiles on the boundary of the site due to the grassland habitats and the presence of suitable refugia. All three common species of reptile have been recorded within 5km of the scheme boundary.
- B.1.41 Site area 2 has the potential to support breeding birds in the hedgerows, woodland and arable farmland habitats such as SPI farmland bird species and Schedule 1 bird species (e.g. quail, red kite, hobby, and barn owl). The woodland may have trees with potential roosting features for barn owl, which have been recorded within 5km of the scheme boundary. Other Schedule 1 bird species have also been recorded within 5km of the scheme boundary, such as hobby. Breeding bird surveys will be required to survey for evidence of Schedule 1 breeding bird species and notable and rare breeding bird species.
- B.1.42 There are trees within the hedgerows and woodland that have potential roosting features (PRFs), which could support roosting bats. Some of the trees are dead and others have woodpecker holes, which are likely to have high potential to support roosting bats. These habitats are also of high suitability for commuting and foraging bats. Preliminary bat roost assessments of the trees will be required to identify PRFs and determine the actual or potential presence of bats and the need for further survey and/or mitigation as well as bat activity transect surveys.
- B.1.43 Site area 2 is potentially the most suitable of the three site areas for terrestrial invertebrates due to the presence of the woodland, south-west of the landfill. However, further invertebrate surveys are required to evaluate the significance of the woodland for invertebrates.
- B.1.44 Habitats such as hedgerows and broadleaved woodland across the site area 2 have the potential to support hazel dormouse. However, no records were returned within 5km of the site area 2 boundary and, therefore have been scoped out of further assessment.
- B.1.45 Further invertebrate surveys will be required at site area 2 and its associated corridors. Further surveys will be required within the woodland, which extends west from the south-western corner of the landfill and is within the WWTP footprint and the diversion of the existing waste water transfer network. Further terrestrial invertebrate surveys are also recommended for Site 2 along the hedgerows on Mere's Way which falls within site 2 Waterbeach transfer pipeline, land within the northern extent of the Waterbeach transfer pipeline (MoD land); a pond west of Milton Cemetery, Landbeach Road, a hedgerow east of the Cambridge FootGolf Centre, Ely Road, within the Option B treated effluent tunnel or pipeline.
- B.1.46 Where there is physical disturbance of the ditches to the west of the railway line within the treated effluent corridor for the site area 2 option B, and there is potential for negative impact to these habitats and aquatic species populations. Therefore, it is recommended that further surveys for fish, aquatic invertebrates, macrophytes and white clawed crayfish be required, to undertake an impact assessment and recommend suitable mitigation measures for the works.

Landscape scale initiatives (green infrastructure strategies or initiatives)

- B.1.47 The proposed site area and associated corridors for site area 2 partially falls within the Cambridgeshire Strategic Green Infrastructure Network (strategic network area 6 Cambridge and Surrounding Areas).
- B.1.48 The Natural England Network Enhancement Zone 118 falls within the Waterbeach transfer pipeline. Therefore, there are opportunities to incorporate the network enhancement zone into the landscape and ecology post-construction enhancement/habitat creation and restoration proposals. However, the Natural England Network Enhancement Zone 1 appears to relate to traditional orchard HPI west of the Waterbeach transfer pipeline. The Waterbeach transfer pipeline is likely to be restored to the baseline habitat recorded and returned to its original land use following construction. Therefore, the creation of orchards within the pipeline area is likely to be unsuitable. However, opportunities to plant orchards within the WWTP site could be explored.

Site area 3

Designated sites

- B.1.49 Site area 3 is within 10km of three statutory designated sites of international importance that are relevant to the assessment (Wicken Fen Ramsar and Fenland SAC) as detailed in the sections above for site areas 1 and 2 (Sections B.1.9 and B.1.28) and Devils Dyke SAC. In addition to the potential impact pathways identified for site area 1 in Section B.1.9 onwards, site area 3 option includes the crossing of the River Cam for the Waterbeach transfer pipeline. Although there are unlikely to be any LSE on the qualifying features, the development proposals will also be subject to a Stage 1 Screening HRA to determine LSE. The crossing of the River Cam by the proposed Waterbeach transfer pipeline is approximately 4.7km south from Wicken Fen Ramsar and Fenland SAC.
- B.1.50 Site area 3 is also within 10km of Devils Dyke SAC with a potential air quality impact pathway, as described for Fenland SAC in relation to site area 1 in Section B.1.9. This will be subject to a Stage 1 Screening HRA to determine LSE.
- B.1.51 Site area 3 falls within eight SSSI impact risk zones. Unlike site area 1 and 2, there are two SSSIs (Stow-cum-Quy Fen SSSI and Wilbraham Fens SSSI) within 1.4km of site area 3 and further assessment is required for these two SSSIs.
- B.1.52 Stow-cum-Quy Fen is the closest SSSI at approximately 1.1km north-east of site area 3 (1.5km from the indicative WWTP footprint). Black Ditch (an ordinary watercourse) is directly connected to the one of the water bodies within Stow-cum-Quy Fen SSSI. As a result, there is potential, without mitigation, for surface water and potentially groundwater impacts at the SSSI during construction and operation at site area 3 due to surface water or possibly seepages originating from groundwater underlying site area 3, which may discharge to Black Ditch. As a result, the discharge from site area 3 may reach at least one of the water bodies in Stow-cum-Quy Fen. However, standard mitigation measures included within a CEMP will reduce any potential surface water impact at Stow-cum-Quy Fen SSSI to a negligible level. The permanent site drainage will be designed to avoid any discharge of pollutants to Black Ditch during operation of the scheme. As a result, Stow-cum-Quy Fen SSSI should not be adversely affected by surface water discharge from the site.
- B.1.53 Consideration has also been given to the potential impacts during operation of the WWTP, due to leakage of waste water from the treatment plant, leading to contamination of groundwater in the chalk aquifer at site area 3, which could adversely affect Stow-cum-Quy Fen SSSI. Leakage of waste water from the treatment plant might result from:

- an operational failure giving rise to the short term discharge of waste water to the ground in or surrounding the WWTP; or,
- long term operation leading to deterioration and minor, undetected failures of the integrity of the plant, giving rise to leakages to drainage and groundwater.

- B.1.54 Either mechanism could result in the contamination of groundwater in the Chalk aquifer at site area 3. However, these risks would be taken into account fully in the robust design, protection measures and operational procedures for the WWTP. In addition, monitoring of groundwater and drainage in the area within and surrounding the WWTP could be implemented prior to and during the construction of the works, which is detailed in the mitigation section of this report (Section B.1.79). A Hydrogeological Impact Assessment⁴² (HIA) has been undertaken to further assess the potential impacts on the water environment including on Stow-cum-Quy Fen SSSI as discussed above. The HIA modelled the potential migration of contamination in shallow groundwater to the Black Ditch in the unlikely event of a release of contaminants during construction or operation of a WWTP at site area 3. The preliminary conclusions of the HIA indicate that with appropriate construction design, management and operational management, including protection measures, it is unlikely that significant concentrations of potential contaminants will reach Black Ditch within 1,000 years and therefore, it is unlikely that there will be an adverse impact on Stow-cum-Quy Fen SSSI.
- B.1.55 Wilbraham Fens SSSI is approximately 1.3km south-east from site area 3. Operational traffic may require further assessment as the vehicle movements exceed the assessment thresholds within the Environmental Protection UK and Institute of Air Quality Management guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017). Wilbraham Fens SSSI, is within 200m of the A1303, which may be used by operational traffic and therefore further assessment may be needed to determine likely effects from vehicle emissions at this site. However, although further assessment is recommended it is considered that the change in pollutant concentration as a percentage of the relevant critical level or load is likely to be less than 1%. According to the Institute of Air Quality Management (IAQM) guidance *A guide to the assessment of air quality impacts on designated nature conservation sites*⁴³, where the change in concentration is less than 1%, the effects can be deemed to be insignificant.
- B.1.56 There are no anticipated LSE from either construction of the WWTP or associated infrastructure and this is detailed in Appendix H for the SSSIs. Potential impacts from discharge and combustion will be controlled as detailed in the two bullet points under Section B.1.9. Consideration was given to the SSSIs downstream of the potential discharge location for site 3. For example, Cam Washes SSSI, which is approximately 7.2km from the potential discharge location for site 3 and the same approach has been taken as detailed for site area 1 Option A and B (which is also the same for site area 2) in Section B.1.10.
- B.1.57 There is potential for impact on four CWSs. There is potential for habitat loss to Low Fen Drove Way Grasslands and Hedges CWS as the CWS falls partially within site area 3 and the site access areas. The potential impacts on Milton Road CWS and River Cam CWS due to the waste water transfer tunnel and treated effluent tunnel or pipeline/discharge location, respectively are the same as reported for site areas 1 and 2 in Section B.1.11. Furthermore, the Waterbeach transfer pipeline will also cross the River Cam CWS, unlike for site areas 1 and 2 where the Waterbeach transfer pipeline will not cross the River Cam.

⁴² Further assessment of the potential impacts on groundwater and the groundwater-dependent environment has been undertaken in a Hydrogeological Impact Assessment (HIA) as requested by the Environment Agency in their response to consultation. The HIA will be made available once it has been reviewed the Environment Agency

⁴³ Holman *et al* (2019) *A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.0*, Institute of Air Quality Management, London. Available online at: www.iaqm.co.uk/text/guidance/airquality-impacts-on-nature-sites-2019.pdf

- B.1.58** Impacts have also been considered on Allicky Farm Pond CWS, which is 0.6km north-east of site area 3. Like Stow-cum-Quy Fen SSSI, Black Ditch could be connected to Allicky Farm Pond, the CWS is also within Flood Zone 3 along the ditch. As a result, there is potential, without mitigation, for surface water and potentially groundwater impacts at the CWS during construction and operation at site area 3 due to surface water or possibly seepages originating from groundwater underlying site area 3, which may discharge to Black Ditch. As a result, the discharge from site area 3 may drain through the channels and affect the CWS. However, standard mitigation measures included within a CEMP will reduce any potential surface water impact at Stow-cum-Quy Fen SSSI to a negligible level. The permanent site drainage will be designed to avoid any discharge of pollutants to Black Ditch during operation of the scheme. As a result, Allicky Farm Pond CWS should not be adversely affected by surface water discharge from the site. A Hydrogeological Impact Assessment⁴⁴ (HIA) has been undertaken to further assess the potential impacts on the water environment including on Allicky Farm Pond CWS as discussed above. The HIA modelled the potential migration of contamination in shallow groundwater to the Black Ditch in the unlikely event of a release of contaminants during construction or operation of a WWTP at site area 3. The preliminary conclusions of the HIA indicate that with appropriate construction design, management and operational management, including protection measures, it is unlikely that significant concentrations of potential contaminants will reach Black Ditch within 1,000 years and therefore, it is unlikely that there will be an adverse impact on Allicky Farm Pond CWS.

Habitats

- B.1.59** There are no HPI within the indicative WWTP footprint or within site area 3. However, there are HPI within the infrastructure corridors and access areas associated with site area 3. These include deciduous woodland (11.7ha) within the site access areas and waste water transfer tunnel and floodplain grazing marsh (20.6ha), which falls within the waste water transfer tunnel and waterbeach transfer pipeline.
- B.1.60** There is 4.4km species-rich hedgerow (the majority of which is a hedge with trees) within site area 3 (2.3km is present within the site area, of which 0.6km is within the indicative WWTP footprint) and 12.9km species-poor hedgerow within site area 3 (3.6km within the site area, of which 1.3km is within the indicative WWTP footprint).
- B.1.61** Habitats recorded from the extended Phase 1 habitat survey were dominated by arable land within site area 3 (124.5ha). However, habitats also included 0.7ha of broadleaved semi-natural woodland, 1.2ha poor semi-improved grassland, 0.2ha semi-improved neutral grassland, 0.2ha improved grassland, 0.6ha amenity grassland, 4.3km of dry ditch, as well as small areas of scattered scrub, ephemeral short perennial vegetation, hardstanding, and buildings. Within the indicative WWTP footprint there is 22ha of arable land, 24m² of broadleaved semi-natural woodland, 0.1ha of amenity grassland, 0.02ha hardstanding and 1.3km length of dry ditch.
- B.1.62** The habitats within the site area, infrastructure corridors and access areas have the potential to support protected species including bats, badgers, barn owls, breeding birds, terrestrial invertebrates for woodland habitats; breeding birds and reptiles for grassland habitats; water voles, otters, GCN, aquatic invertebrates, spined loach for wetland habitats. Ecological site walkover surveys including Phase 1 habitat surveys and scoping surveys to identify the potential for protected species are ongoing and the results will be provided in a Preliminary Ecological Appraisal report.

⁴⁴ Further assessment of the potential impacts on groundwater and the groundwater-dependent environment has been undertaken in a Hydrogeological Impact Assessment (HIA) as requested by the Environment Agency in their response to consultation. The HIA will be made available once it has been reviewed the Environment Agency

Protected and notable species

- B.1.63 There is a GCN record approximately 350m north of the Waterbeach transfer pipeline. There are no GCN records within the site area or within 0.5km of the boundary. There are only five waterbodies (ditches) within site area 3, none of these are within the indicative WWTP footprint. The five waterbodies were dry at the time of the site visit in August 2020 and, therefore unlikely to be suitable for GCN. It is possible that the five ditches recorded as dry at the time of the survey visit in August 2020 may be wet during the spring months. There are no ponds within site area 3 and only three within 0.25km of site area 3. The ponds will require further surveys to determine the presence or likely absence of GCN. There is suitable terrestrial habitat for GCN within site area 3, although this is limited to hedgerows and the small areas of woodland.
- B.1.64 Ecological site walkover surveys HSI assessment surveys to identify the potential for waterbodies to support GCN are ongoing and the results will be provided in a Preliminary Ecological Appraisal report.
- B.1.65 No badger setts were recorded within the indicative WWTP footprint. However, within site area 3, there is a potential subsidiary sett and outlier badger sett. Further detailed badger surveys will be required to survey for additional setts and to inform the requirement for avoidance and mitigation strategies.
- B.1.66 The indicative WWTP footprint has the potential to support reptiles on the boundary of the site due to patches of grassland and scrub, and vegetated dry ditches, and the presence of suitable refugia. All three common species of reptile have been recorded within 5km of the scheme boundary.
- B.1.67 The site has the potential to support breeding birds in the hedgerows, woodland and arable farmland habitats such as SPI farmland bird species and Schedule 1 bird species (e.g. quail, red kite, hobby, and barn owl). There is a mature tree within a hedgerow in the centre of the indicative WWTP footprint and a derelict farm outbuilding in the north-east of site area 3, which has the potential to support barn owl. Breeding bird surveys will be required to survey for evidence of Schedule 1 breeding bird species and notable and rare breeding bird species.
- B.1.68 Within the indicative WWTP footprint there are trees within the hedgerows and small woodland copse that have PRFs, which could support roosting bats. These habitats are also of high suitability for commuting and foraging bats. Preliminary bat roost assessments of the trees will be required to identify PRFs and determine the actual or potential presence of bats and the needs for further survey and/or mitigation as well as bat activity transect surveys.
- B.1.69 Habitats such as hedgerows and broadleaved woodland (although limited in site area 3) across the site area 3 have the potential to support hazel dormouse. However, no records were returned within 5km of the site area 3 boundary and, therefore have been scoped out of further assessment.
- B.1.70 Roe deer were recorded in the site area 3 during the extended Phase 1 habitat surveys and were also mentioned in the public consultation response. Roe deer are not a species of conservation concern and the construction of the WWTP will not result in a negative impact on these species. Habitat creation as part of the landscape plan will allow deer to disperse around the WWTP into the wider landscape. Therefore, deer have been scoped out of further assessment.
- B.1.71 Further invertebrate surveys will be required at site area 3 and its associated corridors. Further surveys will be required within the hedgerows which form part of the dismantled railway and Low Fen Drove Way Grassland and Hedges CWS within site area 3 and access areas and the small copse and improved grassland in the south-eastern corner of site area 3 and access

areas. The Nationally Scarce species of flea beetle *Longitarsus ballotae* was recorded at the Low Fen Drove Way Grassland and Hedges CWS. Further surveys will also be required along at least two sections of the Waterbeach transfer pipeline, that includes a section of hedge with standing dead elms and a small elm copse.

- B.1.72 Where there is physical disturbance of the River Cam CWS from the Waterbeach pipeline route and where the corridor passes through a ditch (WB 141) within site area 3, and there is potential for negative impact to these habitats and aquatic species populations. Therefore, it is recommended that further surveys for fish, aquatic invertebrates, macrophytes and white clawed crayfish be required, to undertake an impact assessment and recommend suitable mitigation measures for the works.

Landscape scale initiatives (green infrastructure strategies or initiatives)

- B.1.73 The proposed site area and associated corridors for site area 3 fall within the Cambridgeshire Strategic Green Infrastructure Network (strategic network area 6 Cambridge and Surrounding Areas) and site area 3 also falls within the National Trust's Wicken Fen Vision area⁴⁵ Target area 6.2 of the Cambridgeshire Green Infrastructure Strategy focuses on Wicken Fen and Anglesey Abbey, with one of the key objectives to "create a range of habitats, providing new sustainable opportunities for rare fenland species, securing the essential resource of water and protecting peat soils".
- B.1.74 The Natural England Network Enhancement Zone⁴⁶ falls within the waste water transfer tunnel. The Natural England Network Enhancement Zone is land that is within relatively close proximity to the Network Enhancement Zones 1 and 2, which are more likely to be suitable for habitat creation for the particular habitat (which appears to be lowland fens, lowland calcareous grassland) and helps to identify possible locations for connecting and linking up networks across a landscape. Therefore, there are opportunities to incorporate the network enhancement zone into the landscape and ecology enhancement/habitat creation and restoration proposals. However, because the waste water transfer tunnel will be underground, there will be limited impact on land above ground, except for where shafts will be constructed, which may result in areas of habitat loss.
- B.1.75 A Network Enhancement Zone is also adjacent to the north-eastern boundary of site area 3. The zone is associated with Stow-cum-Quy Fen SSSI and its lowland calcareous grassland habitats. There is an opportunity for the site area 3 post-construction habitat creation proposals to create habitats, which support the National Trust's Wicken Fen Vision and creating a green corridor through the development proposals to link with existing habitats outside of the proposed construction boundary.

Nature conservation and biodiversity unmitigated assessment

- B.1.76 Table B.2 provides a summary of the unmitigated assessment for nature conservation and biodiversity.

⁴⁵ Wicken Fen Vision area: <https://nt.global.ssl.fastly.net/wicken-fen-nature-reserve/documents/wicken-fen-vision-strategy-document.pdf>

⁴⁶ Land within relatively close proximity to the Network Enhancement Zones 1 & 2 that are more likely to be suitable for habitat creation for the particular habitat and identifying possible locations for connecting and linking up networks across a landscape. This is termed the 'Network Expansion Zone'. Information available at https://naturalengland-defra.opendata.arcgis.com/datasets/fceb93850462454ab3fb5acce2be35b_0?geometry=-29.930%2C48.013%2C25.573%2C57.298

Table B.2: Nature conservation and biodiversity unmitigated RAG assessment results

Site area	Statutory designated sites	Non-statutory designated sites	Habitats	Protected species	GCN	Landscape scale initiatives	Overall
1	Amber	Amber	Amber	Amber	Red	Amber	Red
2	Amber	Amber	Amber	Red	Red	Amber	Red
3	Amber	Amber	Amber	Amber	Amber	Amber	Amber

Mitigation identification

Site area 1

- B.1.77 Good practice is to apply the mitigation hierarchy. That is to first avoid, mitigate and finally as the last option compensate for biodiversity losses. If compensating for losses within the development footprint is not possible or does not generate the most benefits for nature conservation, then biodiversity losses can be offset by providing gains elsewhere. This is the first principle in the Biodiversity Net Gain Good Practice Principles for Development⁴⁷
- B.1.78 The following measures are the potential avoidance, mitigation, and compensation measures that could be implemented to address the potential impacts for a WWTP development at site area 1:
- B.1.79 Statutory designated sites:
- Wicken Fen Ramsar and Fenland SAC are within 10km of site area 1. No hydrological or air quality impacts are anticipated during construction or operation. Construction activities will be controlled under a CEMP as noted in Section 1.5. During operation, there will be no waste water discharged to ground or surface water, it will be treated and transferred to the discharge point on the river. The operation of the WWTP would be subject to emission controls to meet the requirements of the Industrial Emissions Directive and an environmental permit to meet the requirements of the Urban Waste Water Treatment Directive. Therefore, following mitigation in a CEMP and permits, the WWTP is highly unlikely to result in an adverse significant effect. However, a Stage 1 Screening HRA will be completed to determine LSE. If no effect is likely, a no significant effect can be reported. If effects are likely, a Stage 2 Appropriate Assessment will be required. This will include additional scoping work including the collation of further information and mitigation measures. The scope and methods should be agreed with Natural England, and development proposals should be considered in combination with other plans and programmes. The effect on the integrity of the site will be considered and whether effects can be avoided by changes to the development, including development of mitigation measures (as required).
 - Construction activities will be controlled under a CEMP as noted in Section 1.5 to ensure there are no impacts on SSSIs, NNR, and LNRs.
- B.1.80 Non-statutory designated sites:
- Proceed with a further detailed review on the potential hydrological impact on Cottenham Moat CWS and ensure that the temporary dewatering in the lower Greensand aquifer during

⁴⁷ CIEEM, CIRIA, IEMA (2016) *Biodiversity Net Gain: Good Practice Principles for Development*. Available online: <https://cieem.net/wp-content/uploads/2019/02/Biodiversity-Net-Gain-Principles.pdf>

shaft construction does not impact on the integrity of the CWS. Depending on the source of water in the Moat and an assessment of likely impacts, mitigation may include providing an alternative water supply to the moat during dewatering but only if the assessed impact will be significant. Mitigation will therefore include ground investigation to determine if the Moat is connected to the Lower Greensand and what the source of water is, assessing the point at which a decline in water levels may adversely impact the habitat (specifically for GCN) and provide a temporary alternative water supply to the moat when levels approach a critical level.

- Avoid direct impact (i.e. habitat loss) on Milton Road Hedgerow CWS during construction by ensuring that the waste water transfer tunnel works, including the shaft positioning, are not within the CWS as well as being outside the hedgerow root protection area (RPA). If this is not possible, translocate the length of hedgerow that will be lost as a result of construction (if suitable), replant, enhance existing hedgerows and or create/plant new hedgerows.
- Avoid direct impact (i.e. habitat loss) to the habitats on the banks of the River Cam due to the treated effluent transfer tunnel or pipeline and discharge location. If this is not possible ensure the area lost is replaced through re-planting.

B.1.81 Habitats:

- The indicative WWTP footprint is positioned largely on arable land, which is also used for polytunnel farming (19.3ha). However, where possible the indicative WWTP footprint should be reconfigured to avoid the loss of the 0.3km species-poor hedge and 1.7km broadleaved scattered trees (tree line wind break on the edge of the existing polytunnel fields). If this is not possible, translocate the length of hedgerow that will be lost as a result of construction, replant, enhance existing hedgerows and or create/plant new hedgerows. Trees should be retained and protected where possible, otherwise trees must be re-planted to avoid the severance of the hedgerows and tree line. Ensure the reconfigured WWTP footprint avoids the broadleaved plantation woodland in the north-west corner of site area 1.
- Re-configure the indicative WWTP footprint to avoid the loss and severance of standing water/ditches. Any ditches crossed by the scheme should continue to provide habitat connectivity for species, which may use them. Therefore, mammal ledges may be required in culverts; if this is not possible, a separate dry passage may be required.
- Site area 1 is dominated by arable fields, which is also used for polytunnel farming (55.8ha) and semi improved grassland (7.4ha). Where possible, the indicative WWTP footprint should avoid the semi-improved grassland. Where this is not possible the landscape and ecology habitat creation plan should include the creation of species-rich grassland.
- Propose a tunnel rather than a pipeline for the treated effluent transfer to avoid and reduce the loss of deciduous woodland HPI (Option A (woodland adjacent to the A10 and A14) will result in the greater loss of woodland compared to Option B), traditional orchard HPI, and floodplain grazing marsh HPI. The floodplain grazing marsh HPI is adjacent to the River Cam in both Options A and B. A greater area is recorded in Option B, but this is because the corridor is wider than Option A. Further botanical surveys will be required to ascertain the presence of this HPI because the fields were mapped as poor semi-improved grassland in Option A and Option B as well as arable in Option B. The habitat will need to be assessed against the JNCC Coastal and Floodplain Grazing Marsh HPI description and criteria⁴⁸. The poor semi-improved grassland in Option B does appear to be grazed by sheep, it is

⁴⁸ Grazing marsh is defined as periodically inundated pasture, or meadow with ditches which maintain the water levels, containing standing brackish or fresh water. The ditches are especially rich in plants and invertebrates. Almost all areas are grazed and some are cut for hay or silage. Sites may contain seasonal water-filled hollows and permanent ponds with emergent swamp communities, but not extensive areas of tall fen species like reeds; although they may abut with fen and reed swamp communities. Habitat description available online at: <http://data.jncc.gov.uk/data/82b0af67-d19a-4a89-b987-9dba73be1272/UKBAP-BAPHabitats-07-CoastFloodGrazingMarsh.pdf>

surrounded by ditches and is also within Flood Zone 3 (having a high probability of flooding) and, therefore is likely to fall under HPI. Whereas, the field in Option A is in Flood Zone 1 (low probability of flooding). Ensure shafts are located in areas of negligible or low ecological value (i.e. avoid woodland, floodplain grazing marsh, good quality semi-improved grassland, and waterbodies).

- Translocate floodplain grazing marsh habitat and good quality semi-improved grassland in the Waterbeach transfer pipeline and re-plant post construction in the original footprint, if possible.
- Translocate species-rich hedgerows lost due to construction and plant as part of the landscape and ecology habitat creation proposals. Avoid severance and fragmentation of hedgerows and habitats. If translocation is not suitable, then the planting of new species-rich hedgerows will be required.
- Enhance and improve existing hedgerows by increasing species diversity through planting and 'planting up' defunct/gappy hedgerows.
- Locate pipelines to avoid loss of trees within hedgerows.
- Ensure planting proposals provide a biodiversity net gain (BNG) by setting aside space for habitat creation within the site area and associated infrastructure corridors. Undertake biodiversity net gain calculations following baseline habitat information collected to determine the area required for BNG. Explore further opportunities for offsite planting with landowners to strengthen mitigation.
- Habitat translocation should be the last resort and habitats should be maintained in situ as evidence shows the condition of habitats is often not retained after translocation. Translocation should not be seen as a mitigation for loss through development and may only offer partial compensation⁴⁹.

B.1.82 Protected and notable species:

- There are no ponds within site area 1 and there are no GCN records within 5km of site area 1. However, there are 13 waterbodies (ditches) within site area 1, five of which had standing water present at the time of the survey visit in August 2020. Three of the ditches are present in the indicative WWTP footprint, their HSI score varied from poor (<0.5), to below average (0.5-0.59), to average (0.6-0.69). Generally, where a HSI score of less than 0.5 (rating poor) is achieved, and inspection of the waterbody suggests that it is unlikely to support great crested newt, the waterbody can be scoped out from further surveys.
- Where possible the design should avoid the loss of ditches with standing water. Complete presence-absence surveys for GCN of suitable waterbodies (including ponds and ditches) within 250m of the WWTP development and which achieved a higher HSI rating than poor. Apply for a Natural England European Protected Species Mitigation (EPSM) licence for GCN if confirmed breeding ponds and suitable terrestrial habitat will be lost due to construction. Mitigate through the creation of new ecological ponds and terrestrial habitat creation, and the trapping, relocation and exclusion of GCN, where required to maintain the favourable conservation status (FCS) of the affected population. Where ponds supporting GCN are lost they will need to be compensated for by the creation of two ponds for each pond lost. This approach can also be used even when GCN are not recorded as biodiversity enhancement measures. The scheme is generally positioned in arable and pasture fields that are sub-optimal habitat for GCN. Therefore, it is generally considered that GCN habitat losses associated with waterbodies more than 250m from the scheme is unlikely to be significant.

⁴⁹ JNCC (2003) *A habitats Translocation Policy for Britain*. Available online at: <https://sblpublicinquiry.files.wordpress.com/2014/01/5-21-a-habitats-translocation-policy-for-britain-2003.pdf>

- Within site area 1, but outside of the indicative WWTP footprint are two potential outlier and subsidiary badger sett and one main sett outside site area 1. Further detailed badger surveys will be required to survey for additional setts and determine overall activity. Providing the indicative WWTP footprint, access roads, pipelines and or tunnels avoids the sett and there is a sufficient buffer (e.g. 30m between the development works and setts) a Natural England badger development licence is unlikely to be required. However, compensation for the loss of foraging habitat (grassland) may be required if large areas are affected by the proposal and movement around the site will need to be maintained so that badgers can disperse and continue to use setts within their territory. If the sett cannot be avoided a Natural England badger development licence will be required to legally close and destroy the sett.
- Subject to detailed water vole surveys along the stretch of the River Cam and ditches identified as having potential to support water voles, where necessary, identify the requirement for mitigation and enhancement.
- Subject to detailed otter surveys along the stretch of the River Cam, where necessary, avoid loss of holts and couches and consider disturbance impacts. Enhancement measures could include the creation of new holt.
- The hedgerows and tree line provide commuting and foraging habitat for bats. Bat activity transect surveys and static bat detector surveys will be required to determine bat activity levels, species present, how bats may be using the site, temporal distribution, and how habitats used on site are connected to habitats in the surrounding area. There will be a requirement for the provision of new hedgerows and trees to replace the loss of those within the footprint and ensure that connectivity with the surrounding network of hedgerows is maintained.
- The indicative WWTP footprint has the potential to support reptiles on the boundary of the site due to the grassland habitats and the presence of refugia. Reptile surveys will be required where there will be a significant loss of suitable habitat. If a reptile population is recorded, the translocation of reptiles may be required in areas where habitat loss cannot be avoided in order to sustain and protect the population. Translocation and mitigation would need to be covered under a method statement and agreed with the local planning authority ecologist. An on-site receptor area would be required to accommodate reptiles, otherwise an off-site receptor site would be required. If only small areas of suitable reptile habitat will be affected, it may be possible to complete the early works using habitat manipulation by progressively making the habitat unsuitable and encouraging reptiles to disperse out of the proposed works area. The creation of new species-rich grassland, ponds, mixed patchy vegetation (coarse grasses and scrub) and the provision of refuge such as log piles and hibernaculum in the new landscape and ecology proposals will provide compensation and enhancement for loss of habitat and features within the site area.
- The hedgerows, trees and field margins within site area 1 are suitable for breeding birds. Breeding bird surveys will be required. Habitat creation will need to consider these species habitat requirements, which can be partly compensated for by the planting of new hedgerows and woodlands. However, grassland habitat creation may also be required.
- Further invertebrate surveys will be required at site area 1 and its associated corridors. Further surveys will be required along the hedgerows on Mere Way, which falls within site area 1, and the diversions of the existing waste water transfer network. The invertebrate scoping visit completed in September 2020 recorded two Nationally Scarce species of flea beetles (*Podagrica fuscipes* and *Longitarsus ballotae*) along the hedgerow on Mere Way. Further terrestrial invertebrate surveys are also recommended for the northern extent of the Waterbeach transfer pipeline; a pond west of Milton Cemetery, Landbeach Road, a hedgerow east of the Cambridge FootGolf Centre, Ely Road, within the Option B treated

effluent tunnel or pipeline; and the woodland south-west of the landfill, which is within the diversion of the waste water transfer network. The following mitigation/compensation measures are recommended to maintain invertebrate communities at site area 1; avoid loss of the Mere Way hedgerow and species rich grassland. If avoidance of hedgerows at this site wasn't possible, the scheme should retain and translocate key hedgerows, dead wood and mature tree stumps into new areas of woodland habitat creation to provide habitat for terrestrial invertebrates. The habitat creation should include new pond creation, the use a combination of a tree, shrub and wildflower plant-mix to benefit invertebrates with areas of bare ground and low-fertile soil to create a species-rich sward, and open mosaic habitat.

B.1.83 Landscape scale initiatives (green infrastructure strategies or initiatives):

- The proposed site area and associated corridors fall partially within the proposed Cambridgeshire Strategic Green Infrastructure Network (strategic network area 6 Cambridge and Surrounding Areas). The Natural England Network Enhancement Zone 1 falls within the Waterbeach transfer pipeline. Therefore, there are opportunities to incorporate the network enhancement zone into the landscape and ecology post-construction enhancement/habitat creation and restoration proposals. However, the Natural England Network Enhancement Zone 1 appears to relate to traditional orchard HPI west of the Waterbeach transfer pipeline. The Waterbeach transfer pipeline is likely to be restored to the baseline habitat recorded and returned to its original land use following construction. Therefore, the creation of orchards within the pipeline area may be unsuitable. However, opportunities to plant orchards within the site area 1 proposals can be explored. Stakeholder engagement and reference to planning policy to develop green infrastructure, which benefits biodiversity will be encouraged during project development.

Site area 2

B.1.84 As detailed in Paragraph B.1.77 the mitigation hierarchy should be applied to site area 2. The following measures are the potential avoidance, mitigation, and compensation measures that could be implemented to address the potential impacts for a WWTP development at site area 2:

B.1.85 Statutory designated sites:

- Wicken Fen Ramsar and Fenland SAC are within 10km of the treated effluent transfer tunnel or pipeline and potential discharge location and Waterbeach transfer pipeline associated with site area 2. They are not within 10km of site area 2 itself. No hydrological or air quality impacts are anticipated during construction or operation. Construction activities will be controlled under a CEMP as noted in Section 1.5. During operation there will be no waste water discharged to ground or surface water, it will be treated and transferred to the discharge point on the river. The operation of the WWTP would be subject to emission controls to meet the requirements of the Industrial Emissions Directive and an environmental permit to meet the requirements of the Urban Waste Water Treatment Directive. Therefore, following mitigation in the CEMP and permits, the WWTP is highly unlikely to result in an adverse significant effect. However, a Stage 1 Screening Habitat Regulations Assessment (HRA) will be completed to determine likely significant effect. If no effect is likely, a no significant effect can be reported. If effects are likely, a Stage 2 Appropriate Assessment will be required. This will include additional scoping work including the collation of further information. The scope and methods should be agreed with Natural England, and development proposals should be considered in combination with other plans and programmes, the effect on the integrity of the site will be considered and whether effects can be avoided by changes to the development, including development of mitigation measures (if required).

B.1.86 Non-statutory designated sites:

- Proceed with a further review on the potential hydrological impact on Cottenham Moat CWS and ensure that the temporary dewatering in the lower Greensand aquifer during shaft construction does not impact on the integrity of the CWS. Depending on the source of water in the Moat and an assessment of likely impacts, mitigation may include providing an alternative water supply to the moat during dewatering, but only if the assessed impact will be significant. Mitigation will therefore include ground investigation to determine if the Moat is connected to the Lower Greensand and what the source of water is, assessing the point at which a decline in water levels may adversely impact the habitat (specifically for GCN) and provide a temporary alternative water supply to the moat when levels approach a critical level.
- Avoid direct impact (i.e. habitat loss) on Milton Road Hedgerow CWS during construction by ensuring that the waste water transfer tunnel works including shaft positioning is not within the CWS as well as being outside the hedgerow RPA. If this is not possible, translocate the length of hedgerow that will be lost as a result of construction, replant, enhance existing hedgerows and or create/plant new hedgerows.
- Avoid direct impact (i.e. habitat loss) to the habitats on the banks of the River Cam due to the treated effluent transfer tunnel or pipeline and discharge location. If this is not possible ensure the area lost is replaced through re-planting.

B.1.87 Habitats:

- The indicative WWTP footprint is positioned largely on arable land (21ha). However, the WWTP footprint should be re-configured to avoid the loss of the 0.9ha broadleaved woodland (woodland band, which extends west from the south-western corner of the landfill and provides habitat connectivity with the surrounding landscape and is likely to be a HPI) and 0.5km of species-poor hedge with trees. If this is not possible, translocate the length of hedgerow that will be lost as a result of construction, replant, enhance existing hedgerows and or create/plant new hedgerows. If woodland is lost due to construction, a larger area of woodland habitat creation should be proposed to mitigate for the loss.
- There are strips of poor semi-improved grassland around the edges of the arable fields within the WWTP footprint. This type of grassland can be more diverse, therefore where possible the grassland edge should be retained and managed to enhance species diversity around the footprint of the proposed WWTP.
- Ensure the proposed site access area avoids the loss and encroachment into 4.7ha of the deciduous woodland HPI on the boundary of the landfill site. Retaining this woodland and the woodland band, which extends west from the south-eastern corner of the landfill will also provide visual screening and maintain habitat connectivity.
- Propose a tunnel rather than a pipeline for the treated effluent transfer to avoid and reduce the loss of deciduous woodland HPI (Option A (woodland adjacent to the A10 and A14) will result in the greater loss of woodland compared to Option B), traditional orchard HPI, and floodplain grazing marsh HPI. The floodplain grazing marsh HPI is adjacent to the River Cam in both Options A and B. A greater area is recorded in Option B, but this is because the corridor is wider than Option A. Further botanical surveys will be required to ascertain the presence of this HPI because the fields were mapped as poor semi-improved grassland in Option A and Option B as well as arable in Option B. The habitat will need to be assessed against the JNCC Coastal and Floodplain Grazing Marsh HPI description and criteria. The poor semi-improved grassland in Option B does appear to be grazed by sheep, it is surrounded by ditches and is also within Flood Zone 3 (having a high probability of flooding) and, therefore is likely to fall under HPI. Whereas, the field in Option A is in Flood Zone 1

(low probability of flooding). Ensure shafts are located in areas of negligible or low ecological value (i.e. avoid woodland, floodplain grazing marsh, good quality semi-improved grassland, and waterbodies).

- Translocate floodplain grazing marsh habitat and good quality semi-improved grassland in the Waterbeach transfer pipeline and re-plant post construction in the original footprint, if possible.
- Translocate species-rich hedgerows lost due to construction and plant as part of the landscape and ecology habitat creation proposals. Avoid severance and fragmentation of hedgerows and habitats.
- Enhance and improve existing hedgerows by increasing species diversity through planting and ‘planting up’ defunct/gappy hedgerows.
- Locate pipelines to avoid loss of trees within hedgerows.
- Ensure planting proposals provide a biodiversity net gain (BNG) by setting aside space for habitat creation within the site area and associated infrastructure corridors. Undertake biodiversity net gain calculations following baseline habitat information collected to determine the area required for BNG. Explore further opportunities for offsite planting with landowners to strengthen mitigation.
- Habitat translocation should be the last resort and habitats should be maintained in situ as evidence shows the condition of habitats is often not retained after translocation. Translocation should not be seen as a mitigation for loss through development, and may only offer partial compensation⁵⁰.

B.1.88 Protected and notable species:

- There is a GCN record from Natural England’s Open Source Data Set for GCN Class Licence Survey Returns 50m east of the indicative WWTP footprint. It is unknown what pond or waterbody this record is linked to. There are seven waterbodies (ditches) within the site area 2, but they were dry at the time of the site visit in August 2020, and therefore unlikely to be suitable for GCN. There are no ponds within site area 2 and only one within 250m of the site area 2 boundary, which will require further survey. However, there is suitable terrestrial habitat on site for GCN including the woodland and hedgerows. Where possible the design should avoid the loss of suitable terrestrial habitat.
- Complete presence-absence surveys for GCN of suitable waterbodies (including ponds and ditches) within 250m of the WWTP development. Apply for a Natural England EPSM licence for GCN if confirmed breeding ponds and suitable terrestrial habitat will be lost due to construction. Mitigate through the creation of new ecological ponds and terrestrial habitat creation, and the trapping, relocation and exclusion of GCN, where required to maintain the FCS of the affected population. Where ponds supporting GCN are lost they will need to be compensated for by the creation of two ponds for each pond lost. This approach can also be used even when GCN are not recorded as biodiversity enhancement measures.
- Within the indicative WWTP footprint there are two badger setts (one potential main sett and one active outlier). There is also a potential outlier sett and subsidiary badger sett within site area 2, but these are outside of the WWTP footprint. Further detailed badger surveys will be required to survey for additional setts and determine overall activity. The indicative WWTP footprint should be reconfigured to avoid the loss of these two setts or at the very least the main sett. Licensable activities can vary depending on the machinery and development methods proposed. A licence is not required if development works (use of heavy tracked

⁵⁰ JNCC (2003) *A habitats Translocation Policy for Britain*. Available online at: <https://sblpublicinquiry.files.wordpress.com/2014/01/5-21-a-habitats-translocation-policy-for-britain-2003.pdf>

machinery) are 30m from the sett, therefore there is scope to undertake the works if a suitable buffer is provided between the development footprint and the sett. However, compensation for the loss of foraging habitat (grassland) may be required if large areas are affected by the proposal and movement around the site will need to be maintained so that badgers can disperse and continue to use setts within their territory. If the badger setts cannot be avoided a Natural England badger development licence will be required to legally close and destroy the setts. If the main sett cannot be retained, the creation of an artificial badger sett is likely to be required. If the artificial sett cannot be created adjacent to the existing main sett (or obviously within the badger clans territory), bait marking surveys may be required. Bait marking surveys is a group-based method for determining the number and arrangement of badger territories and will help determine territory exclusivity and overlap to identify where the artificial badger sett should be located.

- Subject to detailed water vole surveys along the stretch of the River Cam and ditches identified as having potential to support water voles, where necessary, identify the requirement for mitigation and enhancement.
- Subject to detailed otter surveys along the stretch of the River Cam, where necessary, avoid loss of holts and couches and consider disturbance impacts. Enhancement measures could include the creation of new holt.
- The hedgerows and woodland provide commuting and foraging habitat for bats. Bat activity transect surveys and static bat detector surveys will be required to determine bat activity levels, species present, how bats may be using the site, temporal distribution, and how habitats used on site are connected to habitats in the surrounding area. There will be a requirement for the provision of additional hedgerows and woodland to replace the loss of those within the footprint and ensure that connectivity with the surrounding network of hedgerows and woodland is maintained.
- There are trees within the hedgerows and woodland that have PRFs, which could support roosting bats. Some of the trees are dead and others have woodpecker holes, which are likely to have high potential to support roosting bats. Preliminary bat roost assessments of the trees will be required to identify PRFs and to determine the actual or potential presence of bats, and the need for further survey and/or mitigation. Mitigation and compensation will include the provision of alternative roosting habitat for bats, such as bat boxes on trees and or bat boxes on posts (dependent on roost type recorded).
- The indicative WWTP footprint has the potential to support reptiles on the boundary of the site due to the grassland habitats and the presence of refugia. Reptile surveys will be required where there will be a significant loss of suitable habitat. If a reptile population is recorded, the translocation of reptiles may be required in areas where habitat loss cannot be avoided in order to sustain and protect the population. Translocation and mitigation would need to be covered under a method statement and agreed with the local planning authority ecologist. An on-site receptor area would be required to accommodate reptiles, otherwise an off-site receptor site would be required. If only small areas of suitable reptile habitat will be affected, it may be possible to complete the early works using habitat manipulation by progressively making the habitat unsuitable and encouraging reptiles to disperse out of the proposed works area. The creation of new species-rich grassland, ponds, mixed patchy vegetation (coarse grasses and scrub) and the provision of refuge such as log piles and hibernaculum in the new landscape and ecology proposals will provide compensation and enhancement for loss of habitat and features within the site area.
- The hedgerows, woodland and field margins within site area 2 are suitable for breeding birds. Breeding bird surveys will be required. Habitat creation will need to consider these species habitat requirements, which can be partly compensated for by the planting of new hedgerows and woodlands. However, grassland habitat creation may also be required.

- Further invertebrate surveys will be required at site area 2 and its associated corridors. Further surveys will be required within the woodland, which extends west from the south-western corner of the landfill and is within the WWTP footprint and the diversion of the existing waste water transfer network. Further terrestrial invertebrate surveys are also recommended for Site 2 along the hedgerows on Mere's Way which falls within site 2 Waterbeach transfer pipeline, land within the northern extent of the Waterbeach transfer pipeline (MoD land); a pond west of Milton Cemetery, Landbeach Road, a hedgerow east of the Cambridge FootGolf Centre, Ely Road, within the Option B treated effluent tunnel or pipeline. The following mitigation/compensation measures are recommended to maintain invertebrate communities at site area 1; avoid loss of the woodland within site area 2 and Mere's Way hedgerow and species rich grassland. If avoidance of hedgerows at this site wasn't possible, the scheme should retain and translocate key hedgerows, dead wood and mature tree stumps into new areas of woodland habitat creation to provide habitat for terrestrial invertebrates. Replant woodland and ensure the habitat creation also includes new pond creation, the use a combination of a tree, shrub and wildflower plant-mix to benefit invertebrates with areas of bare ground and low-fertile soil to create a species-rich sward, and open mosaic habitat.

B.1.89 Landscape scale initiatives (green infrastructure strategies or initiatives):

B.1.90 The proposed site area and associated corridors fall partially within the proposed Cambridgeshire Strategic Green Infrastructure Network (strategic network area 6 Cambridge and Surrounding Areas). The Natural England Network Enhancement Zone 1 falls within the Waterbeach transfer pipeline. Therefore, there are opportunities to incorporate the network enhancement zone into the landscape and ecology post-construction enhancement/habitat creation and restoration proposals. However, the Natural England Network Enhancement Zone 1 appears to relate to traditional orchard HPI west of the Waterbeach transfer pipeline. The Waterbeach transfer pipeline is likely to be restored to the baseline habitat recorded and returned to its original land use following construction. Therefore, the creation of orchards within the pipeline area may be unsuitable. However, opportunities to plant orchards within the site area 1 proposals can be explored. Stakeholder engagement and reference to planning policy to develop green infrastructure, which benefits biodiversity will be encouraged during project development.

Site area 3

B.1.91 As detailed in Paragraph B.1.77 the mitigation hierarchy should be applied to site area 3. The following measures are the potential avoidance, mitigation, and compensation measures that could be implemented to address the potential impacts for a WWTP development at site area 3:

B.1.92 Statutory designated sites:

- Wicken Fen Ramsar, Fenland SAC, and Devils Dyke SAC are within 10km of site area 3. No hydrological or air quality impacts are anticipated during construction or operation. Construction activities will be controlled under a CEMP as noted in Section 1.5. During operation there will be no waste water discharged to ground or surface water, it will be treated and transferred to the discharge point on the river. The operation of the WWTP would be subject to emission controls to meet the requirements of the Industrial Emissions Directive and an environmental permit to meet the requirements of the Urban Waste Water Treatment Directive. Therefore, following mitigation in the CEMP and permits, the WWTP is highly unlikely to result in an adverse significant effect. However, a Stage 1 Screening Habitat Regulations Assessment (HRA) will be completed to determine likely significant effect. If no effect is likely, a no significant effect can be reported. If effects are likely, a Stage

2 Appropriate Assessment will be required. This will include additional scoping work including the collation of further information. The scope and methods should be agreed with Natural England, and development proposals should be considered in combination with other plans and programmes, the effect on the integrity of the site will be considered and whether effects can be avoided by changes to the development, including development mitigation measures (if required).

- Black Ditch is directly connected to one of the water bodies at Stow-cum-Quy Fen SSSI. Standard mitigation measures included within the CEMP will reduce any potential surface water and groundwater impact at Stow-cum-Quy Fen SSSI to a negligible level. The permanent site drainage will be designed to avoid any discharge of pollutants to Black Ditch during operation of the scheme. As a result, Stow-cum-Quy Fen SSSI should not be adversely affected by surface water discharge from the site. Consideration has also been given to the potential impacts during operation of the WWTP, due to leakage of waste water from the treatment plant, leading to contamination of groundwater in the chalk aquifer at site 3, which could adversely affect Stow-cum-Quy Fen SSSI. However, these risks would be taken into account fully in the robust design, protection measures and operational procedures for the WWTP. In addition, monitoring of groundwater and drainage in the area within and surrounding the WWTP could be implemented prior to and during the construction of the works. A water quality sampling programme to monitor for potential contaminants would then be agreed with the Environment Agency and implemented during the operation of the site. The sampling programme may be reviewed during the early years of monitoring in connection with the operation of the plant. However, any subsequent changes to the monitoring programme would only be made with the agreement of the Environment Agency. If any significant contamination of groundwater was detected, an immediate clean up programme would be implemented.
- Wilbraham Fens SSSI is approximately 1.3km from site area 3. Operational traffic may require further assessment as the vehicle movements exceed the assessment thresholds. However, although further assessment is recommended it is considered that the change in pollutant concentration as a percentage of the relevant critical level or load is likely to be less than 1%. Where the change in concentration is less than 1%, the effects can be deemed to be insignificant.
- Construction activities will be controlled under a CEMP as noted in Section 1.5 to ensure there are no impacts on SSSIs, NNR, and LNRs.

B.1.93 Non-statutory designated sites:

- Avoid direct (i.e. habitat loss and severance) and indirect impacts to Low Fen Drove Way Grasslands and Hedges CWS by ensuring that:
 - A sufficient habitat buffer (e.g. woodland and species-rich grassland habitat creation) is created between the WWTP footprint and CWS, and that construction works areas avoid the CWS.
 - The site access area is moved to avoid the loss of the CWS. If this is not possible, the section of hedge and grassland should be translocated and connected to the existing stretch of the CWS and or compensated for through the creation of new habitat. The access road should be positioned to run through existing gaps in the hedge and avoid trees and their RPAs to minimise the loss of trees within the hedgerow.
- Avoid direct impact (i.e. habitat loss) on Milton Road Hedgerow CWS during construction by ensuring that the waste water transfer tunnel works including shaft positioning is not within the CWS as well as being outside the hedgerow RPA. If this is not possible, translocate the

length of hedgerow that will be lost as a result of construction, replant, enhance existing hedgerows and or create/plant new hedgerows.

- Avoid direct impact (i.e. habitat loss) to the habitats on the banks of the River Cam due to the treated effluent transfer tunnel or pipeline and discharge location. If this is not possible ensure the area lost is replaced through re-planting.
- Avoid direct impact (i.e. habitat loss) to the habitats on the banks of the River Cam due to the Waterbeach transfer pipeline by tunnelling underneath the River Cam and ensuring a sufficient buffer is proposed to avoid loss of trees. If this is not possible ensure the area lost is replaced through re-planting.
- Black Ditch could be connected to the pond within Allicky Farm Pond CWS. Standard mitigation measures included within the CEMP will reduce any potential surface water and groundwater impact to a negligible level.

B.1.94 Habitats:

- The indicative WWTP footprint for site area 3 generally falls within land of low ecological value including arable land (22ha), amenity grassland (0.1ha) and hardstanding. However, the footprint could be re-configured to avoid and reduce the loss of 1.9km hedgerows (1.3km species-poor and 0.6km species-rich, which includes hedge with trees). If this is not possible, translocate the length of hedgerow (targeting species-rich) that will be lost as a result of construction, replant, enhance existing hedgerows and or create/plant new hedgerows.
- Re-configure the indicative WWTP footprint to avoid a small copse (24m²) of semi-natural broadleaved woodland in the east of the footprint. The woodland should be replanted as the last resort.
- Propose a tunnel rather than a pipeline for the treated effluent transfer to avoid and reduce the loss of hedgerows and scattered broadleaved trees. Ensure shafts are located in areas of negligible or low ecological value (i.e. avoid woodland, good quality semi-improved grassland, waterbodies).
- Ensure that the waste water transfer tunnel works including shaft positioning are located in areas of negligible or low ecological value (i.e. avoid HPI woodland, HPI floodplain grazing marsh, good quality semi-improved grassland, waterbodies).
- Translocate floodplain grazing marsh habitat and good quality semi-improved grassland in the Waterbeach transfer pipeline and re-plant post construction in the original footprint, if possible.
- Translocate species-rich hedgerows lost due to construction and plant as part of the landscape and ecology habitat creation proposals. Avoid severance and fragmentation of hedgerows and habitats.
- Enhance and improve existing hedgerows by increasing species diversity through planting on species-poor and 'planting up' defunct/gappy hedgerows.
- Locate pipelines to avoid loss of trees within hedgerows.
- Ensure planting proposals provide a biodiversity net gain (BNG) by setting aside space for habitat creation within the site area and associated infrastructure corridors. Undertake biodiversity net gain calculations following baseline habitat information collected to determine the area required for BNG. Explore further opportunities for offsite planting with landowners to strengthen mitigation.
- Habitat translocation should be the last resort and habitats should be maintained in situ as evidence shows the condition of habitats is often not retained after translocation.

Translocation should not be seen as a mitigation for loss through development, and may only offer partial compensation⁵¹.

B.1.95 Protected and notable species

- There are no ponds within site area 3 and there are no GCN records within 5km of site area 3. However, there are five waterbodies (ditches) within the site area 3, although none are within the indicative WWTP footprint. The five waterbodies were dry at the time of the site visit in August 2020 and, therefore unlikely to be suitable for GCN.
- There are five ponds within 250m of site area 3. Complete presence-absence surveys for GCN of suitable waterbodies (including ponds and ditches) within 250m of the WWTP development. Apply for a Natural England European Protected Species licence for GCN if confirmed breeding ponds and suitable terrestrial habitat will be lost due to construction. Mitigate through the creation of new ecological ponds and terrestrial habitat creation, and the trapping, relocation and exclusion of GCN, where required to maintain the favourable conservation status (FCS) of the affected population. Where ponds supporting GCN are lost they will need to be compensated for by the creation of two ponds for each pond lost. This approach can also be used even when GCN are not recorded as biodiversity enhancement measures.
- Within site area 3, but outside of the indicative WWTP footprint are two active badger setts that are likely to be a subsidiary and outlier sett. Further detailed badger surveys will be required to survey for additional setts and determine overall activity. Providing the indicative WWTP footprint and access roads avoids these setts and ensures there is a sufficient buffer (e.g. 30m between the development works and setts) a Natural England badger development licence is unlikely to be required. However, compensation for the loss of foraging habitat (grassland) may be required if large areas are affected by the proposal and movement around the site will need to be maintained so that badgers can disperse and continue to use setts within their territory. If the two badger setts cannot be avoided a Natural England badger development licence will be required to legally close and destroy the setts. Further surveys will be required to locate the main sett to help inform whether the creation of an artificial badger sett is likely to be required if the subsidiary sett is closed and destroyed. Bait marking surveys may be required.
- Subject to detailed water vole surveys along the stretch of the River Cam and ditches identified as having potential to support water voles, where necessary, identify the requirement for mitigation and enhancement.
- Subject to detailed otter surveys along the stretch of the River Cam, where necessary, avoid loss of holts and couches and consider disturbance impacts. Enhancement measures could include the creation of new holt.
- The hedgerows provide commuting and foraging habitat for bats. Bat activity transect surveys and static bat detector surveys will be required to determine bat activity levels, species present, how bats may be using the site, temporal distribution, and how habitats used on site are connected to habitats in the surrounding area. There will be a requirement for the provision of additional hedgerows and trees to replace the loss of those within the footprint and ensure that connectivity with the surrounding network of hedgerows is maintained.
- There are trees within the hedgerows and woodland that have PRFs, which could support roosting bats. Some of the trees are dead and others have woodpecker holes, which are likely to have high potential to support roosting bats. Preliminary bat roost assessments of

⁵¹ JNCC (2003) *A habitats Translocation Policy for Britain*. Available online at: <https://sblpublicinquiry.files.wordpress.com/2014/01/5-21-a-habitats-translocation-policy-for-britain-2003.pdf>

the trees will be required to identify PRFs and determine the actual or potential presence of bats and the need for further survey and/or mitigation. Mitigation and compensation will include the provision of alternative roosting habitat for bats, such as bat boxes on trees and or bat boxes on posts.

- The indicative WWTP footprint has the potential to support reptiles on the boundary of the site due to the grassland habitats and the presence of refugia. Reptile surveys will be required where there will be a significant loss of suitable habitat. If a reptile population is recorded, the translocation of reptiles may be required in areas where habitat loss cannot be avoided in order to sustain and protect the population. Translocation and mitigation would need to be covered under a method statement and agreed with the local planning authority ecologist. An on-site receptor area would be required to accommodate reptiles, otherwise an off-site receptor site would be required. If only small areas of suitable reptile habitat will be affected, it may be possible to complete the early works using habitat manipulation by progressively making the habitat unsuitable and encouraging reptiles to disperse out of the proposed works area. The creation of new species-rich grassland, ponds, mixed patchy vegetation (coarse grasses and scrub) and the provision of refuge such as log piles and hibernaculum in the new landscape and ecology proposals will provide compensation and enhancement for loss of habitat and features within the site area.
- The hedgerows, woodland and field margins within site area 3 are suitable for breeding birds. There is a mature tree within a hedgerow in the centre of the indicative WWTP footprint and a derelict farm outbuilding in the north-east of site area 3, which has the potential to support barn owl. Breeding bird surveys will be required. Habitat creation will need to consider these species habitat requirements, which can be partly compensated for by the planting of new hedgerows and woodlands. However, grassland habitat creation may also be required.
- Further invertebrate surveys will be required at site area 3 and its associated corridors. Further surveys will be required within the hedgerows which form part of the dismantled railway and Low Fen Drove Way Grassland and Hedges CWS within site area 3 and access areas and the small copse and improved grassland in the south-eastern corner of site area 3 and access areas. The Nationally Scarce species of flea beetle *Longitarsus ballotae* was recorded at the Low Fen Drove Way Grassland and Hedges CWS. Further surveys will also be required along at least two sections of the Waterbeach transfer pipeline, that includes a section of hedge with standing dead elms and a small elm copse. The following mitigation/compensation measures are recommended to maintain invertebrate communities at site area 3; avoid loss of the Low Fen Drove Way Grassland and Hedges CWS and small woodland copse within site area 3 and its access areas. If avoidance of hedgerows at this site wasn't possible, the scheme should retain and translocate key hedgerows, dead wood and mature tree stumps into new areas of woodland habitat creation to provide habitat for terrestrial invertebrates. Replant woodland and ensure the habitat creation also includes new pond creation, and a combination of a tree, shrub and wildflower plant-mix to benefit invertebrates with areas of bare ground and low-fertile soil to create a species-rich sward, and open mosaic habitat.

Landscape scale initiatives (green infrastructure strategies or initiatives)

B.1.96 Site area 3 and its associated corridors fall within the following green infrastructure initiatives:

- The National Trust's Wicken Fen Vision area.
- The proposed Cambridgeshire Strategic Green Infrastructure Network (strategic network area 6 Cambridge and Surrounding Areas).

- The Natural England Network Enhancement Zone falls within the waste water transfer tunnel. Therefore, there are opportunities to incorporate the network enhancement zone into the landscape and ecology post-construction enhancement/habitat creation and restoration proposals. However, because the waste water transfer tunnel will be underground, there will be limited impact on land above ground, except for where the shafts will be construction, which may result in areas of habitat loss.
- A Network Enhancement Zone is also adjacent to the north-eastern boundary of site area 3. The zone is associated with Stow-cum-Quy Fen SSSI and its lowland calcareous grassland habitats. There is an opportunity for the site area 3 post-construction habitat creation proposals to create habitats, which support the National Trust's Wicken Fen Vision and creating a green corridor through the development proposals to link with existing habitats outside of the proposed construction boundary.

B.1.97 Stakeholder engagement for the Wicken Fen Vision area to link habitat creation proposals and reference to planning policy and Natural England's Network Enhancement Zones to develop green infrastructure, which benefits biodiversity will be encouraged during project development.

Assessment of mitigated options

Designated sites

- B.1.98** Site areas 1 and 3 are within 10km of Wicken Fen Ramsar and Fenland SAC (site area 2 is just over 10km from these two designated sites). However, for all three of the sites, the associated infrastructure would be within 10km. Site area 3 is also within 10km of a second SAC, Devils Dyke. The production of the CEMP, the design, and the use of controls and permits should prevent any LSE on these statutory designated sites. However, a Stage 1 Screening HRA for the Ramsar and SAC to determine LSE will be undertaken to assess the potential impacts from combustion and discharge.
- B.1.99** Site area 3 is also approximately 1.1km from Stow-cum-Quy Fen. Black Ditch is connected to one of the water bodies at Stow-cum-Quy Fen SSSI. As a result, there is potential, without mitigation, for surface water and groundwater impacts at the SSSI during construction at site area 3, due to the drainage feature connections. However, standard mitigation measures included within the CEMP will reduce any potential surface water and groundwater impact at Stow-cum-Quy Fen SSSI to a negligible level. The permanent site drainage will be designed to avoid any discharge of pollutants to Black Ditch during operation of the scheme. As a result, Stow-cum-Quy Fen SSSI should not be adversely affected by surface water discharge from the site. Consideration has also been given to the potential impacts during operation of the WWTP, due to leakage of waste water from the treatment plant, leading to contamination of groundwater in the chalk aquifer at site 3, which could adversely affect Stow-cum-Quy Fen SSSI. However, these risks would be taken into account fully in the robust design, protection measures and operational procedures for the WWTP. In addition, monitoring of groundwater and drainage in the area within and surrounding the WWTP could be implemented prior to and during the construction of the works. However, the risk of such contamination moving towards the boundary, or away from any of the sites, is considered to be low. A Hydrogeological Impact Assessment⁵² (HIA) has been undertaken to further assess the potential impacts outlined in the Water Resources Statement (Mott MacDonald, 2020) including on Stow-cum-Quy Fen SSSI as discussed above. The HIA modelled the potential migration of contamination in shallow groundwater to the Black Ditch in the unlikely event of a release of contaminants during construction or operation of a WWTP at site area 3. The preliminary conclusions of the HIA indicate that with appropriate construction design, management and operational management, including protection measures, it is unlikely that significant concentrations of potential contaminants will reach Black Ditch within 1,000 years and therefore, it is unlikely that there will be an adverse impact on Stow-cum-Quy Fen SSSI.
- B.1.100** Site area 3 is approximately 1.3km from Wilbraham Fens SSSI. Operational traffic may require further assessment as the vehicle movements exceed the assessment thresholds within the Environmental Protection UK and Institute of Air Quality Management guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017). Wilbraham Fens SSSI, is within 200m of the A1303, which may be used by operational traffic and therefore further assessment may be needed to determine likely effects from vehicle emissions at this site. However, although further assessment is recommended it is considered that the change in pollutant concentration as a percentage of the relevant critical level or load is likely to be less than 1%. According to the Institute of Air Quality Management (IAQM) guidance A guide to the assessment of air quality impacts on designated nature conservation sites, where the change in concentration is less than 1%, the effects can be deemed to be insignificant.

⁵² Further assessment of the potential impacts on the water environment has been undertaken in a Hydrogeological Impact Assessment (HIA) as requested by the Environment Agency in their response to consultation. The HIA will be made available once it has been reviewed the Environment Agency

- B.1.101 Site areas 1 and 2 have the potential to impact three non-statutory designated sites (Cottenham Moat CWS, Milton Road Hedgerows CWS, and the River Cam CWS (at one location)). Whereas, site area 3 has the potential to impact on four CWSs (Low Fen Drove Way Grasslands and Hedges CWS, Milton Road Hedgerows CWS, the River Cam CWS (at two locations and Allicky Farm Pond CWS).
- B.1.102 Site areas 1 and 2 will require GI and assessment to determine the source of water in Cottenham Moat CWS and the point at which water levels impact ecological habitats. Additional temporary water supply may be required to restore water levels should they fall below those required to sustain the waterbody which supports great crested newts (GCN).
- B.1.103 Site areas 1, 2, and 3 waste water transfer tunnel works and shaft positioning should avoid the Milton Road Hedgerow CWS to avoid habitat loss and the requirement to translocate or replant the hedgerow as compensation.
- B.1.104 Site areas 1, 2, and 3 treated effluent transfer tunnel or pipeline and discharge location should avoid the loss of habitats associated with the River Cam CWS, if this is not possible habitats will need to be replanted post construction. This will also apply to Site 3 Waterbeach transfer pipeline, which should be undertaken at a distance from the River Cam's banks to avoid disturbance to the river and its associated habitats.
- B.1.105 Low Fen Drove Way Grasslands and Hedges CWS is within site area 3, mitigation to avoid indirect impacts could include the creation of a habitat buffer between the indicative WWTP footprint and the CWS and the landscape and ecology planting proposals could explore enhancing habitat connectivity between the CWS and existing habitats. The access road should be positioned to run through existing gaps in the hedge and avoid trees and their RPAs. If this is not possible, the section of hedge and grassland should be translocated and connected to the existing stretch of the CWS and / or compensated for through the creation of new habitat.
- B.1.106 For site area 3 similarly to Stow-cum-Quy Fen SSSI, Black Ditch could be connected to the Allicky Farm Pond CWS. As a result, there is potential, without mitigation, for surface water impacts at the CWS during construction at site area 3, due to the drainage feature connections. However, standard mitigation measures included within a CEMP will reduce any potential surface water impact to a negligible level. However, as discussed in B.1.99 the HIA concluded that with appropriate construction design, management and operational management, including protection measures, it is unlikely that significant concentrations of potential contaminants will reach Black Ditch within 1,000 years and therefore, it is unlikely that there will be an adverse impact on Allicky Farm CWS.

Habitats

- B.1.107 This assessment considered that overall, a development on site area 3 would experience the fewest ecological effects owing to the presence of larger areas of low ecological valuable habitats such as arable land. Although there is Low Fen Drove Way Grasslands and Hedges CWS within site area 3, which supports habitats of value, the indicative WWTP footprint should avoid this CWS. Compared to site area 1, which includes areas of poor semi-improved grassland, broadleaved plantation woodland, stretches of broadleaved scattered trees (mature tree lines that appear to be wind breaks/shelter belts) and dry and wet ditches, and site area 2, which includes a mature band of semi-natural broadleaved woodland, broadleaved plantation woodland, poor semi-improved and improved grassland, and dry ditches. Hedgerows are present within all sites and it is likely that there will be a loss in hedgerows. However, hedgerows can be translocated and or re-planted to ensure there is no net loss in length and maintain habitat connectivity around the site areas. Whereas the loss of mature trees and

woodlands would result in the loss of a valuable ecological resource, which cannot be as readily replaced.

- B.1.108 Option B for site areas 1 and 2 is likely to result in less impact on HPI (deciduous woodland and floodplain grazing marsh) compared with option A. The treated effluent tunnel or pipeline for site 3 does not fall within HPI, whereas its associated waste water transfer tunnel does. However, loss to the floodplain grazing marsh should be avoided via tunnelling and locating the shafts in habitat of negligible ecological value.
- B.1.109 Waterbeach transfer pipeline options for sites 1, 2, and 3 have the potential to result in the temporary loss of floodplain grazing marsh HPI. Waterbeach transfer pipeline for option site 2 will likely result in the loss and temporary severance of a greater number of hedgerows, the potential removal of more trees, and impacts on ditches, compared to the Waterbeach transfer pipeline options for sites 1 and 3.
- B.1.110 To achieve a BNG, habitats lost within the site areas would need to be compensated for by the creation and enhancement of new and existing habitats. Generally, the loss of broadleaved woodland and trees, which would occur in site area 1 and 2 (to a greater extent compared with site area 3) will require larger areas of land for new habitat creation in order to achieve BNG.

Protected and notable species

- B.1.111 All site area options have potential for GCN in proximity to the Waterbeach pipeline routes and site area 2 has a record of a GCN licence within the site area. site area 1 was found to have ditches with standing water in, whereas, the ditches in site areas 2 and 3 were all dry at the time of the August 2020 survey visit. However, each site area has at least one pond within 250m of the site area boundary, which will require further survey. It is considered that the risks to GCN can be mitigated by avoiding the loss of waterbodies and suitable terrestrial habitat and where this is not possible providing new ecological ponds and terrestrial habitat creation, trapping, translocation and exclusion, where required to maintain the FCS of the affected population. Completing further surveys in the form of presence-absence surveys of suitable waterbodies as identified during the extended Phase 1 habitat survey will identify the requirement for a Natural England GCN EPSM licence, mitigation and compensation
- B.1.112 Two badger setts are present within the indicative WWTP footprint for site area 2. Avoidance measures will be required to retain and not disturb the setts, otherwise mitigation and compensation measures will be required such as a Natural England badger disturbance licence and the creation of an artificial badger sett. This will require further surveys and land to locate the new sett within. One and two badger setts are also present within site area 1 and 3, respectively. However, they are outside the indicative WWTP footprints and through avoidance measures could be retained and protected. If this is not possible, a Natural England badger disturbance licence will be required.
- B.1.113 All site area options have potential to support common species of reptiles and breeding birds including Schedule 1 species (e.g. barn owl). Mitigation can be provided by planting new habitats as part of the landscape and ecology planting proposals. Reptile surveys will be required where there will be a significant loss of suitable habitat. If a reptile population is recorded, the translocation of reptiles may be required in areas where habitat loss cannot be avoided. Translocation and mitigation would need to be covered under a method statement. An on-site receptor area would be required to accommodate reptiles, otherwise an off-site receptor site would be required. If only small areas of suitable reptile habitat will be affected, it may be possible to complete the early works using habitat manipulation.

- B.1.114 All site area options have the potential to support commuting and foraging bats. However, the woodland within site area 2 has more PRFs for bats compared to sites 1 and 3, which only include standalone trees within hedgerows and a small copse (which should be avoided) in site area 3 and within the tree line for site area 1. Woodland and trees should be avoided, where possible. Further surveys will be required to determine the presence or likely absence of bats and the need for mitigation and compensation. If bat roosts are identified, a Natural England EPSM licence will be required and the provision of new bat roosting alternatives. Mitigation can also be provided by planting new habitats as part of the landscape and ecology planting proposals to ensure that habitat connectivity around the site and the existing landscape is maintained.
- B.1.115 All site areas are within areas of Green infrastructure initiatives. The initiative associated with site area 1 and 2 is not well defined. Whereas site area 3 is within the Wicken Fen vision area, which is a specific and has a well-established plan.

Table B.3: Mitigation RAG assessment for nature conservation and biodiversity

Site	Unmitigated RAG score	Mitigated RAG score
1	Red	Green
2	Red	Green
3	Amber	Green

Incorporating feedback

B.1.116 Phase one non-statutory consultation was held in order to share the proposals for relocating the WWTP with the public and stakeholders. This section provides a summary of the feedback received from the public in relation to nature conservation and biodiversity and how the concerns, issues and opportunities raised have been considered within the assessment criteria for Stage 4 final site selection.

Table B.4: Feedback for nature conservation and biodiversity

Sub-Theme	Site (if specific)	Comment Summary	CWWTPR Response
Wildlife	General	Comment that any damage to greenbelt will have a negative effect on local wildlife, and that all locations run close to Fen Edge ditches which are unique habitats for various species.	Further ecological surveys will be undertaken to assess the habitats and their potential to support protected species. Further targeted species surveys will also be undertaken, where required. Where possible the mitigation hierarchy will be applied to avoid impacts in the first instance, and then mitigate, compensate, and offset. The project will aim for a biodiversity net gain.
	Site 1	Respondents described the site as a large green area with diverse variety of trees & shrubs which support small insects, animals, and birds.	Site area 1 does include hedgerows and lines of trees, which are likely to support terrestrial invertebrates and birds. Further ecological surveys will be undertaken to determine the presence or absence of protected and notable species and the requirement for mitigation and compensation. The design will aim to minimise the loss of trees and hedgerows.
		Comment that relocation to this site would impact the conservation area of Landbeach Woods established in 1991, which is an important habitat for nature.	It is assumed that Landbeach Woods refers to the area of woodland within Worts Meadow LNR is approximately 0.7km from site area 1. This woodland was planted in 1992 and named Bourne Wood. It is highly unlikely that the development will impact on the qualifying features of the LNR and result in an adverse significant effect.
	Site 2	Comment that, although the landfill site is located near, the surrounding farmland and mature trees are home to Little Owls, Tawny Owls, and badgers among other animals.	Site area 1 does include hedgerows, trees and woodland, which are likely to support birds and badgers. Further ecological surveys will be undertaken to determine the presence or absence of protected and notable species and the requirement for mitigation and compensation. The design will aim to minimise the loss of trees, woodland and hedgerows, and therefore the impact on these species. Mitigation and compensation measures will otherwise be provided to protect badgers and other species. The project will aim for a biodiversity net gain.
	Site 3	Respondents who oppose site 3 have frequently mentioned impacts to the Wicken Fen Vision. Comments have also noted that Quy Fen is an SSSI, and biodiversity value of the River Cam.	The Wicken Fen Vision aims to create a range of habitats for a wide number of species, including many which are rare and threatened, as well as mitigating wider problems created by climate change through measures such as carbon capture and storage in wetlands and sustainable drainage systems to allow water to percolate into soils and replenish ground water. The CWWTP team will engage with stakeholders to incorporate the aims of the Wicken Fen Vision in the design of the scheme. The scheme will take a landscape scale approach when it comes to green infrastructure and will include habitat creation proposals that will work with the Wicken Fen Vision. AW propose to achieve biodiversity net gain. AW will follow the mitigation hierarchy to avoid impacts in the first instance (i.e. safeguard high quality habitats such as woodland, mature trees), followed by mitigation, compensation, and offsetting if required. An ecological and landscape habitat creation proposal will be developed which will look to target priority habitats in the vicinity and local biodiversity action plan habitats.

Sub-Theme	Site (if specific)	Comment Summary	CWWTPR Response
			Habitat creation will be designed to provide green corridors linking to existing blocks of habitat and non-statutory designated sites as well as providing a buffer to these habitats. Site area 3 lies between the Wicken Fen Vision area and the Cambridge Fens (part of the Potential Nature Recovery Network) and could play a role in linking these habitats. Stow-cum-Quy Fen SSSI is approximately 1.1km east of the site area 3. Design and mitigation measures will be put in place to prevent impacts on the qualifying features of the SSSI. Further hydrological assessments will be undertaken to ascertain the presence of hydrological links between site area 3 and the SSSI and, therefore inform design, mitigation and monitoring requirements, if required. Further ecological surveys will be undertaken on stretches of the River Cam (which is noted as a CWS), mitigation measures will ensure that the biodiversity of the River Cam is not affected.
		Respondents have also referenced the local species of Roe Deer, bees, bats, badgers, and more which will be affected by the relocation. The area apparently has over 9300 different species.	The site includes hedgerows, trees and a small woodland copse, which are likely to support birds, bats, badgers, invertebrates and other mammals. Further ecological surveys will be undertaken to determine the presence or absence of protected and notable species and the requirement for mitigation and compensation. The design will aim to minimise the loss of trees and hedgerows. The project will aim for a biodiversity net gain.

Summary of results

- B.1.117 When comparing site areas there is little differentiation with regards to designated nature conservation sites. However, site area 3s rating has been classified as amber compared to site area 1 and 2, which is green for statutory designated nature conservation sites and dependent on mitigation and embedded design. Site area 3 is closer to two SSSIs (Wilbraham Fens SSSI and Stow-cum-Quy Fen SSSI) compared with site area 1 and 2 and rated as amber due to the requirement for further assessment relating to Stow-cum-Quy Fen SSSI.
- B.1.118 Site area 3 is approximately 1.1km from Stow-cum-Quy Fen SSSI. Black Ditch is connected to one of the water bodies at Stow-cum-Quy Fen SSSI. As a result, there is potential, without mitigation, for surface water and groundwater impacts at the SSSI during construction at site area 3, due to the drainage feature connections. However, standard mitigation measures included within a CEMP should reduce any potential surface water and groundwater impact at Stow-cum-Quy Fen SSSI to a negligible level and the permanent site drainage will be designed to avoid any discharge of pollutants to Black Ditch during operation of the scheme. In addition, monitoring of groundwater and drainage in the area within and surrounding the WWTP could be implemented prior to and during the construction of the works. The risk of such contamination moving towards the boundary, or away from any of the sites, is considered to be low. A Hydrogeological Impact Assessment⁵³ (HIA) has been undertaken to further assess the potential impacts groundwater and the groundwater-dependent environment including on Stow-cum-Quy Fen SSSI as discussed above. The HIA modelled the potential migration of contamination in shallow groundwater to the Black Ditch in the unlikely event of a release of contaminants during construction or operation of a WWTP at site area 3. The HIA concluded that with appropriate construction design, management and operational management, including protection measures, it is unlikely that significant concentrations of potential contaminants will reach Black Ditch within 1,000 years and therefore, it is unlikely that there will be an adverse impact on Stow-cum-Quy Fen SSSI. This approach also applies to the CWS Allicky Farm Pond 0.6km north-west of site area 3.
- B.1.119 For Wilbraham Fens SSSI, which is approximately 1.3km from the site area, operational traffic may require further assessment as the vehicle movements exceed the assessment thresholds. However, although further assessment is recommended it is considered that the change in pollutant concentration as a percentage of the relevant critical level or load is likely to be less than 1% and the effects insignificant.
- B.1.120 There is one CWS (Low Fen Drove Way Grasslands and Hedges CWS) within site area 3 and its associated access areas, therefore, there could be direct loss of the CWS hedgerow and grassland habitats if it is not avoided. The indicative WWTP footprint should avoid this CWS and habitat creation can provide a buffer between the footprint and CWS. The access road should be positioned to run through existing gaps in the hedge and avoid trees and their RPAs. If this is not possible, the section of hedge and grassland should be translocated and connected to the existing stretch of the CWS and / or compensated for through the creation of new habitat.
- B.1.121 Sites 1 and 2 do not have CWSs within their site areas or access areas, however, there are two CWSs within or adjacent to the treated effluent tunnel or pipeline, potential discharge location, and waste water transfer tunnel. This includes Milton Road Hedgerow CWS and the River Cam CWS. These two CWSs also fall within the treated effluent tunnel or pipeline, potential discharge location, waste water transfer tunnel, and Waterbeach transfer pipeline associated

⁵³ Further assessment of the potential impacts on the groundwater and the groundwater-dependent environment has been undertaken in a Hydrogeological Impact Assessment (HIA) as requested by the Environment Agency in their response to consultation. The HIA will be made available once it has been reviewed the Environment Agency

with site area 3. Without avoidance measures there is potential for direct loss of the two CWSs by all three site options.

- B.1.122 Whilst there are no CWSs within site area 1 and 2, their location could have an indirect impact on Cottenham Moat CWS during construction. Further assessment, including GI, is required to determine the source of water in Cottenham Moat CWS and the point at which water levels impact ecological habitats. Additional temporary water supply may be required to restore water levels should they fall below those required to sustain the ecological habitats (specifically those which support GCN).
- B.1.123 This assessment considered that a development on site area 3 would experience the fewest direct ecological effects on habitats and the potential presence of protected species owing to the presence of larger areas of low ecological valuable habitats such as arable land. This is compared to site area 1, which includes areas of poor semi-improved grassland, broadleaved scattered trees (mature tree lines) and dry ditches, and site area 2, which includes a mature band of broadleaved woodland, poor semi-improved grassland and dry ditches. Hedgerows are present within all sites and it is likely that there will be a loss in hedgerows due to construction. However, hedgerows can be translocated and or re-planted to ensure there is no net loss in length and maintain habitat connectivity around the site areas. Whereas, the loss of mature trees and woodlands are valuable ecological features that cannot be as readily replaced.
- B.1.124 Loss of habitats will be greater for site 1 and 2 treated effluent tunnel or pipeline, compared to site 3. Option B for site area 1 and 2 is likely to result in less impact on HPI (deciduous woodland and floodplain grazing marsh) compared with option A for site area 1 and 2. The treated effluent tunnel or pipeline for site 3 does not fall within HPI, whereas its associated waste water transfer tunnel does, but loss to the floodplain grazing marsh should be avoided via tunnelling and locating the shafts in habitat of negligible ecological value. Waterbeach transfer pipeline options for sites 1, 2, and 3 have the potential to result in the temporary loss of floodplain grazing marsh HPI. Waterbeach transfer pipeline for option site 2 will likely result in the loss and temporary severance of a greater number of hedgerows, the potential removal of more trees, and impacts on ditches, compared to the Waterbeach transfer pipeline options for sites 1 and 3.
- B.1.125 All three site areas have limited differentiation with regards to habitats and their potential to support protected species such as bats, great crested newts, birds, reptiles and badgers. However, based on the extended Phase 1 habitat survey, site area 2 has the potential to be the most constrained by the presence of protected and notable species.
- B.1.126 Two badger setts (a main and an outlier) were recorded in the indicative WWTP footprint for site area 2, which will require avoidance and mitigation measures, and compensation if the main sett cannot be retained. There is also a potential outlier sett and subsidiary badger sett within site area 2, but these are outside of the WWTP footprint. Within site area 1 there are two badger setts (likely outlier and subsidiary) and one main sett outside site area 1 and two within site area 3 (likely outlier and subsidiary), but these outside the WWTP footprint. Provided these setts are avoided by access roads, construction compounds, the indicative WWTP footprint, tunnels, pipelines, and will not be disturbed by construction, the setts are unlikely to pose a constraint.
- B.1.127 Site area 2 is potentially the most constrained by recorded great crested newt presence, therefore requiring mitigation and compensation where ponds or waterbodies are lost due to construction. There is a great crested newt record within the site area 2 (50m east of the

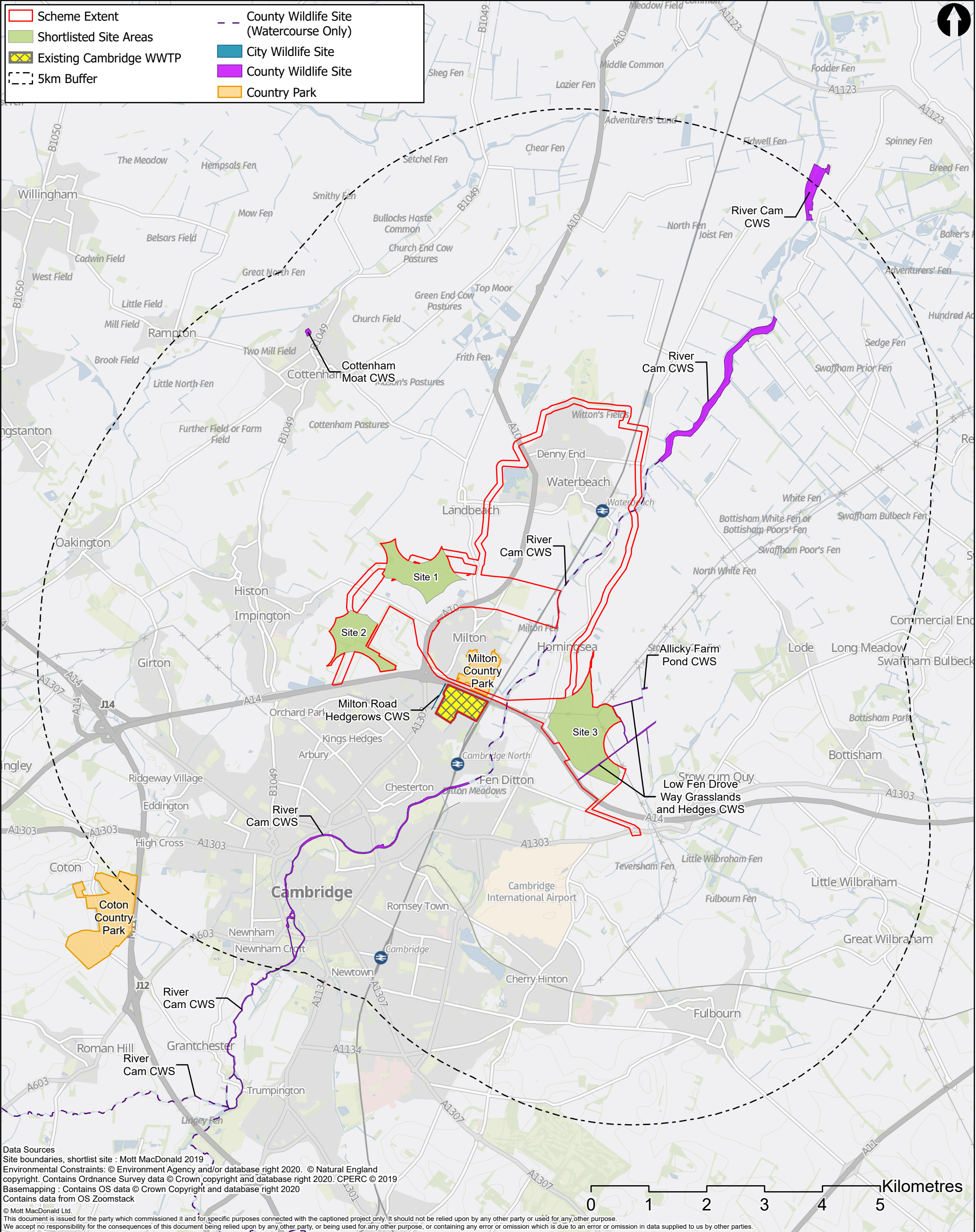
indicative WWTP footprint⁵⁴) and within 0.25km of the Waterbeach transfer pipeline (which also applies to site 1). However, there are only seven waterbodies (ditches) within site area 2, of those two are within the indicative WWTP footprint. The seven waterbodies were dry at the time of the site visit and, therefore unlikely to be suitable for great crested newt. There is suitable terrestrial habitat for great crested newts within site areas 1, 2 and 3.

B.1.128 There are trees and or woodland present in all three sites, which may support bat roosts, although site area 2 has the highest potential due to the greater area of woodland.

B.1.129 All site areas are within Green infrastructure initiatives. The initiative associated with site area 1 and 2 is not well defined. Whereas, site area 3 is within the Wicken Fen vision area, which is a specific and has a well-established plan and, therefore would likely require more extensive stakeholder consultation.

Drawings

⁵⁴ The record is from Natural England's Open Source data set GCN Class Licence Survey Returns. However, the grid reference and X and Y coordinates do not link to a waterbody or pond and therefore it is unknown what this positive record may relate to. During the extended Phase 1 habitat surveys there were no waterbodies with standing water recorded and no ponds.



Data Sources
Site boundaries, shortlist site : Mott MacDonald 2019
Environmental Constraints: © Environment Agency and/or database right 2020. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right 2020. CPERC © 2019
Basemapping : Contains OS data © Crown Copyright and database right 2020
Contains data from OS Zoomstack
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M M MOTT MACDONALD 22 Station Road Cambridge CB1 2JD United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client anglianwater					Title CWWTPR Project Stage 4 Final Site Selection Non-statutory designated sites location plan			Drawn	N Critten	
									Checked	S White	
									Approved	T Cook	
									Scale at A3 1:60,000		
	Rev Date Drawn Description Ch'k'd App'd G 01/21 NC Final SW TC					Drawing Number 409071-MMD-00-XX-GIS-Y-0456			Security STD	Status PRE	Rev G

Habitat Point

- ✕

A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- A3.2 - Coniferous parkland/scattered trees

Habitat Line

- ✕✕

A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- A3.2 - Coniferous parkland/scattered trees
- A3.3 - Mixed parkland/scattered trees
- C2 - Upland species-rich ledges
- F2.1 - Marginal and inundation - marginal vegetation
- G2 - Running water
- E—

G2.1 - Running water - eutrophic
- M—

G2.2 - Running water - mesotrophic
- O—

G2.3 - Running water - oligotrophic
- D—

G2.4 - Running water - dystrophic
- C—

G2.5 - Running water - marl
- B—

G2.6 - Running water - brackish
- ||||

H2.3 - Saltmarsh/dune interface
- ||||

H8.1 - Hard cliff
- ∨∨

H8.2 - Soft cliff
- ∩∩

I1.1 - Inland cliff
- ×××

I1.2 - Scree
- ∨∨∨

J2.1.1 - Intact hedge - native species-rich
- J2.1.2 - Intact hedge - species-poor
- ∨∨∨

J2.2.1 - Defunct hedge - native species-rich
- -

J2.2.2 - Defunct hedge - species-poor
- ∨∨∨

J2.3.1 - Hedge with trees - native species-rich
- ||||

J2.3.2 - Hedge with trees - species-poor
- ||||

J2.4 - Fence
- J2.5 - Wall
- -

J2.6 - Dry ditch
- ××

J2.7 - Boundary removed

- J2.8 - Earth bank
- ||||

J3.5 - Artificial sea wall

Habitat Polygon

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A1.2.1 - Coniferous woodland - semi-natural
- A1.2.2 - Coniferous woodland - plantation
- A1.3.1 - Mixed woodland - semi-natural
- A1.3.2 - Mixed woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- A3.3 - Mixed parkland/scattered trees
- SI

B2.2 - Neutral grassland - semi-improved
- SI

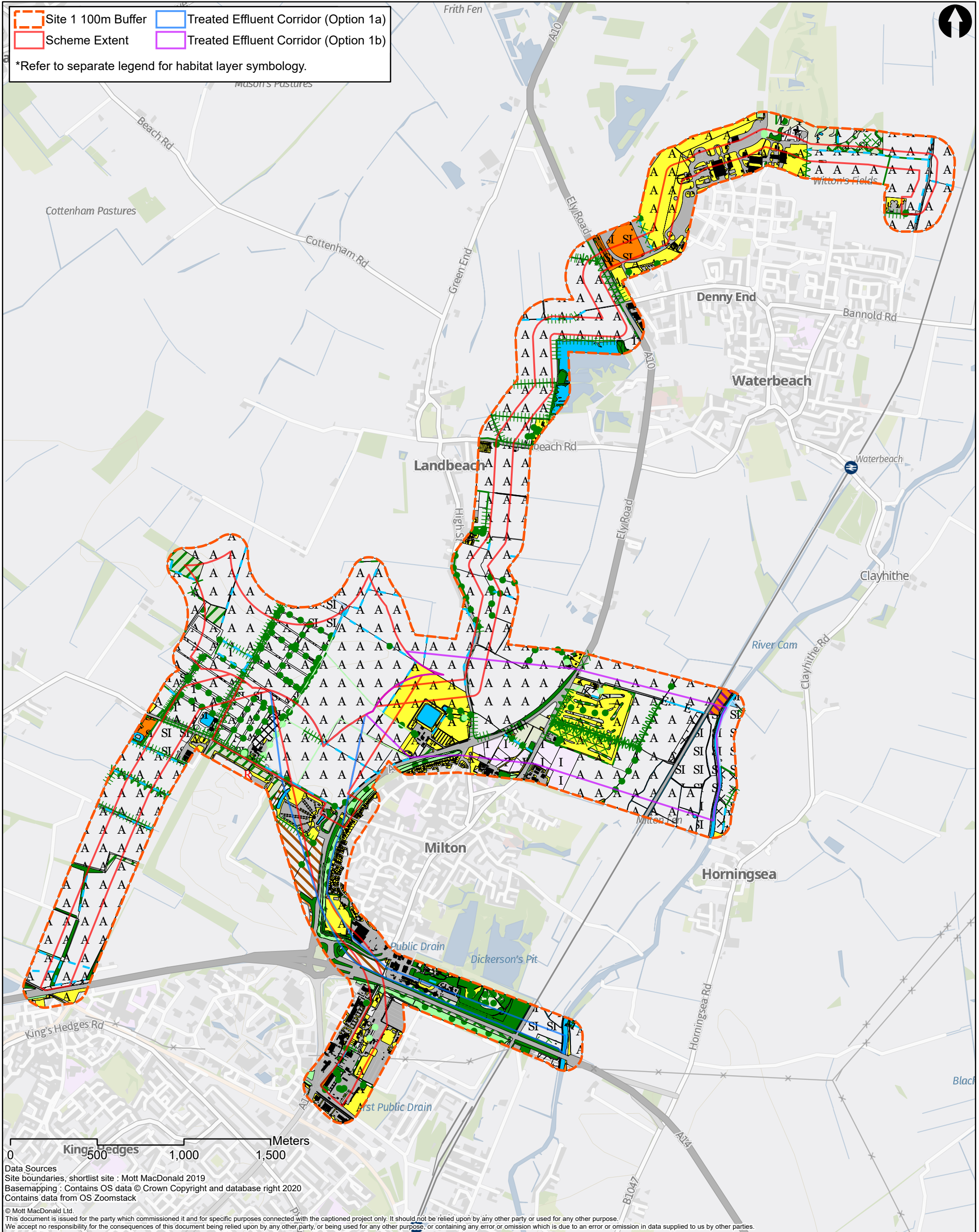
B3.2 - Calcareous grassland - semi-improved
- B4 - Improved grassland
- B5 - Marsh/marshy grassland
- SI

B6 - Poor semi-improved grassland
- C3.1 - Other tall herb and fern - ruderal
- G1 - Standing water
- G2 - Running water
- R F

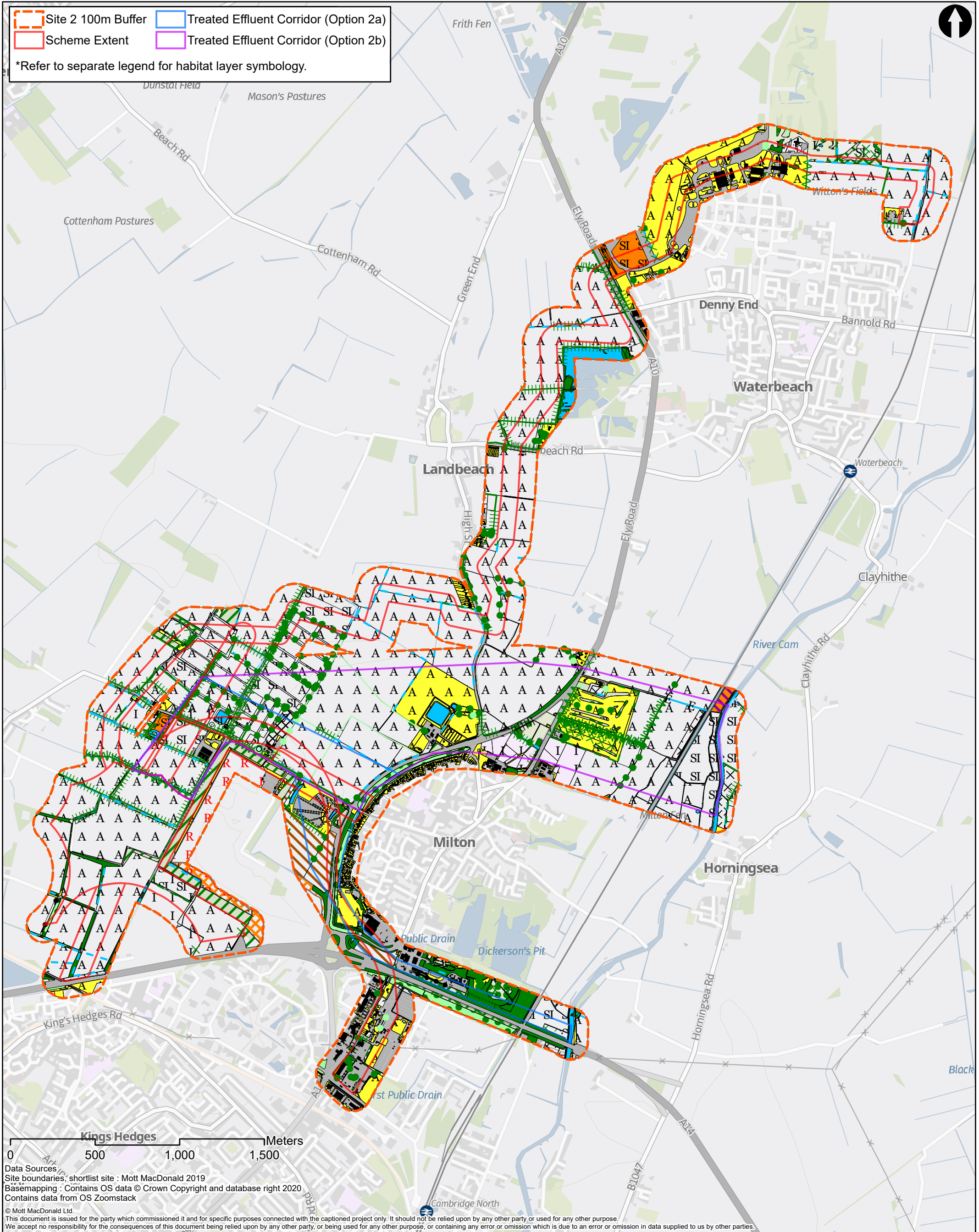
I2.4 - Refuse-tip
- A A

J1.1 - Cultivated/disturbed land - arable
- J1.2 - Cultivated/disturbed land - amenity grassland
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J1.4 - Introduced shrub
- J2.1.2 - Intact hedge - species-poor
- J2.6 - Dry ditch
- J3.4 - Caravan site
- J3.6 - Buildings
- J4 - Bare ground
- J5 - Other habitat
- J5 - Hardstanding

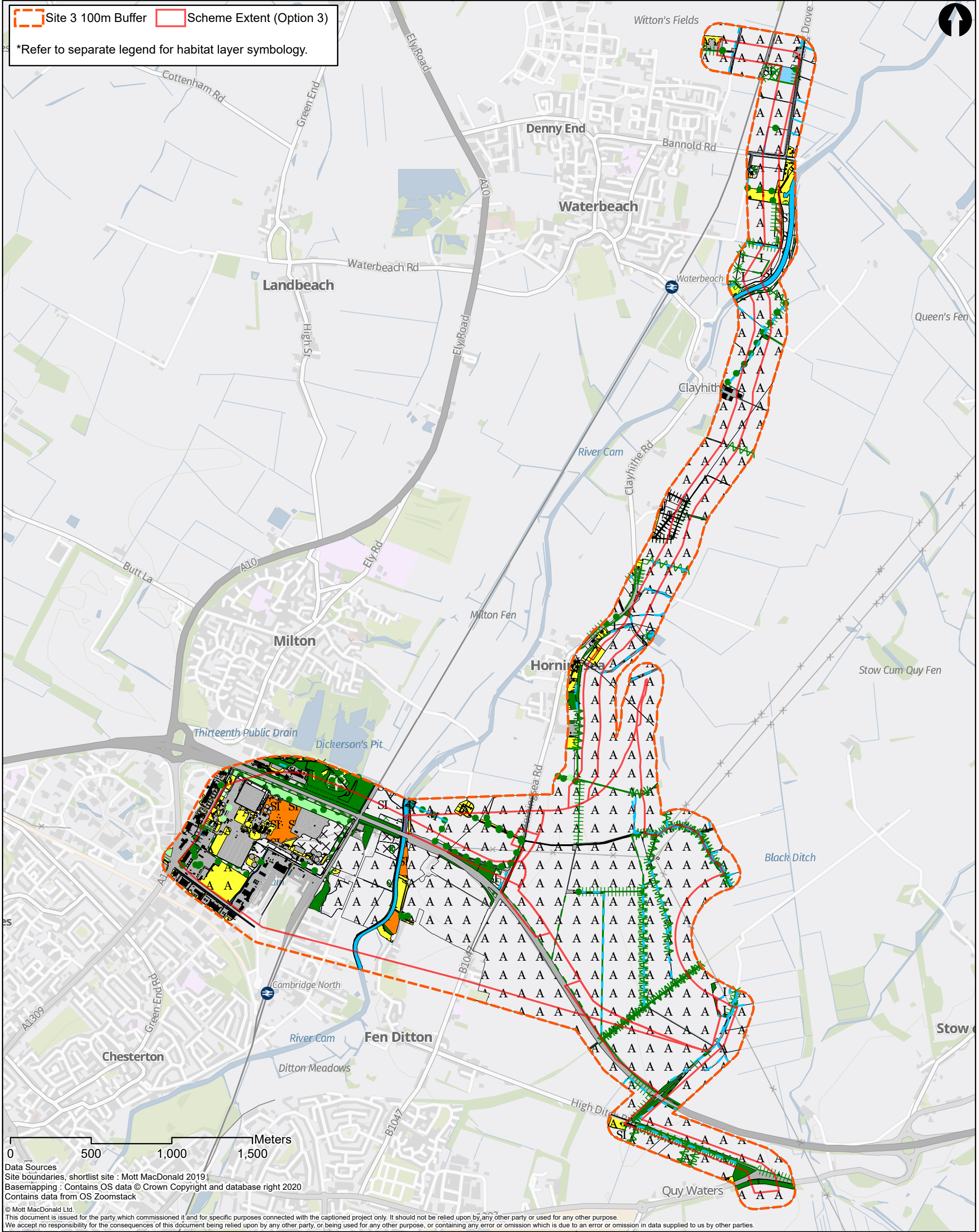
M M MOTT MACDONALD 22 Station Road Cambridge CB1 2JD United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client						Title CWWTPR Project Stage 4 Final Site Selection Phase 1 Habitat Survey Legend	Drawn	N Critten		
	anglianwater							Checked	S White		
								Approved	T Cook		
								Scale at A3			
	Rev	Date	Drawn	Description	Ch'k'd	App'd	Drawing Number			Security	Status
G	01/21	NC	Final	SW	TC	409071-MMD-00-XX-GIS-Y-0457			STD	PRE	G



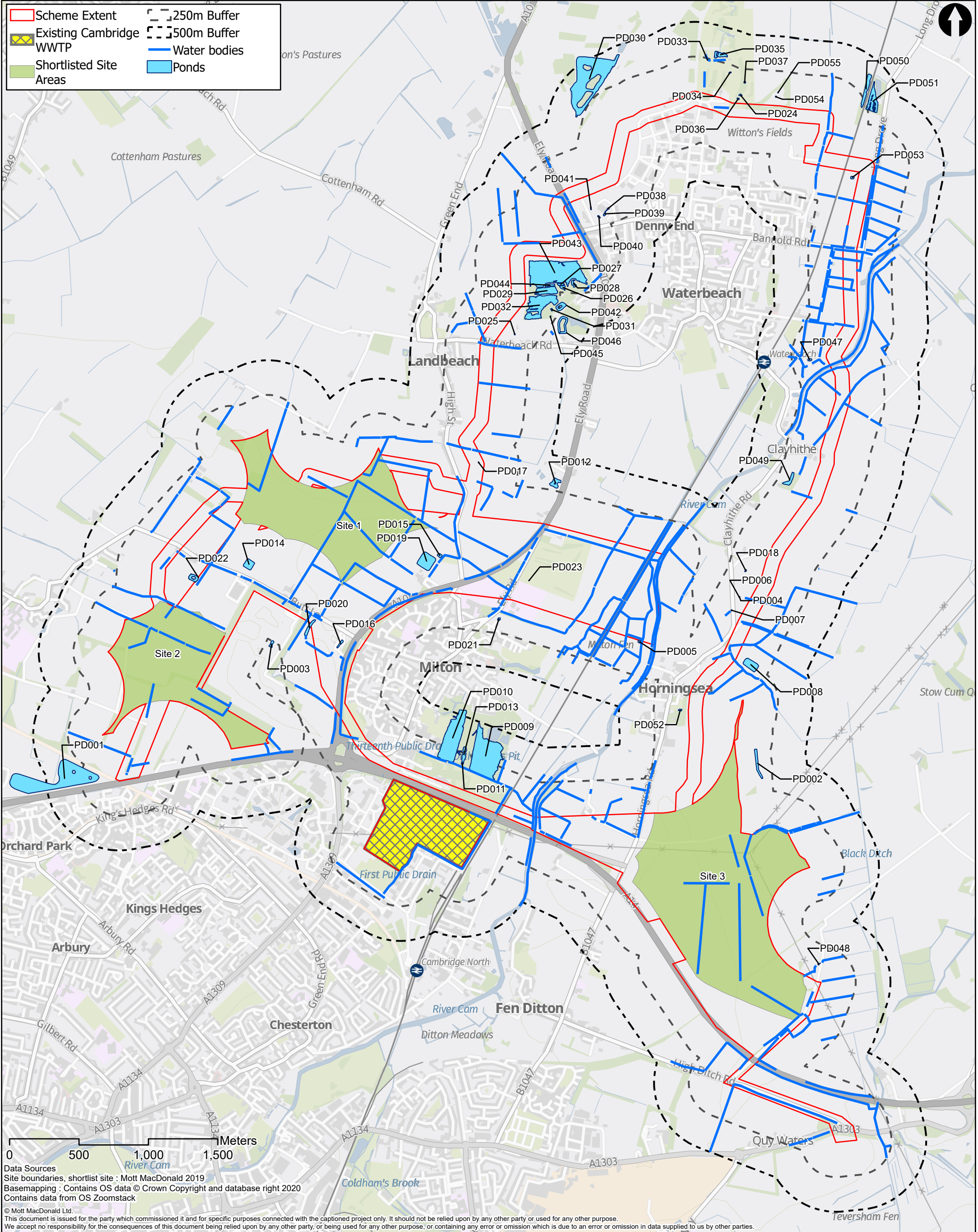
M M MOTT MACDONALD 22 Station Road Cambridge CB1 2JD United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client anglianwater					Title CWWTPR Project Stage 4 Final Site Selection Phase 1 Habitat Survey Site 1	Drawn	N Critten		
							Checked	S White		
	Approved	T Cook								
	Scale at A3 1:20,000									
	Rev	Date	Drawn	Description	Ch'k'd	App'd	Drawing Number 409071-MMD-00-XX-GIS-Y-0458	Security	Status	Rev
G	01/21	NC	Final	SW	TC	STD		PRE	G	



M M MOTT MACDONALD 22 Station Road Cambridge CB1 2JD United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client anglianwater					Title CWWTPR Project Stage 4 Final Site Selection Phase 1 Habitat Survey Site 2	Drawn	N Critten	
							Checked	S White	
	Approved	T Cook							
	Scale at A3 1:20,500								
	Rev	Date	Drawn	Description	Ch'k'd	App'd	Drawing Number	Security	Status
G	01/21	NC	Final	SW	TC	409071-MMD-00-XX-GIS-Y-0459	STD	PRE	G



M M MOTT MACDONALD 22 Station Road Cambridge CB1 2JD United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client						Title CWWTPR Project Stage 4 Final Site Selection Phase 1 Habitat Survey Site 3			Drawn	N Critten	
	anglianwater									Checked	S White	
										Approved	T Cook	
	Rev	Date	Drawn	Description		Ch'k'd	App'd	Drawing Number			Security	Status
G	01/21	NC	Final		SW	TC	409071-MMD-00-XX-GIS-Y-0460			STD	PRE	G



M M MOTT MACDONALD 22 Station Road Cambridge CB1 2JD United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client anglianwater					Title CWWTPR Project Stage 4 Final Site Selection Ponds and waterbodies within 500m of the site boundary		Drawn	N Critten		
								Checked	S White		
								Approved	T Cook		
								Scale at A3 1:25,000			
	Rev	Date	Drawn	Description		Ch'k'd	App'd	Drawing Number 409071-MMD-00-XX-GIS-Y-0461		Security STD	Status PRE
G	01/21	NC	Final		SW	TC					

B.2 Landscape and visual amenity

Assessment methodology

- B.2.1 This assessment considered the potential impacts upon landscape character and visual amenity of the unmitigated options for the three site areas and their associated infrastructure.
- B.2.2 The assessment was based on a high-level desk based review of the options together with an initial baseline field survey to appraise opportunities and constraints within the local landscape, including existing local features that may offer screening opportunities.
- B.2.3 The methodology for the assessment was informed by guidance in the Guidelines for Landscape and Visual Impact Assessment, 3rd Edition⁵⁵. The assessment has been developed and completed by competent Landscape Architects.
- B.2.4 Aerial imagery, OS mapping, a review of Cambridgeshire County Council's 'My Cambridgeshire' interactive map, and Zone of Theoretical Visibility (ZTV) mapping were used to consider the following:
- The sensitivity of the local landscape character areas
 - The number of sensitive visual receptor locations within the ZTV
 - Existing vegetation and the opportunity to utilise existing vegetation to provide screening of site features

The study area

- B.2.5 The extent of the study area was initially determined by digitally mapping the ZTV of the three site options to determine the area from which the infrastructure could theoretically be visible at any location within a 10 km radius of the sites.
- B.2.6 To determine a worst-case scenario, the ZTVs were modelled assuming the highest structures on the new WWTP would be the digestors, at 26m high. The viewer height was assumed to be 1.6m high. An indicative WWTP site footprint was developed for each site area, however, the layout of the WWTP within the footprint will not be developed until later design stages.
- B.2.7 The ZTVs were created using a digital surface model from LiDar data that included the heights of surface features such as buildings and vegetation. These ZTVs are shown on Drawings 409071-MMD-00-XX-GIS-Y-0462 to 0464. They illustrate the relatively minor role of the local topography in screening the proposed works.
- B.2.8 It should be noted that ZTV mapping is a tool for indicating the theoretical extent of the visual influence of a development and that it tends to overestimate the visibility of a development because the data used does not fully register the screening effects of existing vegetation or built development. In addition, it does not reflect how visual impacts diminish with distance from a development, so that the further a receptor is from the new structure, the less prominent it is in the view. The mapping shows that the scheme would be most visible to the north, west and east of the three site area options, but largely screened from the city of Cambridge and the south by the A14 and built development. The ZTVs indicate that visibility of the scheme would decline beyond the outer boundary of the Green Belt in the north, west and east. Consequently, the study area for the Stage 4 assessment is focused on the area where the potential effects of the new WWTP are most likely, within approximately 5km of the three site area options, to the north and north-east of Cambridge.

⁵⁵ Landscape Institute and Institute of Environmental Management and Assessment (2013)

Local character assessment

- B.2.9 A number of landscape character assessments have been produced for Cambridge and its surroundings including the most recent, the Cambridge Inner Green Belt Study, 2015⁵⁶. The Stage 4 assessment uses the landscape character areas (LCA) identified in the 2015 study to allow comparison between the Stage 4 assessment and the Cambridge Inner Green Belt studies. The sensitivity of the LCAs was evaluated by considering the existing value of the landscape and its susceptibility to the type of change arising from the proposed development. The value of each LCA was evaluated in accordance with the criteria set out in the table below.

Table B.5: Landscape value

Value	Criteria for assessing landscape value
High	Designated landscape (such as National Park, AONB). Landscape of high scenic quality with a distinctive combination of features, elements and characteristics, outstanding views and a strong sense of place. A scarce or fragile landscape with cultural, historic or ecological elements which make a major contribution to landscape character. No or very few landscape detractors. Has components which are difficult to replace (such as mature trees). A tranquil landscape in good condition, largely intact, with an unspoilt character.
Medium	Landscape locally designated (such as conservation area, regional park) or locally valued (for its recreational facilities and footpath networks for instance). Some scenic quality and a moderate sense of place. A landscape with some distinctive features, elements and characteristics. Some cultural, historic or ecological elements which contribute to landscape character. Some high use areas, but overall medium tranquillity. Few landscape detractors.
Low	Undesignated landscape, not valued for its scenic quality, with a disparate combination of features, elements and characteristics and a weak sense of place. Mainly common features and few or no cultural, historic or ecological elements that contribute to landscape character. Many landscape detractors. A landscape of low tranquillity.

Source: Criteria based on guidance in the Guidelines for Landscape and Visual Impact Assessment. 3rd edition (LI and IEMA, 2013)

- B.2.10 The susceptibility of each LCA to change was evaluated in accordance with the criteria set out in the table below.

Table B.6: Landscape susceptibility to change

Susceptibility	Criteria for assessing landscape susceptibility
High	The overall character and the valued landscape characteristics, elements and features have a low ability to tolerate the nature and scale of the change resulting from the proposed development without permanent serious adverse change to the baseline situation.
Medium	The overall character and the valued landscape characteristics, elements and features have a moderate ability to tolerate the nature and scale of the change resulting from the proposed development, with some adverse changes to the baseline situation.
Low	The overall character and the valued landscape characteristics, elements and features have a high ability to tolerate the nature and scale of the change resulting from the proposed development, with limited adverse changes to the baseline situation.

- B.2.11 The sensitivity of each LCA was then evaluated in accordance with the criteria set out in the table below.

⁵⁶ https://www.scambs.gov.uk/media/6596/a-cambridge-inner-green-belt-boundary-study_-main-report.pdf

Table B.7: Landscape sensitivity

Sensitivity	Criteria for assessing landscape sensitivity
High	Landscape of high national importance, rarity and value with distinctive features/elements with limited ability to accommodate change without incurring substantial loss/gain (i.e. designated areas, registered parks and gardens, country parks and strong sense of place). A high susceptibility to change due to the type of development proposed.
Medium	Landscape of medium value and local or regional recognition of importance, able to accommodate some change (i.e. with features worthy of conservation, some sense of place or value through use of perception). A medium susceptibility to change due to the type of development proposed.
Low	Undesignated landscape of low value, low to medium ability to accommodate change (i.e. non-designated or designated areas of local recognition or areas with little sense of place). A low susceptibility to change due to the type of development proposed.

Source: Insert Notes or Source Source: Criteria based on guidance in the Guidelines for Landscape and Visual Impact Assessment. 3rd edition (LI and IEMA, 2013)

Visual amenity

B.2.12 The ZTVs for the site options show the potential visibility of the scheme to people in the study area. Visual receptors vary in their sensitivity to changes in the view. This was evaluated by considering the value receptors attach to specific views and their susceptibility to changes to views and visual amenity. The value attached to a view could derive from a planning designation, an association with a heritage asset or a view from a landscape famed for its views. The susceptibility to change depends on the occupation or activity of the receptor and the extent to which their attention is focused on the view and visual amenity. The assessment focusses on visual receptors within 1km of the site as being most likely to experience significant visual effects.

Table B.8: View value

View value	Criteria for assessing view value
High	A view in which attractive features are dominant or include attractive focal points and/or skyline features. Visual detractors may be present but are not strongly apparent in the composition of the view. A view in a high quality landscape such as an Area of Outstanding Natural Beauty, designated or identified as of value in a guide book or tourist literature. A view where the composition is a fundamental aspect of the design or function of a heritage asset and is integral to its setting.
Medium	An unremarkable view where neither attractive or discordant elements are dominant or form a clearly apparent part of its composition. A view that is undesignated and undocumented.
Low	A view where discordant or unattractive features are dominant or prevalent and/or where such features are focal points and/or skyline features. These views may contain some attractive features but these are not strongly apparent in the composition of the view. A view that is undesignated and undocumented.

Table B.9: Visual receptor susceptibility to change

Susceptibility	Criteria for assessing visual receptor susceptibility
High	Occupiers of residential properties, users of public rights of way, visitors to places whose attention is focussed on the landscape.
Medium	People working in or travelling through rural areas whose attention is partially on the landscape. People walking or cycling through urban areas whose views are partially focussed on their surroundings. Users of publicly accessible outdoor open space including cemeteries.
Low	People at work, at school and engaging in formal sport. People walking or cycling through urban areas whose attention is focussed on their destination rather than enjoying the scenery they are passing through. People travelling at high speed on roads or railways.

B.2.13 The evaluation of sensitivity was based on the criteria set out in the table below.

Table B.10: Visual receptor sensitivity

Receptor	Sensitivity
Occupiers of residential properties, PRow users, visitors to heritage assets. Views with few detractors, is designated, is within a scenic area or is important to the setting of a heritage asset.	High
People working in or travelling through rural areas, and walking or cycling through urban areas and visiting outdoor publicly accessible open space. Views where neither attractive or discordant elements are dominant and are undesignated and undocumented.	Medium
People at work, at school, engaging in formal sport, commuting in urban areas and travelling at high speed on roads or railways. Views with predominantly discordant or unattractive and are undesignated and undocumented.	Low

Source: Criteria based on guidance Guidelines for Landscape and Visual Impact Assessment. 3rd edition (LI and IEMA, 2013)

RAG definitions

- B.2.14 The RAG definitions adopted for the assessment of impact upon landscape character and visual amenity, follow those set out in the Stage 3 assessment and are provided in Table B.11.

Table B.11: Landscape and visual amenity RAG criteria

Criterion	Green	Amber	Red
Landscape character sensitivity	Located within a landscape character area of low sensitivity with existing landscape detractors	Located within a landscape character area of low - medium sensitivity with few landscape detractors	Located within a landscape character area of medium - high sensitivity with very few or no landscape detractors
Visual sensitivity	Fewer than 50 sensitive receptors within 1km of the site.	Between 50 and 100 sensitive receptors within 1km of the site.	More than 100 sensitive receptors within 1km of the site.
Opportunity to utilise existing features for screening	Vegetation adjacent to the site boundary screening greater than 50% of the site	Vegetation adjacent to the site boundary screening up to 50% of the site	No vegetation providing screening opportunities

Assessment of unmitigated options

Landscape designations

- B.2.15 There are no statutory landscape designations within the study area. There are a number of nature conservation and heritage designations within the study area including registered parks and gardens, conservation areas, sites of special scientific interest and scheduled monuments. Where relevant, these are referred to in the local landscape character area descriptions in the section below. Descriptions of the other designations within the study area can be found in the nature conservation and historic environment assessments.
- B.2.16 The study area includes part of the National Trust's Wicken Fen Vision area. The 100 year vision aims to restore habitats and create a landscape-scale space for people and wildlife between Cambridge and the Wicken Fen Nature Reserve. The vision is a strategic element of green infrastructure in the adopted development plans for both South Cambridgeshire District

Council (adopted 2018)⁵⁷ and East Cambridgeshire District Council (adopted 2015)⁵⁸. The study area also includes part of the proposed Cambridgeshire Strategic Green Infrastructure Network (Strategic Network Area 6: Cambridge and Surrounding Areas).

Registered Parks and Gardens

- B.2.17 The gardens of Anglesey Abbey and Swaffham Prior House are on the Historic England's register of Historic Parks and Gardens of special historic interest.

Landscape character

National character assessment

- B.2.18 The study area is located across two National Character Areas⁵⁹ (NCA), NCA 88: Bedford and Cambridgeshire Claylands and NCA 46 The Fens. Site areas 1 and 2 are located within NCA 88 Bedford and Cambridgeshire Claylands. site area 3 is located within NCA 46 The Fens. site area 3 is close to the boundary with NCA 87: East Anglian Chalk.

Local character assessment

- B.2.19 Site areas 1 and 2 lie in the Western Fen Edge LCA. site area 3 lies in the Eastern Fen Edge LCA. The Waterbeach Lode Fen LCA lies between the two. Brief descriptions of the three LCAs are given below. Drawing 409071-MMD-00-XX-GIS-Y-0602 in Appendix J shows the location of all the LCAs within the study area.

Western Fen Edge LCA

- B.2.20 The Western Fen Edge LCA is relatively low lying. Land uses include arable and pastoral agriculture, roads, industrial and commercial development and settlement. The A14 severs Cambridge from the fen edge landscape to the north. The LCA includes large-scale infrastructure including the Milton Park and Ride and Milton Recycling Centre just off the A10 Milton Road, the land fill site, the guided busway and small industrial estates and units in Impington and Milton.
- B.2.21 The LCA includes the villages of Impington, Histon, Milton and Landbeach. Apart from Landbeach, they have expanded substantially in the 20th and 21st centuries with mainly housing. There is a hospital and large secondary school at Impington and development is ongoing, with the expansion of Waterbeach on the former barracks site. The historic centres of Impington, Histon, Milton and Landbeach are designated as conservation areas but they lack the historic character of the villages in the Eastern Fen Edge LCA which has undergone less change. Impington and Milton are joined to Cambridge via a narrow corridor of development which runs up to the A14 on both sides. Otherwise, the villages largely retain a rural setting, with the urban edge meeting farmland in most directions. Land between the villages comprises flat open fields separated by drainage ditches and hedgerows. It becomes more wooded, with tree belts and tree lined field boundaries near to Impington. The open countryside extends to the outskirts of Cambridge in gaps between the villages that rings the city boundary.
- B.2.22 Milton Country Park is a valued local outdoor recreational facility and there are a small number of public rights of way in the area. Traffic generated by the larger villages, science parks in Cambridge (south of the LCA), the A14, the Milton Park and Ride and Milton Recycling Centre

⁵⁷ South Cambridgeshire District Council, South Cambridgeshire Local Plan, 2018. https://www.scambs.gov.uk/media/12740/south-cambridgeshire-adopted-local-plan-270918_sml.pdf

⁵⁸ East Cambridgeshire District Council, East Cambridgeshire Local Plan, 2015. <https://www.eastcambs.gov.uk/local-development-framework/east-cambridgeshire-local-plan-2015>

⁵⁹ <https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles#ncas-in-the-east-of-england>

result in relatively low levels of tranquillity in Histon, Impington and Milton. Away from the main roads, especially around Horningsea and Stow cum Quy, the landscape is more tranquil. According to the CPRE light pollution and dark skies map⁶⁰, the area immediately north of Cambridge is not generally dark at night. This is due to street lighting in settlements and along roads.

- B.2.23 The landscape of the LCA is not designated and there are many detracting features along the A14 corridor. It lacks distinctive features that would contribute to a distinctive sense of place. The villages all contain historic cores with conservation area status but overall, they lack a strong historic character and the LCA has a low value. The LCA has a low susceptibility to change due to the type of development proposed owing to the presence of large-scale infrastructure in the area. The overall sensitivity of the area is low.

Waterbeach-Lode Fen LCA

- B.2.24 The key characteristics of the Waterbeach-Lode Fen LCA stem from the flatness of the low-lying landform and the modifications to the pattern and features of the landscape made over the centuries to convert former wetland into farmland. It is a regular landscape, with straight roads, ditches, shelter belts and field boundaries. The dark brown peat soils support intensive arable agriculture. Lines of willows and poplars mark the course of the River Cam and subsidiary watercourses. Settlement is dispersed and on the higher land, along roads. There are many 'islands' which rise above the fen, ranging from the Isle of Ely, at 20m above the adjacent peat fens, to much smaller features only a metre or two above the surrounding farmland. These islands are often occupied by settlements or farmsteads which, with their associated tree cover, increases their prominence. Most buildings are of brick construction and date from the draining of the land in the 18th and 19th centuries.
- B.2.25 There are few views to Cambridge, but the hangars of the airport are visible from the southern end of the LCA. Green links to the city are along the River Cam and through Ditton Meadows. There is an extensive public rights of way network between Horningsea, Stow cum Quy and Lode. This includes the Fen Rivers Way, along the River Cam, and the Harcamlow Way. The LCA is tranquil away from the A14 and, according to the CPRE light pollution and dark skies map, is relatively dark at night. Skyglow above Cambridge is apparent.
- B.2.26 The LCA includes three conservation areas: Baits Bite Lock, Waterbeach and Horningsea Conservation Areas. Stow cum Quy Fen is a SSSI. The LCA includes the majority of the National Trust's Wicken Fen Vision area. The 100 year vision aims to restore habitats and create a landscape-scale space for people and wildlife between Cambridge and the Wicken Fen Nature Reserve. The vision is a strategic element of green infrastructure in the adopted development plans for both South Cambridgeshire District Council (adopted 2018) and East Cambridgeshire District Council (adopted 2015).
- B.2.27 The landscape is important for recreation and wildlife, providing a continuous green link between Cambridge and the countryside. It has distinctive elements and features that contribute to its moderately strong sense of place. These factors combine to give the LCA a medium value. The LCA has a medium susceptibility to change due to the type of development proposed owing to the absence of large-scale infrastructure in the area. The overall sensitivity of the area is medium.

Eastern Fen Edge LCA

- B.2.28 The Eastern Fen Edge is a transitional landscape between the Fenlands LCA to the west and the Chalklands LCA to the south and east. The area is relatively low lying, appearing generally

⁶⁰ Campaign to Protect Rural England: England's Light Pollution and Dark Skies <https://www.nightblight.cpre.org.uk/maps/>

flat, and containing a variety of land uses, including arable and pastoral farmland, roads and settlement. The fen edge has traditionally been an important location for settlement, being above the fen floodplain but close to the lower lying farmland along rivers and watercourses. The A14 has severed the link between Cambridge and the landscape to the north. Fen edge villages such as Swaffham Prior and Bottisham were in the past wealthy and contain fine medieval churches. Building materials traditionally used in the fen edge villages include gault brick, render, and thatch. There are distant views of the centre of Cambridge from higher ground to the east and south and views of the larger structures at Cambridge Airport from around Teversham.

B.2.29 The villages in the LCA, including Horningsea, Lode, Stow cum Quy, Landbeach and Bottisham, largely retain a rural setting, with the urban edge meeting farmland in most directions. Land between these villages comprises flat open fields separated by drainage ditches and hedgerows. Fen Ditton is on the southern side of the A14 and there is continuous urban development along Ditton Lane between Cambridge and Fen Ditton, but overall there is a clear landscape separation between the village and the city provided by the grazing land south of the village and Ditton Meadows, on the River Cam. Around the villages, the landscape is more wooded.

B.2.30 There is a good public rights of way network in the LCA, including the Harcamlow Way Trail and a registered park and garden at the National Trust's Anglesey Abbey. The centres of Horningsea, Waterbeach and Fen Ditton are conservation areas. The LCA includes the southern end of the National Trusts' Wicken Fen Vision area. The area is relatively tranquil, especially away from the A14, which generates traffic and noise along its corridor. traffic generated by these elements and by the science parks south of the A14 and the A14 junctions result in relatively low levels of tranquillity in Histon, Impington, Milton and Waterbeach and the landscape along the A14 and A10. Away from the main roads, especially around Horningsea and Stow cum Quy, the landscape is more tranquil. The villages are lit at night, but the minor roads in rural areas are not lit and consequently the landscape is relatively dark at night, though skyglow above Cambridge is apparent. There are few detractors from the rural character of the landscape.

B.2.31 The landscape of the LCA is not designated but the presence of the registered park and garden, conservation areas and many buildings of historic interest in the villages and the opportunities for recreation in the countryside give the LCA a medium value. The LCA has a medium susceptibility to change due to the type of development proposed owing to the lack of large-scale infrastructure in the area. The overall sensitivity of the area therefore is medium.

Visual amenity

B.2.32 A number of the Cambridge Strategic Viewpoints fall within the ZTVs. However, of the viewpoints within the ZTVs, only the one from Red Meadow Hill, Barton looks towards the site options and, due to the distance (over 9km) and the intervening built environment, the scheme options are unlikely to be discernible from this location.

B.2.33 The tables below list potential sensitive visual receptors, their location and distance from the three option sites. Sensitive receptors are taken as those receptors with a high or medium sensitivity, based on the criteria in Table B.14, receptors with low sensitivity are not considered to be sensitive for the purposes of this assessment.

B.2.34 From interpretation of the ZTV, site survey and use of mapping and aerial photography, it was determined that visual receptors within 1km of the site options could potentially have clear, filtered or partially screened views of a development on the sites and therefore might experience

significant visual effects. More distant visual receptors would be unlikely to experience significant visual effects due to intervening screening by vegetation or built structures and their distance from the scheme. Drawing 409071-MMD-00-XX-GIS-Y-0603 in Appendix J shows the location of visual receptors within 1km of the site options. The below tables list these potential visual receptors.

Table B.12: Visual receptors within 1km of the site options (potential significant effects)

Receptor	Sensitivity	Minimum distance
Site area 1		
Residents of Rectory Farm (A10) looking west (one property)	High	0.4km
Residents in properties on Butt Lane looking north (two properties)	High	0.4km
Residents in properties on Milton Road looking north (four properties)	High	0.7km
Residents on High Street and Midway, Landbeach looking south-west (approximately 48 properties)	High	0.5km
Residents on Akeman Street, Landbeach looking south-east (three properties)	High	0.9km
Residents at Oldfield Farm Barn looking south-east (one property)	High	0.9km
Residents at Bedlam Farm looking east (two properties)	High	0.8km
Visitors to Milton Cemetery looking west	Medium	0.5km
Users of Byway 162/3 and permissive paths 31/PF01 and 31/PF02 looking east (Mere Way)	Medium	0.1km
Users on A10 Ely Road looking west	Medium	0.3km
Site area 2		
Residents in properties on Milton Road looking south (four properties)	High	0.4km
Residents adjacent to Fieldstead Farm looking east (two properties)	High	0.5km
Residents of the Blackwell Caravan Site looking north (15 properties)	High	0.4km
Residents of St Andrew's Way, Impington looking east (approximately 11 properties)	High	0.7km
Residents of St George's Way, Impington looking east (approximately 15 properties)	High	0.7km
Residents of Woodcock Close, Impington looking east (approximately 17 properties)	High	0.7km
Residents of Percheron Close, Impington looking east (approximately 11 properties)	High	0.7km
Users of Byway 162/3 (Mere Way) looking west	Medium	0km
Users of Bridleway 135/6 looking north	Medium	0.7km
Site area 3		
Residents of High St, Horningsea looking south (approximately six properties)	High	0.8km
Residents at Biggin Abbey Cottages looking south-east (approximately six properties) looking south-east	High	0.8km
Residents of Horningsea Road, Fen Ditton looking south-east (approximately 17 properties)	High	0.5km
Residents of High Ditch Road, Fen Ditton looking north (approximately 29 properties)	High	0.8km
Residents of the Marleigh Development (under construction) looking north	High	0.9km

Receptor	Sensitivity	Minimum distance
Residents in property on Low Fen Drove Way (one property)	High	0.4km
Users of Footpath 85/5 and Byway 130/3 (Field Lane) looking north-east	Medium	0.8km
Users Byway 85/14 looking west	Medium	0.5km
Users of Footpath 85/8 looking east	Medium	0.7km
Users of Byway 130/1 (Harcamlow Way and Fen Rivers Way) looking south-east	Medium	0.8km
Users of Footpath 130/2 looking east	Medium	0.7km

Landscape and visual effects during construction

- B.2.35 The ZTVs for each site option show the potential visibility of structures during operation. The construction works would have similar ZTVs, although scaffolding and cranes would be taller than the 26m high digesters used in the model. Construction on all three sites would temporarily introduce new elements into the existing rural landscape and views over farmland. Effects would arise from the presence of construction activity and machinery, construction traffic on local roads, earthworks, lighting, fencing and site accommodation. Trees and hedgerows would be removed for the construction of the WWTP, the waste water and treated effluent transfer tunnels, the Waterbeach pipeline and discharge location and the works to the existing waste water transfer network. Tranquillity would be reduced by the increase in noise, activity and movement in the area. On all sites, effects of construction works would be limited to an area within 5km of the sites.
- B.2.36 Site area 1 lies in the Western Fen Edge LCA which is of low sensitivity. A large-scale construction site would be introduced into open farmland on the outskirts of Cambridge.
- B.2.37 Visual receptors at Landbeach, Rectory Farm, Oldfield Farm, Bedlam Farm, on Butt Lane and Akeman Street and on nearby PRoW would have clear views of the works on site area 1. Views from Milton Cemetery would be largely screened by the intervening farm reservoir and vegetation. Residents in Milton, Impington and Histon would mainly see the taller elements such as cranes, above intervening vegetation.
- B.2.38 Site area 2 also lies in the Western Fen Edge LCA. A large-scale construction site would be introduced into a partly agricultural and partly developed landscape close to the A14.
- B.2.39 Existing tree belts and blocks of woodland provide mature screening vegetation around much of the site. Visual receptors on Butt Lane, in cul-de-sacs off Milton Road (Impington), on the Blackwell caravan site and on nearby PRoW would have clear and partially filtered views of the works on site area 2. Residents in Milton and Histon would mainly see the taller elements such as cranes, above intervening vegetation. Views from St Andrew's Church, Impington would be screened by intervening vegetation.
- B.2.40 Site area 3 lies in the Eastern Fen Edge LCA which is of medium sensitivity. It is also situated on the boundary between the Eastern Fen Edge LCA and the Waterbeach – Lode Fen LCA, also of medium sensitivity. A large-scale construction site would be introduced into the countryside. The landscape is open in this location with large fields separated by ditches and low hedgerows and expansive views. Built development in the area is small scale and there is little screening vegetation to the east, south of west.
- B.2.41 Visual receptors in Stow cum Quy, Horningsea, at Biggin Abbey, on Horningsea Road (Fen Ditton) and on the many PRoW in the area would have clear or partially filtered views of the works on site area 3. Views from the Marleigh development, which is under construction south

of High Ditch Road, would be screened at lower levels by an existing belt of vegetation, but there would be views from upper storeys.

B.2.42 Overall, construction on site area 2 would result in the least widespread landscape and visual effects owing to the presence of existing development and screening vegetation in the area. Construction on site area 3, being more open and undeveloped, would result in the most widespread landscape and visual effects.

B.2.43

Table B.13: Summary of landscape and visual effects (construction)

Criteria	Site area 1	Site area 2	Site area 3
Landscape character sensitivity	Site within a landscape character area of low overall sensitivity, on open farmland with few landscape detractors.	Site within a landscape character area of overall low sensitivity, on farmland adjacent to existing built development which detracts from local landscape character.	Site within an area of medium sensitivity, on open farmland with few landscape detractors.
Visual sensitivity	Between 50 and 100 sensitive receptors within 1km of the site.	Between 50 and 100 sensitive receptors within 1km of the site.	Between 50 and 100 sensitive receptors within 1km of the site.
Opportunity to utilise existing features for screening	No significant areas of vegetation adjacent to the site.	Significant area of vegetation running along the eastern and southern site boundaries, with additional vegetation to the east and south of the site. Former landfill site, recycling centre and business units on Butt Lane screen the site from the south, east and north.	No significant areas of vegetation adjacent to the site.
Stage 3 assessment	Amber	Green	Amber
Summary of Stage 4 assessment	Site located on farmland, in an area of low landscape sensitivity with little screening vegetation around the site and on the urban edge of Cambridge. Between 50 and 100 sensitive receptor locations within 1km of the site.	Site located in an area of low landscape sensitivity with extensive screening vegetation close to the site, adjacent to existing development and on the urban edge of Cambridge. Between 50 and 100 sensitive receptor locations within 1km of the site.	Site located on farmland, in an area of medium landscape sensitivity with no screening vegetation around the site. Existing development in the area is small scale and domestic. Between 50 and 100 sensitive receptor locations within 1km of the site.

Landscape and visual effects during operation

B.2.44 On all three site areas, effects would arise from the introduction of a new WWTP, with large-scale structures up to 26m high, access roads, hard standing, fencing and lighting, into the rural landscape and existing views over farmland. Hedgerows removed during construction of the waste water and treated effluent transfer tunnels, the Waterbeach pipeline and the works to the existing waste water transfer network would be replanted. However, an easement would prevent the replanting of trees along the tunnel and pipeline corridors. Tranquillity would be reduced by

the increase in noise, activity and movement in the area. Effects of the development in operation would be largely limited to an area within 5km of the sites.

- B.2.45 A large-scale new infrastructure development on site area 1 would change the character of the area. The scale and industrial appearance of the structures would be uncharacteristic of the existing farmed landscape and would extend built development on the outskirts of Cambridge north, into open farmland. The character of the landscape around site area 1 contains urban elements, with the villages of Landbeach, Milton, Impington and Histon, but it forms the southern end of a stretch of open countryside that extends north into the Fens. Lighting on the site would introduce a large lit area into what are currently unlit fields (though the nearby settlements are lit). Trees would be permanently lost from Milton Country Park, south of Butt Lane, adjacent to the A14 junction and the existing WWTP and along the Waterbeach pipeline corridor. Tranquillity in the area would be further reduced by increased activity and traffic generated by the operation of the site.
- B.2.46 Visual receptors at Landbeach, at Rectory Farm, Oldfield Farm, Bedlam Farm, on Butt Lane and Akeman Street and on nearby PRow would have clear views of the new structures on site area 1. Views from Milton Cemetery would be largely screened by the intervening farm reservoir and vegetation. Residents in Milton, Impington and Histon would mainly see the taller elements above intervening vegetation.
- B.2.47 The rural character of the area around site area 2 has already been eroded by the presence of the A14, the landfill site, the recycling centre and business units. A large-scale new infrastructure development on site area 2 would further extend this existing built development west onto farmland. Lighting on the site would introduce a large lit area into currently unlit farmland (though the nearby settlements are lit). Trees would be permanently lost from Milton Country Park, south of Butt Lane, adjacent to the A14 junction and the existing WWTP and along the Waterbeach pipeline corridor. Tranquillity in the area would be further reduced by increased activity and traffic generated by the operation of the site.
- B.2.48 Existing tree belts and woodland blocks would provide mature screening that would limit most views of site area 2 from Impington, with just the tallest elements visible above the trees. Residents in Milton and Histon might see the taller elements above intervening vegetation. Visual receptors on Butt Lane, in cul-de-sacs off Milton Road (Impington), on the Blackwell caravan site and on nearby PRow would have clear or filtered views of the new structures.
- B.2.49 A large-scale new infrastructure development on site area 3 would result in a substantial change to the character of the rural landscape in this location. Effects would be experienced in the Eastern Fen Edge LCA and the Waterbeach – Lode Fen LCA, both of medium sensitivity. This area is open, with little screening vegetation and is part of the open countryside which stretches into fenland and chalkland landscapes to the north and east respectively. The scale and industrial appearance of the structures would be wholly uncharacteristic of the existing built development in an area which currently comprises small villages and isolated farmhouses. Trees would be permanently lost either from the Milton Country Park or the River Cam and farmland south of the A14, depending on the route of the wastewater transfer corridor. They would also be lost along the Waterbeach pipeline corridor and Low Fen Drove Way which would be partly widened for a site access. The WWTP would lie in the National Trust's Wicken Fen Vision area and would detract from the aims of the vision, a strategic element of green infrastructure in South Cambridge District Council and East Cambridge District Council's development plans. Lighting on the site would introduce a large lit area into an unlit area. Tranquillity in the area would be further reduced by increased activity and traffic generated by the operation of the site.

- B.2.50 Visual receptors in Stow cum Quy, Horningsea, at Biggin Abbey, on Horningsea Road (Fen Ditton) and on the many PRow in the area would have clear or partially filtered views of the new structures.
- B.2.51 Overall, a development on site area 2 could be accommodated with the least widespread landscape and visual effects of the three site areas owing to the presence of existing development and screening vegetation in the area. A development on site area 3 would result in the most widespread landscape and visual effects owing to the site location being in open and undeveloped countryside.

Table B.14: Summary of landscape and visual effects

Criteria	Site area 1	Site area 2	Site area 3
Landscape character sensitivity	Site within a landscape character area of low overall sensitivity, on open farmland with few landscape detractors.	Site within a landscape character area of overall low sensitivity, on farmland adjacent to existing built development which detracts from local landscape character.	Site within an area of medium sensitivity, on open farmland with few landscape detractors.
Visual sensitivity	Between 50 and 100 sensitive receptors within 1km of the site.	Between 50 and 100 sensitive receptors within 1km of the site.	Between 50 and 100 sensitive receptors within 1km of the site.
Opportunity to utilise existing features for screening	No significant areas of vegetation adjacent to the site.	Significant area of vegetation running along the eastern and southern site boundaries, with additional vegetation to the east and south of the site. Former landfill site, recycling centre and business units on Butt Lane screen the site from the south, east and north.	No significant areas of vegetation adjacent to the site.
Stage 3 assessment	Amber	Green	Amber
Summary of Stage 4 assessment	Site located on farmland, in an area of low landscape sensitivity with little screening vegetation around the site and on the urban edge of Cambridge. Between 50 and 100 sensitive receptor locations within 1km of the site.	Site located in an area of low landscape sensitivity with extensive screening vegetation close to the site, adjacent to existing development and on the urban edge of Cambridge. Between 50 and 100 sensitive receptor locations within 1km of the site.	Site located in rural area of farmland, in an area of medium landscape sensitivity with no screening vegetation around the site. Sloping site will require large-scale modifications to landform. Existing development in the area is small scale and domestic. Between 50 and 100 sensitive receptor locations within 1km of the site.

Mitigation identification

Site area 1

- B.2.52 The proposed landscape mitigation is illustrated on drawing 409071-MMD-00-XX-GIS-Y-0465. On site area 1, mitigation opportunities include the following:

- woodland planting in severed land no longer suitable for agriculture and around the site boundary to provide long term screening of views from nearby visual receptors and landscape integration;
- strengthening of existing vegetation along Mere Way, with additional tree and hedgerow planting;
- new hedgerows with trees along field boundaries close to visual receptors. This will provide screening more quickly than the site boundary perimeter planting and will strengthen the existing landscape pattern of fields and hedgerows;
- new hedgerow with trees along both sides of the site access road to screen the road, break up views of the site and provide landscape integration;
- exploration of further opportunities for offsite planting to strengthen landscape mitigation;
- use of surplus material excavated during construction to form landscape bunding for screening;
- minimising land take and areas of hard standing through efficient design;
- use of graduated colours for the cladding and paint finishes on taller elements of the WWTP to minimise the prominence of the scheme when viewed against a backdrop of land or sky;
- design of new buildings to be informed by design of existing barns and large farm buildings in the area to improve integration into the farmed landscape; and
- building massing and roof profiles varied to prevent large buildings from appearing as monolithic structures in the landscape.

Site area 2

B.2.53 The proposed landscape mitigation is illustrated on drawing 409071-MMD-00-XX-GIS-Y-0466. On site area 2, mitigation opportunities include the following:

- woodland planting on the western boundary of the site to screen views from Impington to and other nearby visual receptors;
- tree and hedgerow planting along field boundaries to strengthen the existing landscape pattern of fields and hedgerows;
- hedgerow with trees along the access road to screen the road, break up views of the site and provide landscape integration;
- exploration of further opportunities for offsite planting to strengthen landscape mitigation;
- use of surplus material excavated during construction to form landscape bunding for screening;
- minimising land take and areas of hard standing through efficient design;
- use of graduated colours for the cladding and paint finishes on taller elements of the WWTP to minimise the prominence of the scheme when viewed against a backdrop of land or sky;
- design of new buildings to be informed by design of existing barns and large farm buildings in the area to improve integration into the farmed landscape; and
- building massing and roof profiles varied to prevent large buildings from appearing as monolithic structures in the landscape.

Site area 3

B.2.54 The proposed landscape mitigation is illustrated on drawing 409071-MMD-00-XX-GIS-Y-0467. On site area 3, mitigation opportunities include the following:

- woodland planting around the site to screen views from Horningsea, Stow cum Quy and Fen Ditton and in severed fields no longer suitable for agriculture;
- tree and hedge planting along field boundaries to strengthen the existing landscape pattern of fields and hedgerows;
- hedgerow with trees along the access road to screen the road, break up views of the site and provide landscape integration;
- exploration of further opportunities for offsite planting with landowners to strengthen mitigation;
- WWTP to sit as low in the landscape as possible;
- use of surplus material excavated during construction to form landscape bunding for screening;
- minimising land take and areas of hard standing through efficient design;
- use of graduated colours for the cladding and paint finishes on taller elements of the WWTP to minimise the prominence of the scheme when viewed against a backdrop of land or sky;
- design of new buildings to be informed by design of existing barns and large farm buildings in the area to improve integration into the farmed landscape; and
- building massing and roof profiles varied to prevent large buildings from appearing as monolithic structures in the landscape.

Assessment of mitigated options

Site area 1

- B.2.55 Mitigation during construction would concentrate on minimising the loss of existing vegetation and construction light spill. The large scale of the construction works and the openness of the landscape setting means that the works would be visible from Landbeach, Impington and the farms and other residential properties within 1km of the site and Byway 162/3.
- B.2.56 In year 1 of operation, the landscape mitigation planting would not be sufficiently mature to provide any screening effect. Hedgerows removed in construction along the tunnel and pipeline corridors would be replaced but as this is not classed as mitigation, they are described in the assessment of unmitigated options. Trees would not be replaced along the tunnel or pipeline corridors for operational reasons.
- B.2.57 It is assumed that the proposed trees and woodland mitigation planting would be 7.5m high after 15 years, with hedgerows reaching a height of 3m. The planting would screen much of the new WWTP by year 15 year of operation. The mitigation planting would be most effective where it is closest to receptors, along Mere Way, close to Landbeach and Rectory Farm and along the access road to the site. The taller new structures, including the digesters, would remain visible above the vegetation from Landbeach, Impington and the farms and other nearby residential properties and the byway. In time, the proposed landscape mitigation would gradually integrate the new development into its surroundings, but the planting would reduce the openness of the existing view. The WWTP would remain an uncharacteristic addition to the landscape and views.
- B.2.58 Screening vegetation could be partly planted on landscape bunds, reducing the time taken for it to become effective as mitigation. Offsite planting close to receptors would require agreement with landowners.

Site area 2

- B.2.59 Mitigation during construction would concentrate on minimising the loss of existing vegetation and construction light spill. The existing mature vegetation south and west of the site and the former landfill site, recycling centre and business units will screen most views of construction from the north, south and west but the construction activity will be visible from the northern end of Impington, Milton Road, Byway162/3 and Bridleway135/6.
- B.2.60 In year 1 of operation, the landscape mitigation planting would be insufficiently mature to provide any screening effect. Hedgerows removed in construction along the tunnel and pipeline corridors would be replaced but as this is not classed as mitigation, they are described in the assessment of unmitigated options. Trees would not be replaced along the tunnel or pipeline corridors for operational reasons.
- B.2.61 Tree and woodland mitigation planting at 7.5m high by year 15 of operation would screen the lower structures on the site. The mitigation planting would be most effective where it is closest to receptor along Mere Way, but the tallest structures, including the digesters, would remain visible to receptors on Milton Road, Impington and on nearby PRow. In time, the proposed landscape mitigation would gradually integrate the development into its surroundings, effectively blending it in to the existing wooded character of the landscape of the southern half of site area 2.
- B.2.62 Screening vegetation could be partly planted on landscape bunds, reducing the time taken for it to become effective as mitigation. Offsite planting close to receptors would require agreement with landowners.

Site area 3

- B.2.63 Mitigation during construction would concentrate on minimising the loss of existing vegetation and construction light spill. The large scale of the construction works and the openness of the landscape means that the works will be visible from Stow cum Quy, Horningsea, Fen Ditton, Biggin Abbey Cottages and PRow in the area (including the Harcamlow Way).
- B.2.64 In year 1 of operation, the landscape mitigation planting would be insufficiently mature to provide any landscape mitigation or screening effect. Hedgerows removed in construction along the tunnel and pipeline corridors would be replaced but as this is not classed as mitigation, they are described in the assessment of unmitigated options. Trees would not be replaced along the tunnel or pipeline corridors for operational reasons.
- B.2.65 Tree and woodland mitigation planting at 7.5m high by year 15 of operation would screen the lower structures on the site. The mitigation planting would be most effective where it is closest to receptors in Stow cum Quy, Horningsea and Biggin Abbey Cottages, but the tallest structures, including the digesters, would remain visible from Stow cum Quy, Horningsea, Fen Ditton, Biggin Abbey Cottages and nearby PRow. In time, the proposed landscape mitigation would gradually integrate the new development into its surroundings, but the planting would reduce the openness of the existing view. The WWTP would remain an uncharacteristic addition to the landscape and views.
- B.2.66 Screening vegetation could be partly planted on landscape bunds, reducing the time taken for it to become effective as mitigation. Offsite planting close to receptors would require agreement with landowners.

Table B.15: Summary mitigated landscape and visual effects in construction

Criteria	Site area 1	Site area 2	Site area 3
Landscape character sensitivity	Site within a landscape character area of low overall sensitivity, on open farmland with few landscape detractors.	Site within a landscape character area of overall low sensitivity, on farmland adjacent to existing built development which detracts from local landscape character.	Site within an area of medium sensitivity, on open farmland with few landscape detractors.
Visual sensitivity	Between 50 and 100 sensitive receptors within 1km of the site.	Between 50 and 100 sensitive receptors within 1km of the site.	Between 50 and 100 sensitive receptors within 1km of the site.
Opportunity to utilise existing features for screening	No significant areas of vegetation adjacent to the site.	Significant area of vegetation running along the eastern and southern site boundaries, with additional vegetation to the east and south of the site. Former landfill site, recycling centre and business units on Butt Lane screen the site from the south, east and north.	No significant areas of vegetation adjacent to the site.
Stage 3 assessment	Amber	Green	Amber
Summary of Stage 4 assessment	Site located on farmland, in an area of low landscape sensitivity with little screening vegetation around the site and on the urban edge of Cambridge. Between 50 and 100 sensitive receptors locations within 1km of the site.	Site located in an area of low landscape sensitivity with extensive screening vegetation close to the site, adjacent to existing development and on the urban edge of Cambridge. Between 50 and 100 sensitive receptor locations within 1km of the site.	Site located in rural area of farmland, in an area of medium landscape sensitivity with no screening vegetation around the site. Sloping site will require large-scale modifications to landform. Existing development in the area is small scale and domestic. Between 50 and 100 sensitive receptor locations within 1km of the site.

Table B.16: Summary of mitigated landscape and visual effects in operation (year 15)

Criteria	Site area 1	Site area 2	Site area 3
Landscape character sensitivity	Site within a landscape character area of low overall sensitivity, on open farmland with few landscape detractors.	Site within a landscape character area of overall low sensitivity, on farmland adjacent to existing built development which detracts from local landscape character.	Site within an area of medium sensitivity, on open farmland with few landscape detractors.
Visual sensitivity	Between 50 and 100 sensitive receptors within 1km of the site.	Between 50 and 100 sensitive receptors within 1km of the site.	Between 50 and 100 sensitive receptors within 1km of the site.
Opportunity to utilise existing features for screening	No significant areas of vegetation adjacent to the site.	Significant area of vegetation running along the eastern and southern site boundaries, with additional vegetation to the east and south of the site. Former landfill site, recycling centre and business units on Butt Lane screen the site from the south, east and north.	No significant areas of vegetation adjacent to the site.
Stage 3 assessment	Amber	Green	Amber
Summary of Stage 4 assessment	Site located on farmland, in an area of low landscape sensitivity with little screening vegetation around the site and on the urban edge of Cambridge. Between 50 and 100 sensitive receptor locations within 1km of the site. Landscape mitigations will in time integrate the structures into the landscape but owing to their large-scale, they cannot be wholly screened.	Site located in an area of low landscape sensitivity with extensive screening vegetation close to the site, adjacent to existing development and on the urban edge of Cambridge. Between 50 and 100 sensitive receptor locations within 1km of the site. Landscape mitigations will in time integrate the structures into the landscape but owing to their large-scale, they cannot be wholly screened.	Site located in rural area of farmland, in an area of medium landscape sensitivity with no screening vegetation around the site. Sloping site will require large-scale modifications to landform. Existing development in the area is small scale and domestic. Between 50 and 100 sensitive receptor locations within 1km of the site. Landscape mitigations will in time integrate the structures into the landscape but owing to their large-scale, they cannot be wholly screened.

Incorporating feedback

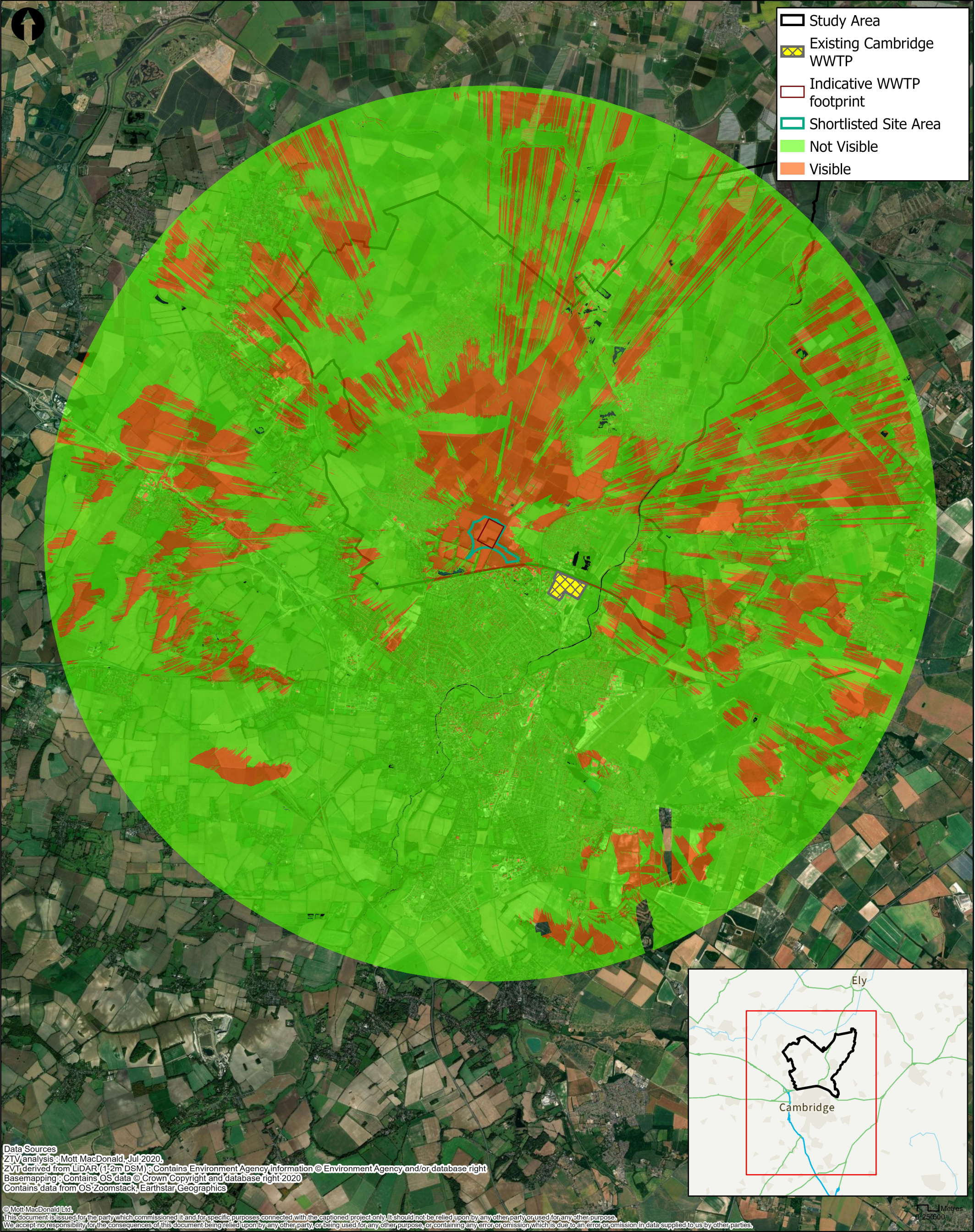
B.2.67 Phase one non-statutory consultation was held in order to share the proposals for relocating the WWTP with the public and stakeholders. This section provides a summary of the feedback received from the public in relation to landscape and visual amenity and how the concerns, issues and opportunities raised have been considered within the assessment criteria for Stage 4 final site selection.

Table B.17: Landscape and visual amenity feedback

Sub-Theme	Site (if specific)	Comment Summary	CWWTPR Response
Public Wellbeing from greenbelt.	General	The importance of open greenspace at all sites has been mentioned by contributors with concerns that if this space is lost/damaged so will the physical/mental benefits that it brings to many people in the local villages and Cambridge City.	This is acknowledged in the landscape and visual assessment of the report. It is a concern on all sites, but especially site areas 1 and 3. The proximity of local amenities to construction and operation of the WWTP were taken into consideration within the individual environmental assessments which were used to establish amenity effects. The potential effects that were taken into consideration were air quality, odour, noise, landscape and visual and traffic.
		Other comments have also asked for the site not to be relocated because of this and just reduce the size of the current site.	Although reducing the size of the current site would result in the fewest landscape and visual impacts, this option was ruled out in the Initial Options Appraisal.
Height and buildings	General	Many comments have also been made regarding the height of the plant, with concern that it will negatively impact countryside views. Respondents have asked for information on how tree screening could be utilised to prevent this.	Details of the landscape mitigation proposals for each site are provided in Appendix B.2. Tree screening is effective soonest when closest to the receptor – the landscape design proposed includes tree belts and hedgerow close to residential receptors. In the long term, woodland planting on earth bunding will also be effective in screening all but the tallest structures on the site (7.5m high after 15 years).
		Other comments suggested overcoming visual impacts by designing a plant with a lower height. It was suggested this could be achieved by having multiple smaller digesters and gas holders, rather than singular tall structures.	Reducing the height of the structures will allow the landscape mitigation to screen the site more quickly.
	Site 1	Comment that viewpoints to Landbeach from Butt Lane and A10 would be negatively impacted by Site 1, as well as concern regarding impact to Mere Way and hedges.	Views from Landbeach and Butt Lane have been considered in the Stage 4 assessment. The view from the A10 has been included in the assessment.
	Site 2	Some respondents commented that the landscape surrounding Site 2 would not be impacted as significantly by the relocation given to the proposed nearby police station and current landfill site.	This is supported by the results of the landscape and visual assessment, which indicated that a WWTP at site area 2 would result in the least widespread landscape and visual effects owing to the presence of existing development and screening vegetation in the area.

Sub-Theme	Site (if specific)	Comment Summary	CWWTPR Response
	Site 3	Comment that the Flat Fen landscape, which can be seen from Honey Hill, would be impacted.	This is consistent with the landscape and visual assessment, which reported that a large-scale new infrastructure development on site area 3 would result in a substantial change to the character of the rural landscape in this location.
	General	Concern that the construction of new tunnel and pipelines will have the same effect on reducing spaces in the greenbelt (and subsequent impacts on local communities' physical and mental health) albeit temporarily.	If pipe routes are tunnelled there would be little permanent impact on the openness of the Green Belt, unless large scale earth bunding is required to dispose of tunnelled materials on site. There would be temporary impacts from excavated pipe routes due to the presence of construction compounds, and plant in the Green Belt.
Tunnel & Pipeline impacts	Site 1 & 2	Comment that the proposed tunnel and pipeline routes could interfere with \ belt of trees located near Milton housing estate, adjacent to A10.	If the treated effluent pipe routes for site areas 1 and 2 are tunnelled, there should be no impact on the trees between the Milton Housing estate and the A10 or on the Sycamores playing fields. This is important existing woodland screening and would be retained. If the treated effluent corridor is a pipeline, there may be a loss of vegetation along the route, but the route would be designed to minimise this. The likelihood is that the pipeline would be tunnelled under the A10, protecting the trees at the same time.
		Concern regarding potential permanent damage to playing fields in the Sycamores.	
	Site 3	Some respondents have suggested that as this would require less infrastructure, is furthest from residential housing and contains large numbers of pylons, then it will be less of an impact on the landscape if relocated here.	Site area 3 has the most landscape impacts due to being in open countryside with little development. The pylons do detract from the landscape value, but not as much as the adjacent development on site area 2.

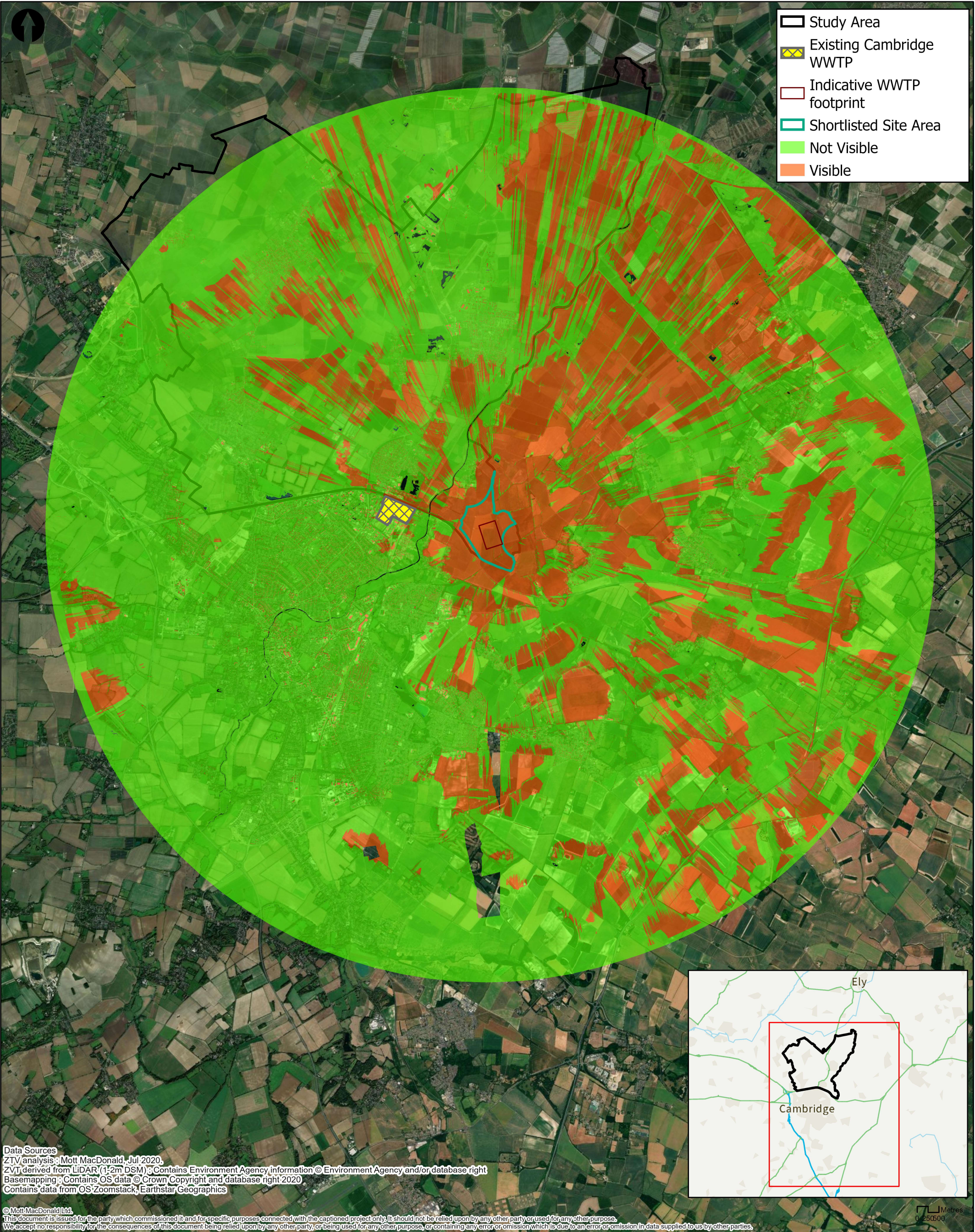
Drawings



Data Sources
ZTV analysis: Mott MacDonald, Jul 2020.
ZVT derived from LiDAR (1-2m DSM): Contains Environment Agency information © Environment Agency and/or database right
Basemapping: Contains OS data © Crown Copyright and database right 2020
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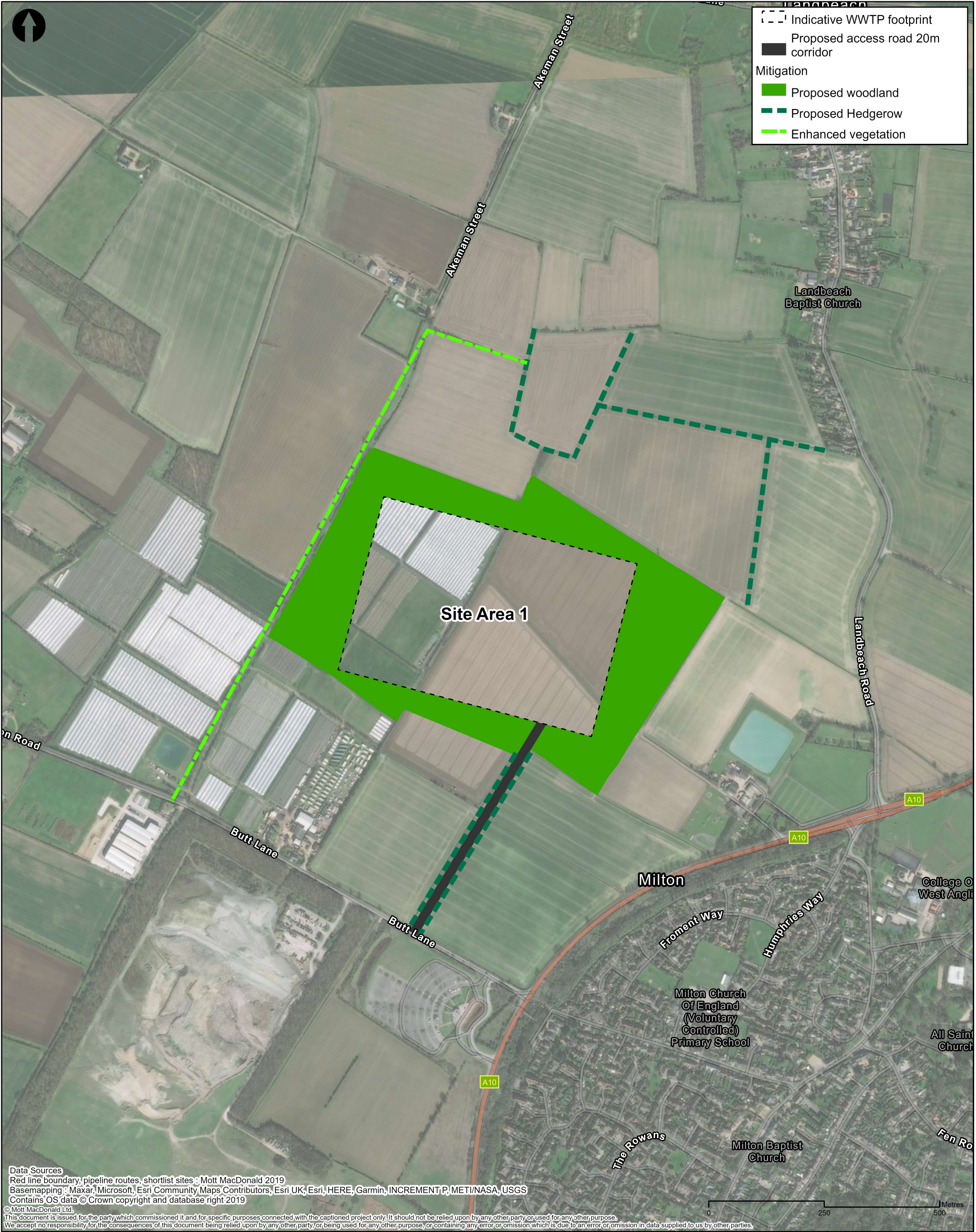
M M MOTT MACDONALD 22 Station Road Cambridge CB1 2JD United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client					Title			Drawn		N Critten																		
	anglianwater					CWWTPR Project Stage 4 Final Site Selection Site area 2 - 10km ZTV			Checked		M Rickard																		
									Approved		J Newton																		
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	<table><tr><th>Rev</th><th>Date</th><th>Drawn</th><th>Description</th><th>Ch'k'd</th><th>App'd</th></tr><tr><td>G</td><td>01/21</td><td>NC</td><td>Final</td><td>MR</td><td>JN</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>						Rev	Date	Drawn	Description	Ch'k'd	App'd	G	01/21	NC	Final	MR	JN							Drawing Number 409071-MMD-00-XX-GIS-Y-0463			Security STD	Status PRE
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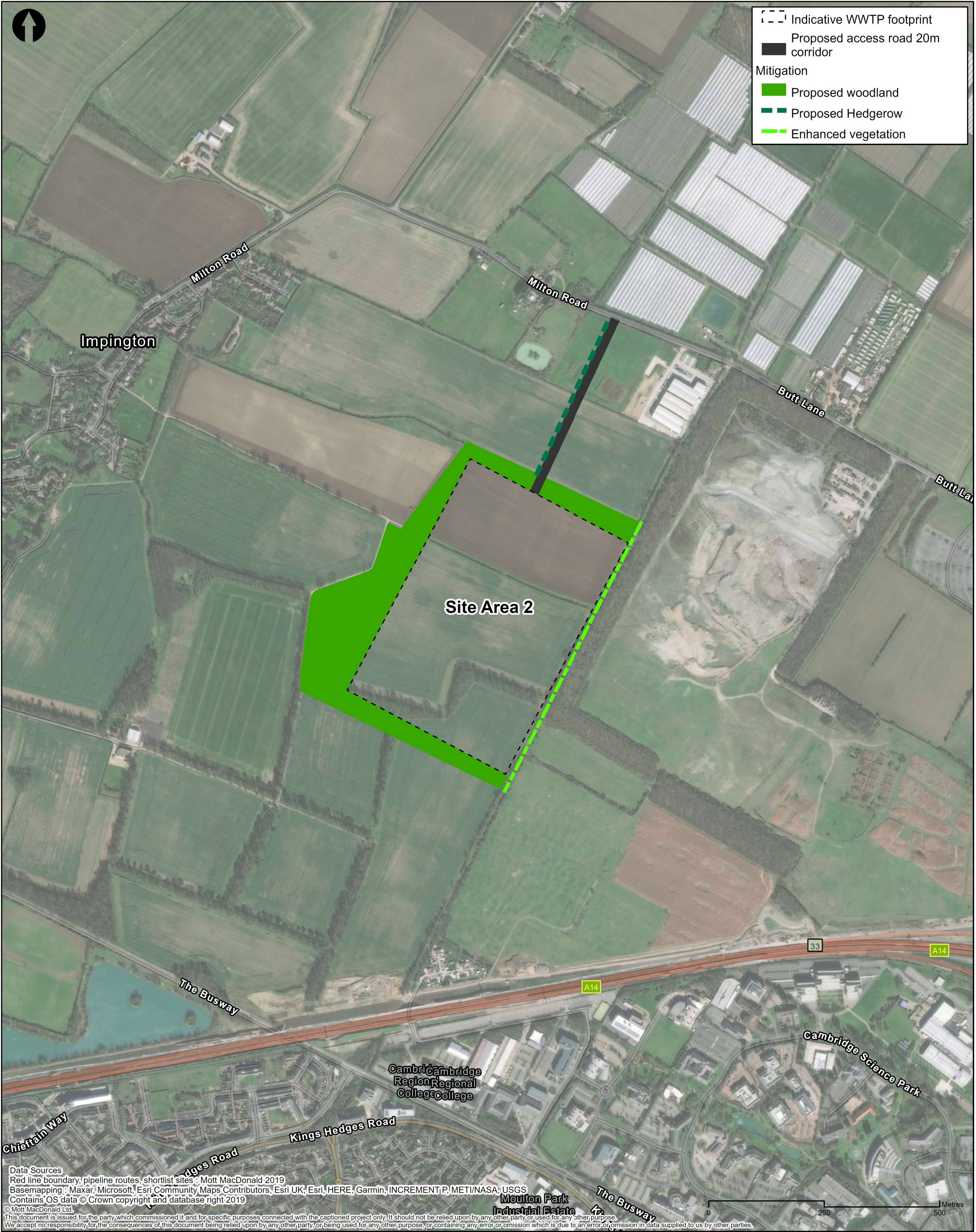
Data Sources
ZTV analysis: Mott MacDonald, Jul 2020.
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M M MOTT MACDONALD 22 Station Road Cambridge CB1 2JD United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client anglianwater						Title CWWTPR Project Stage 4 Final Site Selection Site area 3 - 10km ZTV			Drawn	N Critten	
										Checked	M Rickard	
										Approved	J Newton	
										Scale at A3 1:80,000		
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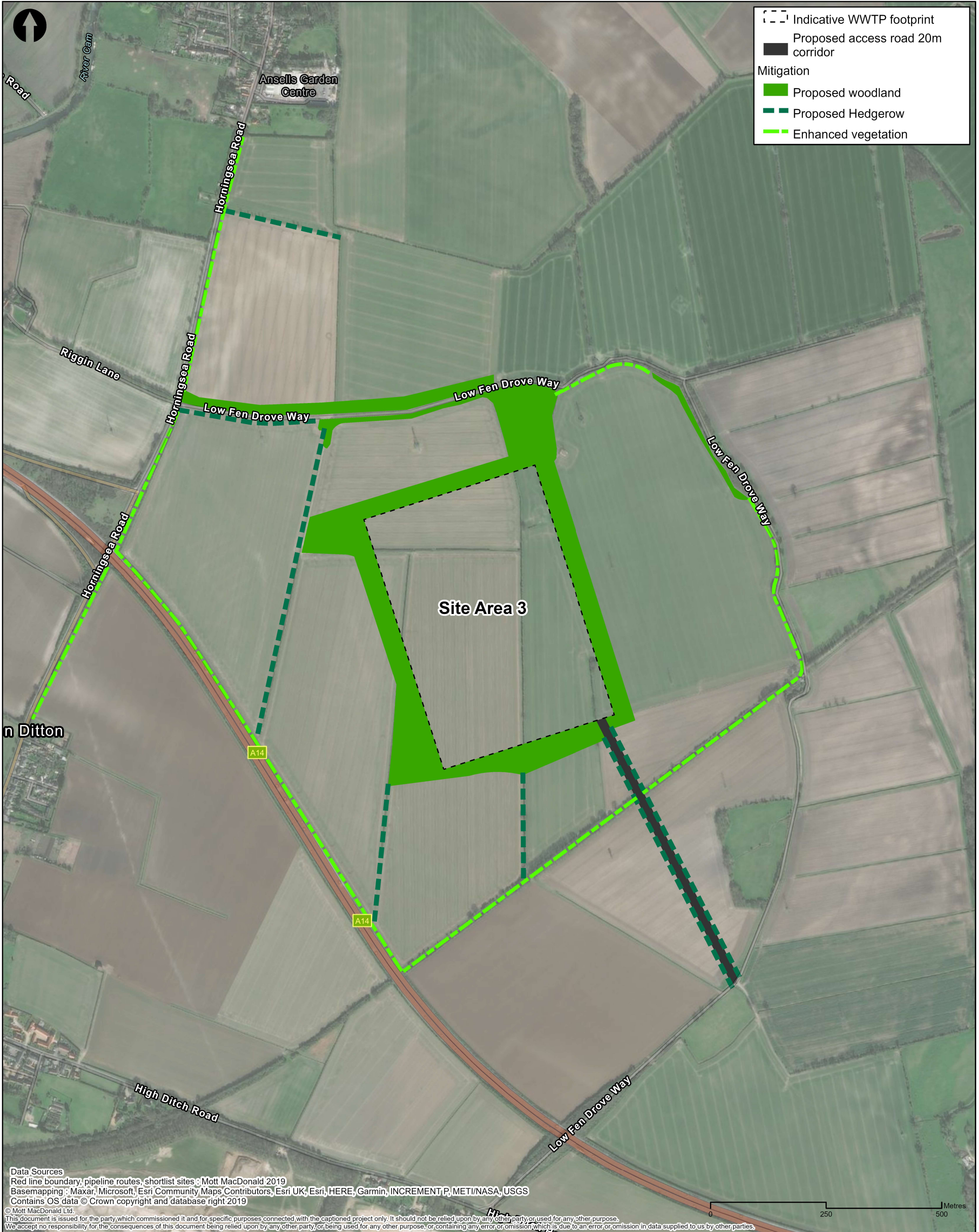


M M MOTT MACDONALD 22 Station Road Cambridge CB1 2JD United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client anglianwater						Title CWWTPR Project Stage 4 Final Site Selection Preliminary Landscape Design Site area 1			Drawn	A Briggs		
										Checked	M Rickard		
										Approved	J Newton		
										Scale at A3 1:7,500			
						Rev			Date	Drawn	Description	Ch'k'd	App'd
						G			01/21	AB	Final	MR	JN



Data Sources
Red line boundary, pipeline routes, shortlist sites : Mott MacDonald 2019
Basemapping : Maxar, Microsoft, Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS
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	anglianwater					CWWTPR Project Stage 4 Final Site Selection Preliminary Landscape Design Site area 2			Checked	M Rickard		
									Approved	J Newton		
									Scale at A3 1:7,500			
		Rev	Date	Drawn	Description	Ch'k'd	App'd	Drawing Number			Security	Status
	G	01/21	AB	Final	MR	JN	409071-MMD-00-XX-GIS-Y-0466			STD	PRE	G



M M MOTT MACDONALD 22 Station Road Cambridge CB1 2JD United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client anglianwater						Title CWWTPR Project Stage 4 Final Site Selection Preliminary Landscape Design Site area 3			Drawn	A Briggs	
	Rev						Checked			M Rickard		
	Date						Approved			J Newton		
	Description						Scale at A3			1:7,500		
	Ch'k'd						Drawing Number			Security	Status	Rev
G	01/21	AB	Final	MR	JN		409071-MMD-00-XX-GIS-Y-0467			STD	PRE	G

B.3 Historic Environment

Assessment methodology

- B.3.1 This assessment considered the potential impacts upon the historic environment of the unmitigated options for the three site areas and their associated infrastructure.
- B.3.2 The assessment provides a more detailed assessment of the three shortlisted site areas than was provided in stage 3, including; a more detailed baseline, a site walkover, and potential impacts on designated heritage assets identified within the 10km ZTV described in section B.2.6.
- B.3.3 The methodology for the historic environment assessment is provided in the full historic environment impact appraisal report in Appendix L.
- B.3.4 An overall Red/Amber/Green (RAG) assessment was given to each of the Stage 4 site area options. The criteria for the defining the overall score are provided in Table B.18.

Table B.18: Historic RAG definitions

Green	Amber	Red
No anticipated impact on non-designated and designated heritage assets. Potential negligible to moderate impact on non-designated assets of low value. Potential negligible to minor impacts on non-designated and designated assets of moderate value.	Potential major impact on non-designated asset of low value. Potential moderate to major impact on non-designated and designated assets of moderate value. Potential negligible to minor impacts on designated and non-designated assets of high value.	Potential for moderate to major impact on non-designated and designated assets of high value.

- B.3.5 Comment is made within the assessment of unmitigated options section of this report as to how this assessment relates to the planning terminology of no harm, less than substantial harm and substantial harm. This is intended to inform how this assessment relates to planning context. It should be noted that this terminology may not always provide a useful representation of anticipated impact due to broad categories, and should be understood in the context of the assessment, rather than taken alone.

Assessment of unmitigated options

- B.3.6 The historic environment impact appraisal for each of the site areas is provided in Appendix L. A summary of the assessments and the resulting RAG evaluation, before mitigation, are provided below.
- B.3.7 Based on the criteria described in section B.3.4 and the impact appraisal described in Appendix L, the RAG outcome for the WWTP development at site area 1 is **AMBER**.
- B.3.8 The primary reason for the Amber rating for site area 1 is the high archaeological potential for Roman and Iron Age remains. This results in a likelihood of moderate to major impact to archaeological remains which may be of low to moderate value, which amounts to substantial harm in accordance with the NPS.
- B.3.9 In addition, the pipeline to Waterbeach encounters remains identified in the CHER with potentially moderate value and would result in a moderate to major impact to these. Therefore, the excavation for the pipeline to Waterbeach is anticipated to result in substantial harm to assets of low to moderate value.

- B.3.10 In addition, potential for impact to the grade I listed Parish Church of All Saints contributes to the RAG outcome. The change within its setting is likely to result in minor impact to a designated heritage asset of high value. Additionally, minor impact to the grade II listed Baptist Chapel from change within its setting contributes to this outcome. In accordance with the NPS, this amounts to less than substantial harm to designated heritage assets.
- B.3.11 Based on the criteria described in section B.3.4 and the impact appraisal described in Appendix L, the RAG outcome for the WWTP development at site area 2 is **AMBER**.
- B.3.12 In accordance with the NPS, this amounts to less than substantial harm to all built heritage assets. There is potential for the development of the CWWTP at site area 2 to result in substantial harm to buried archaeology of low and moderate value.
- B.3.13 The outcome of the RAG assessment on site area 2 relates to the archaeological potential for Roman and prehistoric remains. The relocation of CWWTP to site area 2 would result in moderate to major impact to archaeological remains of potentially moderate value. The pipeline to Waterbeach encounters remains identified in the HER with potentially moderate value and would result in moderate to major harm to these. In both instances this amounts to substantial harm to assets of low and moderate value, in accordance with the NPS.
- B.3.14 Based on the criteria described in section B.3.4 and the impact appraisal described in Appendix L, the RAG outcome for the WWTP development at site area 3 is **RED**.
- B.3.15 The reason for the RAG outcome is the potential for impact to Biggin Abbey as a result of change within its setting. Without mitigation this may amount to moderate harm to the significance of the asset, this amounts to less than substantial harm in accordance with the NPS but constitutes a red rating within the RAG criteria for this report.
- B.3.16 Without this element the site would receive an amber rating due to the potential for impact on buried archaeological remains and lesser impact on Anglesey Abbey. The pipeline to Waterbeach would also likely result in moderate to major impact to archaeological remains of moderate value, if present. This may amount to substantial harm in accordance with the NPS.
- B.3.17 There is also potential for impact to the grade II listed Wildfowl Cottage from change within its setting. The access route from Horningsea Road contains Roman archaeological remains of potentially moderate value and has high potential for associated archaeology. These impacts amount to less than substantial harm.

Mitigation identification

Site area 1

- B.3.18 Design considerations should aim to minimise change within the setting of designated heritage assets, with particular consideration to the grade I listed Parish Church of All Saints and the grade II listed Baptist Chapel. Strategic planting and other landscaping between the WWTP and these designated assets may soften the visual impact, especially in conjunction with design measures for the buildings. Buildings and structures over 10m, including the digesters should be designed to be the minimal feasible height, to further reduce impact on the setting of heritage assets. The exterior of tall elements should be designed to retreat into the landscape, for example by using gradated painting.
- B.3.19 Archaeological investigation would be required if site area 1 is selected. The extent of this investigation would be dependent on the results of further assessment and site survey, as well as consultation with the relevant stakeholders. This is likely to include geophysical survey and archaeological trial trenching as a minimum. Archaeological investigation, importantly, does not

amount to mitigation as the remains would still be removed by the WWTP development; the potential for impact to the buried archaeological remains is therefore the same. However, this does not undermine the importance of undertaking archaeological investigation.

- B.3.20 Geophysical survey, trial trenching and/or other survey may identify areas of greater archaeological potential or specific remains of moderate value within the site area. This may allow for the targeting of building and service locations to reduce impact on buried archaeology. However, as the landscape contains a high density of remains and the historic environment is not the only factor of consideration in the scheme design, this is unlikely to materially reduce the potential for impact.

Site area 2

- B.3.21 Archaeological investigation would be required if site area 2 is selected. The extent of this investigation would be dependent on the results of initial surveys but is likely to include geophysical survey and archaeological trial trenching as a minimum. This does not amount to mitigation, as discussed for site area 1.
- B.3.22 Geophysical survey, trial trenching and/or other survey may identify areas of greater archaeological potential or specific remains of moderate value within the site area. This may allow for the targeting of building and service locations to reduce impact on buried archaeology. However, as the landscape contains a high density of remains and the historic environment is not the only factor of consideration in the scheme design this is unlikely to materially reduce the potential for impact, as for site area 1.
- B.3.23 Strategic planting and other landscaping may reduce the impact of the proposed development on heritage assets, by reducing the change within their setting. However, as the impact on built heritage does not make substantial contribution to the amber outcome for site area 2 this would not reduce its mitigated RAG rating.

Site area 3

- B.3.24 The potential for impact on Biggin Abbey, grade II* listed, and its associated grounds and archaeology can be reduced through mitigation. Some strategic planting close to the asset may be achievable to reduce impact, however the landscape is open and excessive planting may have adverse effect on its character. Bunds may help reduce the visual impact on the landscape and landscaping design proposed may contribute to reducing this impact. The visual impact should be softened as much as possible by introducing landscaping features. However, the mitigation factor which will have the greatest effect on reducing potential for impact is the design, height and massing of the WWTP. Reducing the massing and using materials which aid in fading the digester into the skyline, for example gradated painting, would also contribute to reducing impact. The location of the digesters within the footprint will also influence the extent of impact, they should be placed on the far side of the area from the abbey. The height of the digester should be reduced by the greatest feasible amount. A reduction in potential impact to height is likely to directly correlate to reducing the impact to Biggin Abbey. Other buildings and structures over 10m should also be reduced in height and mass wherever possible.
- B.3.25 The use of the access route from Horningsea Road is slightly preferable when considering potential impact to the historic environment; both routes contain archaeological remains of potentially moderate value and Horningsea Road has potential impact to the setting of Biggin Abbey, however only the High Ditch Road access route contains a designated heritage asset (a listed milestone located in the centre of the junction at the terminus of Fen Drove). If Horningsea Road is used, the entrance should be offset so that line of sight down the avenue from Biggin Abbey is not directed into site area 3. Landscaping should be used to soften elements in the

north-east corner, so they do not dominate views outwards down the avenue entrance. This would reduce the impact from change in setting for the designated asset. Archaeological investigation is also likely to be required for this route.

- B.3.26 If High Ditch Road is used for access to site area 3, the listed milestone should only be removed if absolutely necessary for the WWTP development or necessary to protect the asset from harm. Following construction, it should be returned to its original setting, reducing negative impact to the asset from moderate to minor.
- B.3.27 The access area from High Ditch Road has high potential for early medieval remains, relating to the presence of Fleam Dyke and other assets of this period recorded in the HER. Other sections of the length of Fleam Dyke are scheduled, however desk-based research and initial findings of this report indicate that the section adjacent to High Ditch Road may not be of schedulable quality.
- B.3.28 Fleam dyke, a potentially moderate value asset, is located north and south of the road for which widening may be required for use by construction vehicles if site area 3 is selected, crossing the road along its length. The road should not be widened unless absolutely necessary. Currently the road widening is proposed for the northern side of High Ditch Road, therefore it is assumed that based on the current information there is no anticipated impact on Fleam Dyke. If any widening of the road to the south was required, this would result in moderate to major impact to an asset of moderate value. If the road must be widened this should aim to avoid Fleam Dyke rather than focus on widening on only one side of the road. Archaeological investigation is likely to be required for this route and may be required to determine the route of Fleam Dyke to aid in avoiding the asset. In addition, human inhumations have been identified near Fleam Dyke (CHER: 0603), and there is therefore the potential for human archaeological remains within this access area.
- B.3.29 Archaeological investigation would be required if site area 3 is selected. The extent of this investigation would be dependent on the results of initial surveys but is likely to include geophysical survey and some excavation at a minimum. This does not amount to mitigation, as discussed for site areas 1 and 2.
- B.3.30 Geophysical survey, trial trenching and/or other survey may identify areas of greater archaeological potential or specific remains of moderate value within the site area. This may allow for the targeting of building and service locations to reduce impact on buried archaeology. However, as the landscape contains a high density of remains and the historic environment is not the only factor of consideration in the scheme design this is unlikely to materially reduce the potential for impact, as for site areas 1 and 2.

Assessment of mitigated options

- B.3.31 The proposed mitigation would reduce potential impact on the setting of the grade II listed Baptist church and grade I listed Parish Church of All Saints. The proposed archaeological mitigation for site area 1 would reduce harm to the historic environment and comply with the requirements of planning policy, however this would not alter the impact on archaeology which results in the RAG rating for the site area. Therefore, even with mitigation in place, site area 1 would still receive an **AMBER** rating.
- B.3.32 The proposed mitigation for site area 2 would reduce harm to the historic environment and comply with the requirements of planning policy, however this would not alter the elements of the design which result in the RAG rating for the site area. Therefore, even with mitigation in place, site area 2 would still receive an **AMBER** rating.

- B.3.33 With the proposed mitigation for site area 3 imposed there is potential that the impact may be reduced. This will largely be dependent on the design of the buildings and structures on the site, including the digesters. If all the above mitigation is followed there is potential that the outcome may be reduced to **AMBER**.

Incorporating feedback

B.3.34 Phase one non-statutory consultation was held in order to share the proposals for relocating the WWTP with the public and stakeholders. This section provides a summary of the feedback received from the public in relation to the historic environment and how the concerns, issues and opportunities raised have been considered within the assessment criteria for Stage 4 final site selection.

Table B.19: Historic Environment feedback

Sub-topic	Site (if specific)	Comment Summary	CWWTPR Response
Archaeology and Local Heritage	Site areas 1 & 2	Respondents objectors to Sites 1 & 2 cited a number of local heritage locations such as Milton cemetery, Tithe Barn and other thatched buildings, Akeman street and Mere Way (Roman roads).	All local heritage assets within the study area are captured, as well as providing a brief baseline description of the area to capture local character. Key assets which may be of concern, such as the Cemetery and Roman Road are discussed in slightly greater depth and drawn out in the impact appraisal. (note: Akeman Street/Mere Way is one Roman Road not two, the route of a single Roman Road follows Mere Way before joining Akeman Street)
		Comment that the status of Horningsea and Fen Ditton as conservation area and that they also include the presence of nearby archaeological sites.	Conservation areas are considered along with other designated heritage assets which fall within the study area, including with regard to the ZTV as the potential importance of long views to conservation areas is recognised. Archaeological potential is considered for the study area for all three sites and captures archaeological potential related to these historic settlements where relevant.
	Site area 3	Respondents noted that High Ditch Road is on the Fleam Dyke, an ancient feature of great historic importance with a Roman villa site to the north of Honey Hill and near to recent discoveries of Roman, Iron and Bronze age settlements. Concerns raise that this archaeological heritage would be severely damaged.	The archaeological potential for Roman and Iron Age remains is identified and discussed in the historic environment impact appraisal (Appendix L), including appraising the potential extent of this impact and archaeological investigation which would be required. Fleam Dyke is drawn out and discussed individually due to its significance, with particular regard to the access area for site area 3; the potential impact on the asset is appraised and mitigation is recommended.
		Comment that the historic situation of small villages lying on slightly raised ground, close to water and where the land was easily cultivated, within the three Eastern Fen Edge landscape character areas is an important part of the setting and special character of East Cambridge and should be preserved. Comment that the main charm of these areas is their rural setting, which would be diminished.	The Eastern Fen Edge LCA, Waterbeach-Lode Fen LCA and River Cam Corridor LCA (as identified in previous Green Belt Studies) are important to the setting of eastern Cambridge and all have a rural character, with little large-scale development. The A14 and overhead powerlines are the only real detracting elements. This has been taken into account in the landscape and visual appraisal for the Stage 4 site selection and also in the Green Belt study (Appendix J). Where the setting described here contributes to the significance of heritage assets within the study area and has the potential to be altered by the relocated CWWTP, therefore potentially impacting the significance of heritage assets, this has been captured in the historic environment impact appraisal (Appendix L).

B.4 Land and Water Quality

Assessment methodology

- B.4.1 This assessment considers the potential impacts upon the water environment, including both groundwater and surface water impacts, and the risks from contaminated land to the environment and human health. The unmitigated proposed site options and associated infrastructure have been reviewed.
- B.4.2 The assessment examines the following aspects.
- Contaminated land including:
 - Contamination risks below the WWTP and along the routes of associated infrastructure (tunnels, pipelines and shafts)
 - Groundwater impacts including:
 - Risks to groundwater (flows, levels or quality) as a result of construction and operation of the site
 - Risks to WFD classified groundwater bodies
 - Risks to groundwater dependent ecosystems
 - Surface water impacts including:
 - Risks to WFD classified surface waterbodies⁶¹ (flows and quality) during construction and operation of the site and associated infrastructure
 - Risks to surface water dependent ecosystems
- 9.1.1 The assessment was informed by the following guidance and legislation.
- *Land contamination risk management*⁶²
 - *Hydrogeological impact appraisal for groundwater abstractions*⁶³
 - *Groundwater risk assessment for your environmental permit*⁶⁴
 - *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017*⁶⁵
- B.4.3 The RAG definitions adopted for the assessment of impact upon the water environment, including both groundwater and surface water impacts, and the risks from contaminated land are provided in Table B.20.

⁶¹ It should be noted that risks to natural surface water drainage patterns in and around the new WWTP site and associated infrastructure would be accommodated in the design, possibly by inclusion of SuDS measures within the site. Since impacts are likely to be minimal, these have not been considered as part of the RAG assessment as it would be unlikely to have an effect on the site selection.

⁶² Environment Agency, Land contamination risk management, October 2020. Available at: <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

⁶³ Environment Agency, Hydrogeological impact appraisal for groundwater abstractions, April 2007. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291083/scho0407bmah-e-e.pdf

⁶⁴ Environment Agency and Department for Environment, Food & Rural Affairs, Groundwater risk assessment for your environmental permit guidance, February 2016. Available at: <https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit>

⁶⁵ The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. Available at: <https://www.legislation.gov.uk/uksi/2017/407/contents/made>

Table B.20: Land and water quality RAG definitions

	Green	Amber	Red
Presence of potentially contaminated Land	Low risk of contamination for WWTP development; And low risk of contamination along pipeline and tunnel routes	Moderate risk of contamination for WWTP development; And/ or moderate risk of contamination along pipeline and tunnel routes	High risk of contamination for WWTP development; And/ or high risk of contamination along pipeline tunnel routes
Groundwater	Low risk to Principal aquifer in the short term and long term	Potential short term risk to Principal aquifer in terms of water quality, levels or flow from development of WWTP and associated infrastructure	Potential long term risk to Principal aquifer in terms of water quality, levels or flow from development of WWTP and associated infrastructure
Surface water	Low risk of adverse impact to a WFD surface waterbody from development of WWTP and associated infrastructure	Moderate risk of adverse impact to a WFD surface waterbody from development of WWTP and associated infrastructure	High risk of adverse impact to a WFD surface waterbody from development of WWTP and associated infrastructure

- B.4.4 The Environment Agency provided a consultation response in relation to the project proposals shared in phase one non-statutory consultation. The response detailed a number of concerns in relation to the potential impact of the proposals on the water environment and indicated that a Hydrogeological Impact Assessment (HIA) should be carried out to support the selection of a final site for the relocation of Cambridge WWTP.
- B.4.5 Therefore, Anglian Water commissioned the production of a HIA, which builds on a high-level assessment of the potential impacts on groundwater and the groundwater-dependent environment provided in the Water Resources Statement (Mott MacDonald Ltd, 2020e). The HIA was informed by a preliminary stage of Ground Investigation (GI), which was carried out to investigate the geological, hydrogeological and geotechnical conditions at all three sites and the treated effluent tunnel corridor from sites 1 and 2. Fieldwork was carried out between August and October 2020 and consisted of five investigation boreholes. Further details of the GI are provided in the HIA.
- B.4.6 The assessment of groundwater and groundwater-dependent surface water impacts within the land and water quality assessment was informed by both the Water Resources Statement and the preliminary results of HIA. The HIA will be made available following review by the Environment Agency.
- B.4.7 Maps of the features discussed in the following assessment are provided in the Drawings section at the rear of Appendix B.4. These are as follows:
- 409071-MMD-00-XX-GIS-Y-0468 - Land and water quality assessment study area
 - 409071-MMD-00-XX-GIS-Y-0469 - Bedrock geology
 - 409071-MMD-00-XX-GIS-Y-0470 - Superficial geology
 - 409071-MMD-00-XX-GIS-Y-0471 - Flood zones and nature conservation sites

Assessment of unmitigated options

Contaminated land

- B.4.8 Contamination risks for the WWTP development were previously reviewed as part of the Stage 3 – Fine Screening Report (Mott MacDonald Ltd, 2020d). This determined that site areas 1 and 3 were at low risk of contamination and so were assessed as green in the RAG score. site area 2 was assessed as amber due to the presence of potential offsite sources (such as Milton Landfill) which could act as a source of ground gas and groundwater contamination at the site.
- B.4.9 Risks from the WWTP associated infrastructure (tunnels, pipelines and shafts) were not assessed at Stage 3 – Fine Screening. These have been assessed here based on reviewing the historical maps from Envirocheck Reports⁶⁶ and current available aerial imagery. However, it should be noted that the Envirocheck Reports do not cover the entire pipeline/tunnel routes. Maps and aerial imagery were used to determine whether there were potential sources of contamination present along the tunnel/pipeline routes and then whether there were pathways to controlled waters. For tunnels and pipelines, sensitive human health receptors are limited but include construction workers and residents adjacent to the routes. It is assumed that impacts to construction workers will be mitigated through health and safety risk assessments, method statements and personal protective equipment as required based on site investigation. Impacts to nearby residents would be mitigated through a CEMP which would ensure impacts from dust and runoff are minimised.
- B.4.10 As discussed within Section 1.3, there are several different options for each site, including whether the treated effluent and stormwater discharge will be constructed as tunnel or pipeline. Contamination risks will be dependent upon the location, method of construction and the aquifer designation. Site areas 1 and 2 overlie the Gault Formation which is classified by the Environment Agency as an unproductive aquifer (effectively a non-aquifer). site area 3 is underlain by the West Melbury Marly Chalk Formation. This formation is located towards the base of the Chalk (in the Grey Chalk Sub-group) and is considered to be a Principal aquifer. The Lower Greensand underlies the Gault in the areas of site areas 1, 2, and 3. This is also considered a Principal aquifer.
- B.4.11 Contamination risks are lower from tunnels, as these are generally deeper and do not interfere with shallow soils except at shaft locations. It is likely that the shafts associated with the waste water transfer tunnel could be excavated into (or in close proximity to) the Lower Greensand below the Gault Formation at site areas 1 and 2. In addition, if pipe-jacking is chosen as the method for tunnel construction, additional shafts close to site areas 1 and 2 may also be excavated through Gault Formation and into the Lower Greensand.
- B.4.12 For the treated effluent and stormwater pipelines, it was noted within the Stage 3 Fine Screening Report (Mott MacDonald Ltd, 2020d) that “all residential areas, gardens and land for recreational purposes have been avoided, where possible, and routing through open agricultural land maximised” and “Pipeline...crossings [of roads and railways] would be pipe jacked; which is a method of installing pipes below ground, that avoids surface disruption, by thrusting pipes through the ground as controlled excavation”.
- B.4.13 The Envirocheck report for site area 1 has identified limited potential for contamination across the majority of the study area. Rural land has been predominantly undeveloped and used as agricultural land and the village of Landbeach to the north east has seen limited industrial land

⁶⁶ Provided in Appendix F of the Cambridge WWTP Relocation Project Stage 3 Fine Screening Report, Mott MacDonald Ltd, 2020

use, with the majority of development comprising residential dwellings, with the presence of farms being the most likely sites to be acting as a source of contamination.

- B.4.14 Milton Landfill is present to the south of site area 1. However, a 50m buffer from Milton landfill was used when defining the potential tunnel corridor. In addition, there are “works” located north of the A14, alongside which the treated effluent and stormwater tunnel/pipeline will run adjacent to (Option A only). For Option B, the treated effluent and stormwater tunnel/pipeline is located north of Milton, potentially passing through a cemetery, although this will likely be avoided in the final design. These are potential contamination sources, particularly if the treated effluent is in pipeline within the shallow deposits. There is therefore potential for contamination (soils or groundwater) to be encountered during construction, particularly if the landfill dimensions are larger than records suggest. The potential for disturbing solid waste is low, particularly as the tunnel route passes adjacent to or underneath the A10, which is likely to pre-date the landfill. Despite this, there remains some potential for contamination to be encountered.
- B.4.15 The Envirocheck report for site area 2 has identified some potential for contamination within the study area. Rural land has been predominantly undeveloped and used as agricultural land and the town of Impington to the west has seen limited industrial land use, with the majority of development comprising residential dwellings. However, the presence of landfills and other waste facilities, historical barracks and brick works, as well as industrial land uses, such as those associated with Cambridge Science Park in the area could be acting as a source of contamination. Despite this, the majority of below ground works will be undertaken in Gault Clay which is an Unproductive aquifer and unlikely to facilitate significant mobilisation of contamination.
- B.4.16 In addition, there are “works” located north of the A14, alongside which the treated effluent and stormwater tunnel/pipeline will run adjacent to for Option A at site areas 1 and 2. For Option B, at both site areas 1 and 2, the treated effluent and stormwater tunnel/pipeline is located north of Milton, potentially passing through a cemetery, although this will likely be avoided in the final design. These are potential contamination sources. If the treated effluent is in pipeline within the shallow River Terrace Deposits, the pipeline could act as a pathway, mobilising existing contaminants to groundwater and the River Cam.
- B.4.17 The Envirocheck report review for site area 3 has identified limited potential for contamination within the study area. Rural land has been predominantly undeveloped and used as agricultural land, with the only development comprising a now dismantled railway and the current A14 (formerly A45). The areas of the treated effluent and stormwater tunnel/pipeline and wastewater transfer tunnel corridor are similarly largely undeveloped, with the exception of some farm and residential buildings.
- B.4.18 The indicative Waterbeach waste water transfer pipeline for site area 3 predominantly routes through undeveloped agricultural land, with the exception of some farm and residential buildings nearby.
- B.4.19 In regard to the indicative Waterbeach waste water transfer pipeline, site areas 1 and 2 have similar routes, leading from west of Milton towards the north of Waterbeach. This is mostly travelling through undeveloped agricultural land, with the exception of some farm and residential buildings nearby. However, this pipeline route also travels between Waterbeach Barracks (disused) and a disused airfield (RAF Waterbeach). This is a potential source of contamination. However, the potential impacts will be temporary during construction and due to the size of the pipeline it should be possible to adjust the route in order to avoid constraints and minimise the potential impacts of the pipelines.

- B.4.20 Tunnels and pipelines have potential to mobilise contaminants by creating man-made pathways. As established above, site area 3 has low risk of contamination and therefore low risk of mobilising contaminants. At site areas 1 and 2 the tunnels will likely be within the Gault Formation which is an unproductive aquifer comprised of clay. This will likely form a seal around the tunnels and unlikely to create a pathway for contaminants. Pipelines will likely be at depths of 3-4mbgl and so will likely be within the Gault Formation for site areas 1 and 2, except where River Terrace Deposits are thicker than 3m (e.g. nearer the River Cam valley). Therefore, if the treated effluent is in pipeline, site area 1 (option A) and site area 2 (option A) have the potential to mobilise contaminants (if present) in superficial deposits towards the River Cam. Ground investigation will determine whether there are contaminants along the site area 1 and 2 (option A) treated effluent corridor.

Groundwater

- B.4.21 This assessment considers the potential impact of the WWTP and waste water transfer infrastructure (tunnel and shafts) on groundwater below the study area.
- B.4.22 Groundwater can be found below ground in both shallow superficial deposits as well as deeper bedrock formations.
- B.4.23 The bedrock geology in the area of the three sites comprises the following sequence, listed from youngest to oldest formations:
- Grey Chalk, comprising:
 - Zig Zag Chalk Formation
 - Totternhoe Stone
 - West Melbury Marly Chalk Formation
 - Gault Formation
 - Lower Greensand (Woburn Sands Formation)
 - Kimmeridge Clay Formation (underlain by the Ampthill Clay and West Walton Formations)
- B.4.24 The Lower Greensand Group and the Grey Chalk Subgroup are designated as Principal Aquifers by the Environment Agency. Principal Aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of groundwater storage. They may support water supply and/or river base flow on a strategic scale.
- B.4.25 Site area 3 is underlain by the West Melbury Marly Chalk Formation. This is classified as high in terms of groundwater vulnerability due to the formation being at outcrop with no low-permeability superficial deposits overlying the chalk. This formation is located towards the base of the Chalk (in the Grey Chalk Sub-group). No significant aquifer horizons would be expected in the marly chalk forming the West Melbury Marly Chalk Formation, as described in boreholes near site area 3 (Mott MacDonald Ltd, 2020f). Both the permeability of the marly chalk and the transmissivity of the formation are expected to be low. As a result, groundwater yields and any discharges from the West Melbury Marly Chalk Formation are also likely to be small.
- B.4.26 In terms of WFD status, the Cam and Ely Ouse Chalk groundwater body, (WFD identification reference GB 40501 G 400500) was assessed in 2016 to have both poor quantitative status and poor chemical status. The issues resulting in poor quantitative status comprise changes to the natural flow and levels of water due to agriculture and industry, including the water industry. The issues resulting in poor chemical status include pollution from agriculture and urban areas, transport and waste water.

- B.4.27 Site areas 1 and 2 are underlain by the Gault Formation. The thickness of the Gault Formation in the area is between 20 – 27m based on the geological logs for the preliminary GI boreholes within the site areas (Mott MacDonald Ltd, 2020f). The Gault Formation is classified by the Environment Agency as an unproductive aquifer (effectively a non-aquifer) and as unproductive in terms of groundwater vulnerability.
- B.4.28 The Lower Greensand underlies the Gault in the areas of site areas 1, 2, and 3. Geological logs for the preliminary GI boreholes indicate the Lower Greensand is about 7 to 10m thick in the vicinity of site areas 1 and 2 (Mott MacDonald Ltd, 2020f). Test pumping of a borehole in the Lower Greensand at Sunclose Farm on Butt Lane, between site areas 1 and 2, produced a yield of 1.5 l/s with a drawdown of 12.3m over 24 hours, indicating that the formation is low yielding in the area.
- B.4.29 In terms of WFD status, the Cam and Ely Ouse Woburn Sands groundwater body, (WFD identification reference GB 40501 G 445700) was assessed in 2016 to have good quantitative status but poor chemical status. The issue resulting in poor chemical status comprises pollution from agriculture.
- B.4.30 There are no groundwater abstractions for public water supply within the study area. In addition, no part of the area in and around the sites is within an Environment Agency designated source protection zone (SPZ) for any public water supply groundwater abstraction. Details were obtained for licensed groundwater abstractions and unlicensed private groundwater supplies for the HIA (Mott MacDonald Ltd, 2020f), which established that there are numerous licenced and private groundwater supplies exploiting the Lower Greensand within the study area and as indicated above, records of test pumping of a borehole in the lower Greensand at Sunclose Farm on Butt Lane, between Sites 1 and 2, are available on the BGS website. The HIA established that there is only one unlicensed private groundwater supply and no licensed abstractions exploiting the West Melbury Marly Chalk Formation in proximity to site area 3.
- B.4.31 In addition to Principal Aquifers there are superficial deposits that overlay the bedrock geology in Study Area that are designated as Secondary Aquifers by the Environment Agency. These are permeable layers, typically with lower levels of groundwater storage, capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are designated as medium-low in terms of groundwater vulnerability.
- B.4.32 Superficial River Terrace Deposits, comprising sand and gravel, overlie the bedrock across most of site area 2, together with small areas of site areas 1 and 3. The river terrace deposits have a thickness of up to about 2.5 m in the area around Site 2, as indicated by logs for boreholes held by BGS. Otherwise the three sites are located directly over bedrock below the soil/sub-soil.
- B.4.33 BGS mapping indicates that alluvium, comprising clay, silt, sand and gravel, is present along the valley floor of the River Cam, with extensive River Terrace Deposits at a slightly higher elevation, particularly along the western flank of the valley. Borehole logs indicate that sandy clay and peat are present to a depth of 6 to 7 m in the valley floor at the A14 crossing, overlying sand and gravel to a depth of up to about 9 m. About 0.5 km further downstream, however, the superficial deposits have a depth of approximately 3.2 m, indicating that there is considerable variability in thickness (and composition) of superficial deposits along the valley. The river terrace deposits on the western side of the valley have a recorded depth of nearly 7 m at one location, but are more typically 2.5 to 4 m in depth. Peat is present in some areas to the east of Waterbeach.

B.4.34 River Terrace Deposits and alluvium are classified by the Environment Agency as Secondary A aquifers. Peat is classified as an unproductive aquifer.

B.4.35 There are several still water bodies at Milton Country Park, adjacent to the A14 Histon Interchange and Leyland Water north of Landbeach, which are located in areas of river terrace deposits underlain by Gault Formation. These water bodies have, presumably, resulted from, or been created by, excavation of River Terrace Deposits. They may be fed by groundwater which is perched in the superficial deposits above the Gault Formation, as well as direct rainfall and possibly some surface water flow.

WFD surface water bodies

B.4.36 Information available in the Catchment Data Explorer (Environment Agency, 2019) and Anglian RBMP (Department for Environment Food & Rural Affairs, Anglian river basin district River basin management plan, 2015) indicates that the following WFD surface water bodies are present in the area of the three sites:

- River Cam (WFD identification reference GB 10503304 2750), a heavily modified river with moderate overall WFD classification for 2016. The issues preventing the River Cam water body reaching good status comprise:
 - mainly physical modifications due to changes to the natural flow and levels of water together with modifications resulting from local and central government, recreation and urban and transport; but also,
 - pollution from waste water from the water industry.
- Bottisham Lode - Quay Water (WFD identification reference GB 10503304 2700), a heavily modified river with moderate overall WFD classification for 2016. The issues preventing the River Cam water body reaching good status comprise pollution due to waste water from the water industry.
- The Old West River (WFD identification reference GB 10503304 3375), a heavily modified river with moderate overall WFD classification for 2016. The issues preventing the Old West River water body reaching good status comprise:
 - changes to the natural flow and levels of water, together with pollution from rural areas, as a result of agriculture and rural land management; and,
 - pollution due to waste water from the water industry.

Surface and groundwater dependent nature conservation sites

B.4.37 Full details of the designated nature conservation sites which may be partly or wholly dependent on surface water and groundwater, and could, potentially, be affected by the construction or operation of the scheme are described within the Water Resources Statement (Mott MacDonald Ltd, 2020e). These include seven statutory designated sites and 13 non-statutory designated sites.

B.4.38 The potential impacts on designated sites are considered within the nature conservation and biodiversity assessment in Appendix B.1.

B.4.39 These will be further assessed within the Environmental Impact Assessment (EIA), once a final site has been chosen. However, it is likely that significant adverse impacts will be avoided by mitigation measures either included within a CEMP or within the scheme design. It is anticipated that no special mitigation measures are likely to be required.

Potential construction impacts

B.4.40 The potential impacts during construction include the following:

- Pollution of surface watercourses and groundwater due to poor construction practices and site drainage, including runoff from access roads. This could include contamination of watercourses with silt-laden runoff from construction areas, and pollution of groundwater or surface water by oils, fuels or chemicals used for site plant or in construction processes. The contamination could also lead to an impact on designated nature conservation sites which are linked to these watercourses.
- Mobilisation of contamination during construction.
- Temporary impacts to groundwater quality and flow during piling activities.
- Discharge of silt-laden water during dewatering of excavations, for example during shaft construction.
- Tunnelling works resulting in turbidity in groundwater or contamination with tunnelling fluids.
- Impediments to flow at watercourse crossings on access routes and during work at pipeline crossings.
- Temporary depletion of groundwater resources or impacts on licensed or private groundwater abstractions as a result of dewatering undertaken during shaft construction.
- Temporary impacts on groundwater dependent nature conservation sites, and surface water features or baseflows in watercourses which are dependent on groundwater resources, as a result of dewatering undertaken during shaft construction.
- Dewatering discharges affecting flood flow capacities and water quality in watercourses.

B.4.41 Concerns for contamination or pollution of surface watercourses and groundwater will be taken into account in a detailed CEMP to be produced as a separate document and implemented on site. A CEMP will include measures to ensure that the sediment content of site runoff and dewatering from excavations is at an acceptably low level when discharged to watercourses. Temporary sustainable drainage system (SuDS) measures may be employed at sites to control discharges in periods of high rainfall.

B.4.42 Shallow pipelines are likely to impact the groundwater in any superficial deposits, and significant dewatering may be required. Any silt-laden water from pipeline trenches would be contained or treated before discharge to local ditches or surface watercourses.

B.4.43 Piling for foundations at the WWTP could have potential temporary impacts on groundwater flow and quality during construction. Site areas 1 and 2 are underlain by RTD (only in north on site 1) (Secondary A aquifer) and the Gault Formation, which is an unproductive aquifer. The Lower Greensand (Principal Aquifer) underlies this. Only the most heavily loaded structures comprising the anaerobic digesters should have foundations, potentially to about 25m, that might go deep enough to encounter the lower Greensand. The presence of deep foundations may affect local flow paths within the upper part of the lower Greensand. However, taking into account the overall areal extent of the lower Greensand, the impact on the aquifer and groundwater flow would be negligible.

For Site 3, all piles will be constructed in or through the Grey Chalk. Taking into account the expected low permeability of the West Melbury Marly Chalk Formation, the impact on the aquifer and groundwater flow should be negligible. Some structures might also be installed to a depth below the water table at Site 3, which could alter the direction of shallow groundwater flow.

- B.4.44 Contamination risks from WWTP construction were only noted at site area 2, which is underlain by the River Terrace Deposits and Gault Formation. Piling construction methods would need to be designed to minimise risks piling through potential contamination and this would be included within a CEMP. Impacts to groundwater flow due to piling are likely to be insignificant since the River Terrace Deposits on site area 2 are laterally extensive, covering the majority of the WWTP footprint area, and so flows are likely to migrate around piles. There are potential short term impacts to groundwater quality as a result of turbidity during piling. However, the River Cam is located 2.5km east of the WWTP and so turbidity impacts within the river terrace deposits are unlikely to impact on the river quality. A Foundation Works Risk Assessment would be required to ensure any potential risks from piling within the river terrace deposits are mitigated.
- B.4.45 Shallow pipelines are likely to impact the groundwater in any superficial deposits, and significant dewatering may be required. Any silt-laden water from pipeline trenches would be contained or treated before discharge to local ditches or surface watercourses.
- B.4.46 The River Cam crossing for the pipeline from Waterbeach to Site 3 would be constructed beneath the river by pipe-jacking or micro-tunnelling. Construction activities at the location would be undertaken either side of the river and away from the river banks. As a result, the construction of the crossing would not be expected to disturb the river.
- B.4.47 It is likely that the shafts associated with the waste water transfer tunnel could be excavated into (or in close proximity to) the Lower Greensand below the Gault Formation at site areas 1 and 2. In addition, if pipe-jacking is chosen as the method for tunnel construction, additional shafts close to site areas 1 and 2 may also be excavated through Gault Formation and into the Lower Greensand. As a result, dewatering of the Lower Greensand could be required during the latter stages of excavation, and also lining and installation of the base slab in the shafts. If the base of a shaft is located in the Gault Formation but only a few metres above the Lower Greensand, dewatering may still be required to reduce the upward pressure and the potential for ground heave in the base of the shaft. As an approximate estimate, dewatering could be required for a period of four months during shaft construction.
- B.4.48 Shaft dewatering could have an impact on groundwater levels in the Lower Greensand, and on the water level in any abstraction boreholes, over an extensive area. There could be a substantial impact on the abstraction from the borehole at Sunclose Farm, located close to site areas 1 and 2. Theoretical approximations of the potential impact were carried for the HIA (Mott MacDonald Ltd, 2020f). These indicated that, in theory, the impact might be to reduce the water level in the outcrop area by 2 to 4m over a period of four months. The calculated impact is substantial because the aquifer is confined below the Gault Formation between the sites and the outcrop. As a result, piezometric changes are transmitted rapidly across the aquifer to the outcrop. This could have a significant temporary impact on any spring flows or groundwater seepages to local watercourses in the outcrop area. Some springs and watercourses are indicated in OS mapping on or close to the outcrop around Oakington.
- B.4.49 Due to the presence of Milton Landfill, located on the east side of Site 2, concerns have been raised by the Environment Agency that the temporary dewatering during shaft construction could have an impact on mobilising contaminants originating from the landfill. The contaminants could then pollute the dewatering discharge. This would be of greater concern if contaminants are known to have leached out from the landfill into the surrounding Gault Formation, although the likelihood of significant migration within the Gault Formation is considered to be very low, owing to the unproductive nature of the formation. The concern is principally in relation to Site 2, due to the proximity of the landfill to the proposed works, however a potential risk may also apply with temporary shaft dewatering for Site 1, which is located around 300m from Milton Landfill. Therefore, modelling was carried out in the HIA to understand the potential for

migration from the landfill through the Gault Formation. The preliminary results of the modelling indicated that contaminant migration within the Gault Formation is very slow, owing predominantly to the low hydraulic conductivity of the clay. This is a reason that the landfill was situated within the borrow pit initially, as leachates generated would be effectively contained within the confines of the pit and need to pass through over 10m of Gault Formation to reach the underlying aquifer in the Lower Greensand. The preliminary conclusion of the HIA indicated that through the implementation of the 50m standoff zone around the Landfill, an appropriate CoCP, and the use of EA approved drilling fluids, it is considered unlikely that there will be any impacts associated with contaminant transport from the landfill as a result of the proposed works at Sites 1 or 2.

- B.4.50 In contrast to the shafts, tunnelling, if required in the Lower Greensand, should have a negligible impact on groundwater flows. Tunnelling, if undertaken by closed-face methods, would require the injection of fluids to maintain pressure on the formation and hold back any potential groundwater inflows. Tunnel lining follows immediately behind the closed-face excavation. Bentonite and various polymers are used as fluids and would be of an acceptable quality standard for tunnelling works. Tunnelling in the Lower Greensand would not be expected to lead to significant turbidity in the aquifer as a result of fine grained nature of the Lower Greensand sediments.
- B.4.51 The potential alternative tunnel construction method of pipe-jacking does not have a requirement for dewatering and would not disrupt groundwater flows or be expected to lead to significant turbidity in the Lower Greensand aquifer.
- B.4.52 In contrast to site areas 1 and 2, shaft construction at site area 3 in the lowermost section of the Grey Chalk should require very limited dewatering which would have only a localised impact. Groundwater yields or natural discharges from this section in the West Melbury Marly Chalk Formation are likely to be very low. The preliminary results of the HIA indicate that the radius of influence of dewatering for shaft construction is unlikely to extend beyond the site area boundary. As a result, the impact on groundwater in the Grey Chalk aquifer, and any groundwater abstractions dependent on Chalk groundwater, would also be negligible. This should include a negligible impact on a private groundwater source identified in proximity to site area 3. If the ground investigation indicates that any significant aquifer horizons are present in the Melbury Marly Chalk Formation at site area 3, then test pumping may be required with monitoring of groundwater levels in observation boreholes to assess the potential impacts. However, such a requirement for test pumping is not anticipated.
- B.4.53 If a tunnel is designed to transfer the effluent from site areas 1 or 2 to the point of discharge in the River Cam, construction is not expected to require excavation in the Lower Greensand. The tunnel would be at a shallower depth than the waste water transfer tunnel. The shafts associated with the tunnel would be excavated to a slightly greater depth, although the base of all shafts would still be expected to be well within the Gault Formation. As a result, no dewatering is anticipated within the Lower Greensand. As with the shaft for the waste water transfer tunnel, only minor dewatering would be expected in the Grey Chalk during construction of a shaft for an effluent discharge tunnel at site area 3.
- B.4.54 Construction of shafts at site area 2, and possibly other sites, may require excavation below the sub-soil through a few metres of superficial deposits. Based on BGS mapping, the deposits are likely to comprise sands and gravel which would be saturated below the water table. It is unlikely, however, that any significant dewatering of superficial deposits would be undertaken. The topmost section of each shaft could be completed using a method such as secant piling, caissons or with a sheet pile cofferdam to shut out any groundwater inflow from the superficial deposits to the excavation.

- B.4.55 A summary and comparison of the potential construction impacts for each site can be seen in Table B.21. An 'x' indicates whether the potential impacts apply to the site.

Table B.21: Summary of potential construction impacts

Potential construction impacts	Site 1	Site 2	Site 3
Dewatering required for shallow pipelines within superficial deposits	x	x	x
Dewatering required for shafts which could impact Lower Greensand Formation (and the abstraction borehole at Sunclose Farm)	x	x	
Dewatering impacting Lower Greensand aquifer and, consequently, the Cottenham Moat County Wildlife Site	x	x	
Potential groundwater quality impacts as a result of piling through contaminated land		x	
Potential programme delays if contaminated land is encountered at WWTP		x	
Potential contaminant mobilisation along treated effluent transfer pipeline routes within superficial deposits	x (Option A only)	x (Option A only)	
Potential temporary impacts to superficial deposits during piling		x	

Potential operation impacts

- B.4.56 The potential impacts during operation of the scheme include the following:
- Changes in natural surface water drainage patterns around the new WWTP site.
 - Changes to flow and stage height/water level in the River Cam, including a reduction in flow in the reach downstream of the A14, in the event that the downstream outfall location is chosen.
 - Diversion of water from the Waterbeach WWTP might increase the flood risk in the reach between the new WWTP outfall and the original discharge point at Waterbeach.
 - There could be changes in treated effluent discharge quality leading to changes in water quality in some reaches of the River Cam as a result of the discharge.
 - The treated effluent outfall and any watercourse crossings might affect water levels and the potential for flooding in upstream reaches on the River Cam.
 - Any tunnel section or shaft in the lower Greensand might be subject to leakage from the aquifer (infiltration), resulting in a loss to the groundwater resource. Alternatively, on occasions of high flow, when the tunnel is surcharged, waste water might leak from the tunnel (exfiltration), giving rise to pollution of the aquifer.
 - Tunnels, pipelines, foundations or other below ground structures could interrupt groundwater flow.
- B.4.57 Any significant changes in natural surface water drainage patterns, including drainage ditches, in and around the new WWTP site and associated infrastructure would be accommodated in the design, possibly by inclusion of SuDS measures within the site. This would ensure no significant impacts to water levels at sensitive sites (e.g. Stow-cum-Quy SSSI).
- B.4.58 In the event that the downstream outfall location is chosen, it would not be possible to compensate for the loss of flow over a distance of about 2 km downstream of the A14. On

average, 1.3 m³/s of waste water is treated at the existing WWTP. This compares with a mean flow of about 2.8 m³/s at Jesus Lock in Cambridge and 3.6 m³/s at Bottisham, located respectively upstream and downstream of the A14 crossing, for the periods of record available (1959 to 1983 at Jesus Lock, 1936 to 1987 at Bottisham). The Q95 flows (flows exceeded 95% of the time) were approximately 0.7 m³/s at Jesus Lock and 0.9 m³/s at Bottisham. It is noted that there are no known surface water abstractions from the River Cam between the current outfall location and the potential downstream outfall location (Environment Agency, 2020) and so the loss of flow would not impact on any existing abstraction licences.

- B.4.59 Although, the WWTP discharge would have been significantly lower in the period of flow gauging station records, the flow statistics for the gauging stations indicate that the discharge from the existing WWTP is likely to form a substantial part of the current flow in the River Cam, downstream of the A14, particularly in dry conditions. The loss of flow (and reduction in stage height/water level) might, however, be compensated for to some extent by an improvement in water quality in the reach as a result of the removal of the treated effluent discharge contribution from the existing WWTP.
- B.4.60 A new discharge licence will be required for the treated effluent outfall from the new WWTP. This will require approval by the Environment Agency to ensure no detrimental impacts to the River Cam as a result of flow changes or impacts as a result of discharge quality.
- B.4.61 The impact of the increase in flow between the outfall for the new WWTP and Waterbeach would be assessed in the flood modelling. If found to be critical to flood extents, flood storage compensation might be required and included in the scheme design.
- B.4.62 An improvement in the quality of the treated effluent discharge is foreseen as a consequence of operating the new WWTP, although inclusion of the effluent discharge from the WWTP at Waterbeach would increase the proportion of effluent in the river upstream of Waterbeach. Overall, however, an improvement in water quality is anticipated throughout the River Cam downstream of the outfall from the existing WWTP. Comparison of existing river quality with the prediction of quality resulting from operation of the new WWTP will be the subject of a separate assessment, following site selection.
- B.4.63 The treated effluent outfall and any watercourse crossings will be designed to maintain flows at current levels and have no significant impact on flooding.
- B.4.64 Potential impacts during operation of the scheme, for example due to excessive variations in discharge, or discharge of treated effluent of an unacceptable quality, will be controlled by engineering features, operational practices included in the design and management of the scheme, and by the discharge licence.
- B.4.65 Any tunnel sections (or shafts) in the Lower Greensand will be designed to minimise the likelihood of leakage to the aquifer during operation of the scheme. The tunnels and shaft sections in the Lower Greensand would replace a minimal part of the overall aquifer and would not be expected to have any significant impact on groundwater flow. In addition, piles may interrupt groundwater flow within the River Terrace Deposits at site 2. However, these are likely to be minimal and not have a significant impact on groundwater flow or hydraulic connectivity with the River Cam, which is located 2.5km east of the proposed WWTP at site 2.
- B.4.66 Some structures might also be installed to a depth below the water table at site area 3. It is possible that this could:
- give rise to a localised change in the direction of groundwater flow in the top of the Grey Chalk; or

- cause the groundwater to rise to the surface in the vicinity of the structure.

B.4.67

A summary and comparison of the potential operational impacts for each site can be seen in Table B.22. An 'x' indicates whether the potential impacts apply to the site.

Table B.22: Summary of potential operational impacts

Potential operational impacts	Site 1	Site 2	Site 3
Loss of flow in River Cam 2km downstream of the A14	x (Option B only)	x (Option B only)	
Potential need for flood storage compensation within the scheme design	x	x	x
Impacts on groundwater flow in the West Melbury Marly Chalk due to presence of below ground structures			x

RAG Assessment Tables

Table B.23: Contaminated land RAG assessment (pre-mitigation)

Site area	Stage 3 screening results (WWTP only)	Risk of contamination along Waterbeach pipeline corridor	Risk of contamination along treated effluent and stormwater discharge corridor (tunnel or pipeline)	Risk of contamination along wastewater transfer tunnel corridor	RAG rating
1 (Option A)	Green	Low- Potential contamination associated with the Waterbeach Barracks (disused) and a disused airfield (RAF Waterbeach). However, it should be possible to adjust the route in order to avoid constraints and minimise the potential impacts of the pipelines. In addition, pipelines are likely to be within the Gault Formation and therefore not mobilise contaminants.	Tunnel: Low- Treated effluent and stormwater corridor runs past Milton landfill and adjacent to the A14, alongside which there are several "works" which may be contamination sources. However, tunnel will likely be within the Gault Formation and therefore not mobilise contaminants.	Low- Waste water transfer corridor runs past Milton landfill, which may be a contamination source. However, a 50m buffer around the landfill was utilised when defining the tunnel corridors in order to avoid potential contamination risks. Should contamination be encountered (solid or groundwater) the contamination may need to be removed if it poses a risk to other parts of the water environment	Green
			Pipeline: Moderate- Treated effluent and stormwater corridor runs past Milton landfill and adjacent to the A14, alongside which there are several "works" which may be contamination sources. Pipelines will potentially be within the RTD (Secondary A aquifer) and could cause mobilisation of contaminants, if present.		Amber
1 (Option B)			Low- Treated effluent and stormwater corridor runs north of Milton. There is a cemetery along the corridor but this will likely be avoided in the final route design.		Green

Site area	Stage 3 screening results (WWTP only)	Risk of contamination along Waterbeach pipeline corridor	Risk of contamination along treated effluent and stormwater discharge corridor (tunnel or pipeline)	Risk of contamination along wastewater transfer tunnel corridor	RAG rating
2 (Option A)	Amber Potential groundwater and ground gas contamination associated with Milton Landfill (off site)	Low- Potential contamination associated with the Waterbeach Barracks (disused) and a disused airfield (RAF Waterbeach). However, it should be possible to adjust the route in order to avoid constraints and minimise the potential impacts of the pipelines. In addition, pipelines are likely to be within the Gault Formation and therefore not mobilise contaminants.	Tunnel: Low- Treated effluent and stormwater corridor runs past Milton landfill and adjacent to the A14, alongside which there are several “works” which may be contamination sources. However, tunnel will likely be within the Gault Formation and therefore not mobilise contaminants.	Low- Waste water transfer corridor runs past Milton landfill, which may be a contamination source. However 50m buffer around the landfill was utilised when defining the tunnel corridors in order to avoid potential contamination risks.	Amber
			Pipeline: Moderate- Treated effluent and stormwater corridor runs past Milton landfill and adjacent to the A14, alongside which there are several “works” which may be contamination sources. Pipelines will potentially be within the RTD (Secondary A aquifer) and could cause mobilisation of contaminants, if present.	Should contamination be encountered (solid or groundwater) the contamination may need to be removed if it poses a risk to other parts of the water environment.	Amber
2 (Option B)			Low- Treated effluent and stormwater corridor runs north of Milton. There is a cemetery along the corridor but this will likely be avoided in the final route design.		Amber

Site area	Stage 3 screening results (WWTP only)	Risk of contamination along Waterbeach pipeline corridor	Risk of contamination along treated effluent and stormwater discharge corridor (tunnel or pipeline)	Risk of contamination along wastewater transfer tunnel corridor	RAG rating
3	Green	Low – predominantly through agricultural land.	Low- Treated effluent and stormwater corridor is in area which is largely undeveloped.	Low- Wastewater transfer corridor runs through undeveloped agricultural land.	Green

Table B.24: Groundwater RAG assessment (pre-mitigation)

Site area	Construction Impacts	Operational Impacts	RAG rating
1	Dewatering of superficial deposits for pipework or shafts. Dewatering of the Lower Greensand (below the Gault) is likely required for the shafts associated with the waste water transfer tunnel. This will likely be required for a period of four months. This could have major impact on the groundwater levels in the Lower Greensand, the abstraction borehole at Sunclose Farm, springs, groundwater seepages and potentially the Cottenham Moat CWS. Dewatering activities will require the need to store and treat abstracted water prior to discharge. It is anticipated that discharge will be to surface drains. There is potential that abstracted groundwater will be of poor quality naturally or unnaturally and therefore may require storage and treatment. Storage may be in the form of an above ground storage tank or a settling pond above the lower permeability Gault Clay. Additional space will be required for the storage and treatment area. The magnitude and form of this is highly dependent on the results of monitoring data obtained during the ground investigation.	Any tunnel section or shaft in the Lower Greensand might be subject to leakage from the aquifer, resulting in a loss to the groundwater resource. Alternatively, on occasions of high flow, when the tunnel is surcharged, effluent might leak from the tunnel giving rise to pollution of the aquifer. Tunnels or pipelines could interrupt groundwater flow. However, any tunnel sections (or shafts) in the lower Greensand will be designed to minimise the likelihood of leakage to the aquifer during operation of the scheme. The tunnels and shaft sections in the lower Greensand would replace a minimal part of the overall aquifer and would not be expected to have any significant impact on groundwater flow.	Amber
2	Dewatering of superficial deposits for pipework or shafts. Dewatering of the lower Greensand (below the Gault) is likely required for the shafts associated with the waste water transfer tunnel. This will likely be required for a period of four months. This could have major impact on the groundwater levels in the lower Greensand, the abstraction borehole at Sunclose Farm, springs, groundwater seepages and potentially the Cottenham Moat CWS. Dewatering activities will require the need to store and treat abstracted water prior to discharge. It is anticipated that	Any tunnel section or shaft in the lower Greensand might be subject to leakage from the aquifer, resulting in a loss to the groundwater resource. Alternatively, on occasions of high flow, when the tunnel is surcharged, effluent might leak from the tunnel giving rise to pollution of the aquifer. Tunnels or pipelines could interrupt groundwater flow. However, any tunnel sections (or shafts) in the lower Greensand will be designed to minimise the likelihood of leakage to the aquifer during operation of the scheme. The tunnels and shaft sections in the lower Greensand would replace a minimal	Amber

Site area	Construction Impacts	Operational Impacts	RAG rating
	discharge will be to surface drains. There is potential that abstracted groundwater will be of poor quality naturally or unnaturally and therefore may require storage and treatment. Storage may be in the form of an above ground storage tank or a settling pond above the lower permeability Gault Clay. Additional space will be required for the storage and treatment area. The magnitude and form of this is highly dependent on the results of monitoring data obtained during the ground investigation. Piling activities will potentially impact the River Terrace Deposits. However, turbidity impacts will be short term and won't impact the River Cam which is located 2.5km east.	part of the overall aquifer and would not be expected to have any significant impact on groundwater flow. Piling will impact upon the River Terrace Deposits but are not considered to significantly impact groundwater flows since the River Terrace Deposits are laterally extensive across the site. It is anticipated that flows will migrate around the piles.	
3	Potential requirement for dewatering of superficial deposits for pipework or shafts.	Impacts to the aquifer (Grey Chalk Subgroup) from tunnels or shafts are unlikely since no significant aquifer horizons are anticipated in the marly chalk which forms the West Melbury Marly Chalk. Groundwater yields or discharges are likely to be low within this aquifer. Some structures might also be installed to a depth below the water table at site area 3. It is possible that this could: • give rise to a localised change in the direction of groundwater flow in the top of the Grey Chalk; or • cause the groundwater to rise to the surface in the vicinity of the structure.	Amber

Table B.25: WFD Surface water bodies RAG assessment (pre-mitigation)

Site area	Construction Impacts (from WWTP and associated infrastructure)	Operational Impacts (from WWTP and associated infrastructure)	RAG rating
1 (Option A)	Potential for temporary construction impacts to watercourses, as described in B.4.40, such as dewatering discharges impacting flow or water quality, if silt laden.	The effluent outfall and any watercourse crossings might affect water levels and the potential for flooding in upstream reaches on the River Cam. Potential increase in flood risk due to diversion of water from Waterbeach WWTP. There could be changes in effluent discharge quality leading to changes in water quality in some reaches of the River Cam as a result of the discharge.	Amber
1 (Option B)		As above; and Option B could cause changes to flow in the River Cam, including a reduction in flow, as a result of the outfall location being located downstream.	Amber
2 (Option A)	Potential for temporary construction impacts to watercourses, as described in B.4.40, such as dewatering discharges impacting flow or water quality, if silt laden.	The effluent outfall, and any watercourse crossings, might affect water levels and the potential for flooding in upstream reaches on the River Cam. Potential increase in flood risk due to diversion of water from Waterbeach WWTP.	Amber
2 (Option B)		As above. Additionally, Option B could cause changes to flow in the River Cam, including a reduction in flow, as a result of the outfall location being located downstream.	Amber
3	Potential for temporary construction impacts to watercourses, as described in B.4.40, such as dewatering discharges impacting flow or water quality, if silt laden.	The effluent outfall, and any watercourse crossings, might affect water levels and the potential for flooding in upstream reaches on the River Cam. Potential increase in flood risk due to diversion of water from Waterbeach WWTP. There could be changes in effluent discharge quality leading to changes in water quality in some reaches of the River Cam as a result of the discharge.	Amber

Mitigation identification

Site area 1

B.4.68 For site area 1, mitigation would include the following:

- Adjusting pipeline and tunnel routes in order to avoid potential contamination sources.
- Ground investigation would determine the risks of contamination. If contamination is encountered, remediation may be required.
- Use of a primary and secondary lining for tunnel sections and shafts passing through the Lower Greensand or Grey Chalk aquifers
- Pipeline crossings of roads and railways would be pipe-jacked to avoid surface disruption.
- Risks to surface waters could be mitigated through SuDS design, flood storage compensation, engineering features and WWTP operational practices.
- Test pumping during ground investigations will be required in order to assess potential impacts to the Lower Greensand aquifer. If the impacts of dewatering indicate that abstraction at the licensed rate (or the maximum abstraction rate required by the licensee, if less than the licensed rate) may not be possible during dewatering, then actions will be taken to ensure the required supply. Such actions could include:
 - Lowering the pump in the borehole, or combining this action with provision of a replacement pump, taking into account the higher head requirements;
 - constructing a replacement borehole to allow for increased drawdown; or,
 - providing an alternative water supply for the duration of dewatering and the period of subsequent groundwater level recovery.
- Providing mitigation for loss or reduction of spring discharges and flows in watercourses in the Lower Greensand outcrop is unlikely to be practicable in the event that test pumping indicates that dewatering could affect these features. The impact would, however, be temporary, for up to 12 months during dewatering, plus a subsequent period of aquifer recovery. Mitigation, if practicable, may need to be considered in the event that a significant reduction in water levels is predicted in the Cottenham Moat County Wildlife Site (CWS) as a result of dewatering in the lower Greensand.
- For option A, there is potential for mobilisation of contaminants (if present) along the treated effluent corridor (if in pipeline), through the River Terrace Deposits, towards the River Cam. If contamination is encountered, remediation may be required.

Site area 2

B.4.69 For site area 2, mitigation would include the following:

- Adjusting pipeline and tunnel routes in order to avoid potential contamination sources.
- Ground investigation would determine the risks of contamination. If contamination is encountered, remediation may be required.
- Use of a primary and secondary lining for tunnel sections and shafts passing through the Lower Greensand or Grey Chalk aquifers
- Pipeline crossings of roads and railways would be pipe-jacked to avoid surface disruption.
- Risks to surface waters could be mitigated through SuDS design, flood storage compensation, engineering features and WWTP operational practices.

- Test pumping during ground investigations will be required in order to assess potential impacts to the Lower Greensand aquifer and any licenced or private abstractions. If the impacts of dewatering indicate that abstraction at the licensed rate (or the maximum abstraction rate required by the licensee or private abstractor, if less than the licensed rate) may not be possible during dewatering, then actions will be taken to ensure the required supply. Such actions could include:
 - Lowering the pump in the borehole, or combining this action with provision of a replacement pump, taking into account the higher head requirements;
 - constructing a replacement borehole to allow for increased drawdown; or,
 - providing an alternative water supply for the duration of dewatering and the period of subsequent groundwater level recovery.
- Providing mitigation for loss or reduction of spring discharges and flows in watercourses in the Lower Greensand outcrop is unlikely to be practicable in the event that test pumping indicates that dewatering could affect these features. The impact would, however, be temporary, for up to 12 months during dewatering, plus a subsequent period of aquifer recovery. Mitigation, if practicable, may need to be considered in the event that a significant reduction in water levels is predicted in the Cottenham Moat County Wildlife Site (CWS) as a result of dewatering in the lower Greensand.
- Risks from ground gases at the WWTP can be mitigated through ground investigation. Ground gas monitoring should be undertaken to establish the gas regime at the site and to allow gas protection measures to be designed and installed in new buildings, if required. This may, for example, include incorporation of gas membranes into building design for the protection of future site users and sufficient ventilation within buildings. Construction workers should also use the appropriate respiratory protective equipment, as required.
- If contamination is encountered on site, a Foundation Works Risk Assessment would be required to ensure any potential risks from piling through the River Terrace Deposits are mitigated.
- For option A, there is potential for mobilisation of contaminants (if present) along the treated effluent corridor (if in pipeline), through the River Terrace Deposits, towards the River Cam. If contamination is encountered, remediation may be required.

Site area 3

B.4.70 For site 3 mitigation would include the following:

- Use of a primary and secondary lining for tunnel sections and shafts passing through the Grey Chalk aquifer.
- Pipeline crossings of roads and railways would be constructed by pipe-jacking, micro-tunnelling or directional drilling to avoid surface disruption.
- Drains would be installed to ensure that the groundwater flow is re-directed around below ground structures to avoid any localised change in direction or rise in groundwater in the vicinity of the structure. One option for the drains might comprise the installation of gravel-filled trenches around the structure.
- The River Cam crossing for the pipeline from Waterbeach to Site 3 would be constructed beneath the river by micro-tunnelling or directional drilling. Construction activities at the location would be undertaken either side of the river and away from the river banks to ensure that the construction of the crossing does not disturb the river.
- Risks to surface waters could be mitigated through SuDS design, flood storage compensation, engineering features and WWTP operational practices.

Assessment of mitigated options

B.4.71 The only risk that would not be mitigated is:

- Changes to flow in the River Cam, including a reduction in flow, as a result of the outfall location being located downstream (for Options B at sites 1 and 2).

B.4.72 The RAG assessments, with mitigation measures, can be seen below.

Table B.26: Contaminated land RAG assessment (with mitigation)

Site area	Stage 3 screening results	Mitigation measures	Unmitigated RAG rating	Mitigated RAG rating
1 (Option A-effluent in tunnel)	Green	n/a	Green	Green
1 (Option A-effluent in pipeline)		Pipeline and tunnel routes would be adjusted in order to avoid potential contamination sources.	Amber	Green
1 (Option B)		n/a	Green	Green
2 (Option A-effluent in tunnel)	Amber Potential groundwater and ground gas contamination associated with Milton Landfill (off site)	Ground gas monitoring should be undertaken to establish the gas regime at the site and to allow gas protection measures to be designed and installed in new buildings, if required. This may, for example, include incorporation of gas membranes into building design for the protection of future site users and sufficient ventilation within buildings.	Amber	Green
2 (Option A-effluent in pipeline)		As above, and; Pipeline and tunnel routes would be adjusted in order to avoid potential contamination sources. Contaminated groundwater encountered during construction of pipeline or tunnel routes should be removed or treated if the groundwater has potential to adversely affect groundwater or surface water quality currently not affected by contamination.	Amber	Green
2 (Option B)		As above Ground gas monitoring should be undertaken to establish the gas regime at the site and to allow gas protection measures to be designed and installed in new buildings, if required. This may, for example, include incorporation of gas membranes into building design for the	Amber	Green

Site area	Stage 3 screening results	Mitigation measures	Unmitigated RAG rating	Mitigated RAG rating
		protection of future site users and sufficient ventilation within buildings.		
3	Green	n/a	Green	Green

Table B.27: Groundwater RAG assessment (with mitigation)

Site area	Mitigation measures	Unmitigated RAG rating	Mitigated RAG rating
1	Temporary risks to the Lower Greensand aquifer during dewatering (and potentially the Cottenham Moat CWS). Depending on the source of water in the Moat and an assessment of likely impacts, mitigation may include providing an alternative water supply to the moat during dewatering but only if the assessed impact will be significant. Mitigation will therefore include GI to determine if the Moat is connected to the Lower Greensand and what the source of water is, assessing the point at which a decline in water levels may adversely impact ecological habitats (specifically GCNs) and provide a temporary alternative water supply to the moat when levels approach a critical level.	Amber	Green
2	If the impacts of dewatering the Lower Greensand indicate that private abstractions at the licensed rate (or the maximum abstraction rate required by the licensee or private abstractor, if less than the licensed rate) may not be possible during dewatering, then actions will be taken to ensure the required supply. Such actions could include: lowering the pump in the borehole; constructing a replacement borehole; or providing an alternative water supply for the duration of dewatering and the period of subsequent groundwater level recovery. Test pumping of observation boreholes during ground investigation and a hydrogeological risk assessment will determine the extent of the risks.	Amber	Green
3	Drains would be installed to ensure that the groundwater flow is re-directed around below ground structures to avoid any localised change in direction or rise in groundwater in the vicinity of the structure. One option for the drains might comprise the installation of gravel-filled trenches around the structure.	Amber	Green

Table B.28: WFD Surface water bodies RAG assessment (with mitigation)

Site area	Mitigation measures	Unmitigated RAG rating	Mitigated RAG rating
1 (Option A)	Construction impacts would be mitigated through a CEMP and SuDS measures. Operational impacts would be mitigated through SuDS design, flood storage compensations, engineering features and WWTP operational practices.	Amber	Green
1 (Option B)	As above, and; The outfall location being located downstream would cause changes to flow in the River Cam. These changes could not be mitigated although will require scrutiny through the Environment Agency to ensure no negative impacts to the River Cam. In addition, it can be considered that the likely improvement in effluent quality will provide some compensation.	Amber	Green
2 (Option A)	Construction impacts would be mitigated through a CEMP and SuDS measures. Operational impacts would be mitigated through SuDS design, flood storage compensations, engineering features and WWTP operational practices.	Amber	Green
2 (Option B)	As above, and; The outfall location being located downstream would cause changes to flow in the River Cam. These changes could not be mitigated although will require scrutiny through the Environment Agency to ensure no negative impacts to the River Cam. In addition, it can be considered that the likely improvement in effluent quality will provide some compensation.	Amber	Green
3	Construction impacts would be mitigated through a CEMP and SuDS measures. Operational impacts would be mitigated through SuDS design, flood storage compensations, engineering features and WWTP operational practices. The River Cam crossing for the pipeline from Waterbeach to Site 3 would be constructed beneath the river by pipe-jacking or micro-tunnelling. Construction activities at the location would be undertaken either side of the river and away from the river banks to ensure that the construction of the crossing does not disturb the river.	Amber	Green

Incorporating feedback

B.4.73 Phase one non-statutory consultation was held in order to share the proposals for relocating the WWTP with the public and stakeholders. This section provides a summary of the feedback received from the public in relation to the land and water quality and how the concerns, issues and opportunities raised have been considered within the assessment criteria for Stage 4 final site selection.

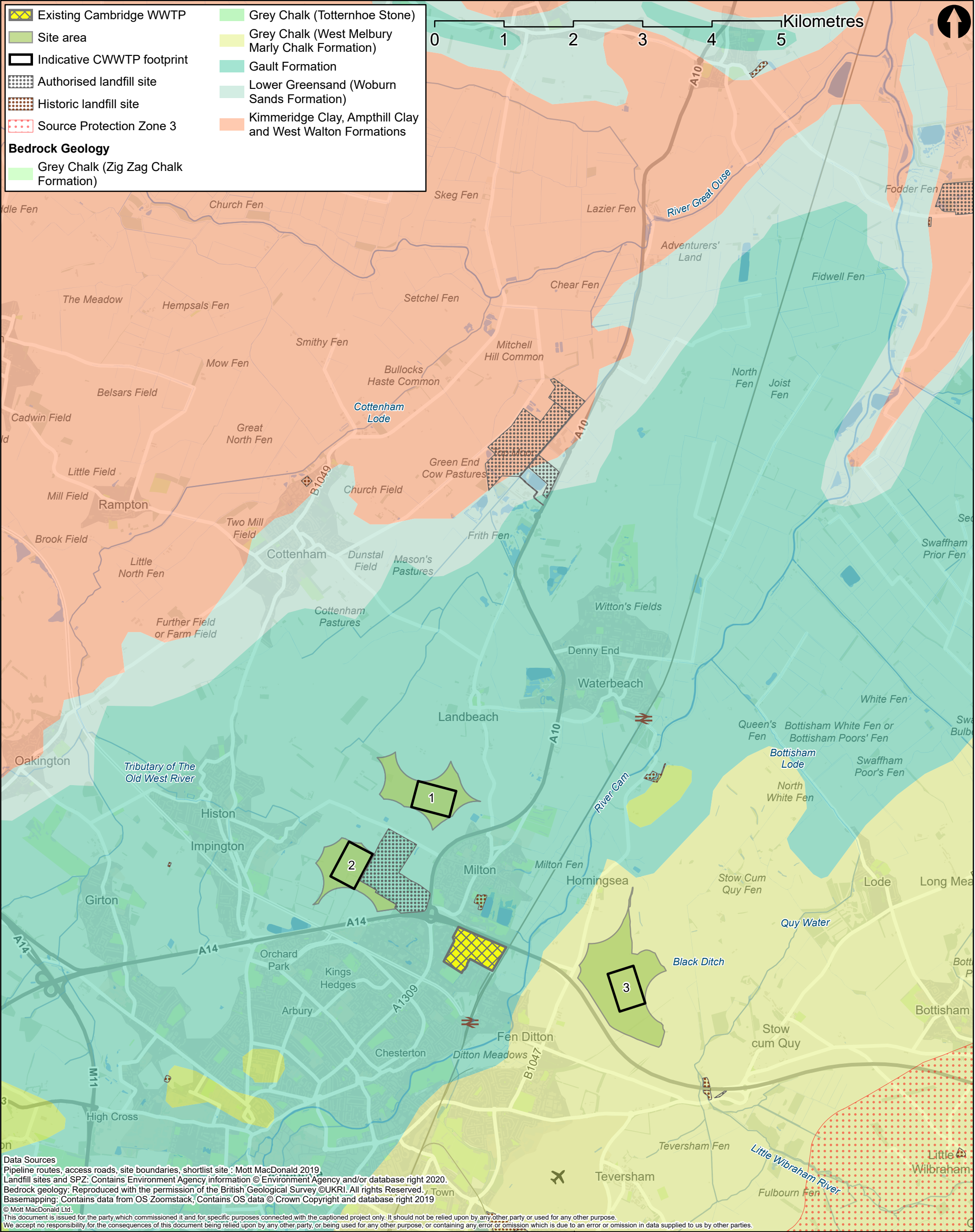
Table B.29: Flood risk, land and water quality feedback

Site (if specific)	Comment Summary	CWWTPR Response
Site area 1	Comment (in opposition to Site 3) that Sites 1 and 2 are rated as unproductive strata and very low risk to contamination.	The geology underlying the site areas is considered within the risk assessment for contaminated land and groundwater impacts. The bedrock below site areas 1 and 2 is the Gault Formation, which is classified as unproductive strata. However, sites 1 and 2 have superficial deposits (River Terrace Deposits) overlying the Gault Formation on site, which are classified as a secondary A aquifer. The Grey Chalk below site area 3 is classified as a principal aquifer. However, this is known to have no significant aquifer horizons. Further to this, site area 3 has less potential contamination sources compared to site areas 1 and 2. This is reflected within the land and water quality RAG assessments.
	Concern was also raised regarding the danger of soil contaminants from previous landfill site becoming air-borne/ water-borne during excavations.	Ground investigation will determine the extent of contamination on site. If present, this would be controlled through risk assessments and ensuring any excavated materials or contaminated groundwaters are appropriately managed through a CEMP. For instance, ensuring dust is suppressed and that trucks carrying material are covered. If dewatering is required, any contaminated water would be treated before being discharged, or else removed from site to an appropriate disposal facility.
Site area 2	As above (comments for Site 1 applicable to Site 2)	See comment above
Site area 3	A number of comments in opposition to Site 3 did cite a range of specific concerns relating to water contamination.	Site area 3 is on a Principal aquifer. However, these are no significant aquifer horizons, no groundwater abstractions within the study area, and the site is not located within a groundwater source protection zone. There are no existing contaminant sources at site 3. Any potential contaminant risks from proposed works would be mitigated (e.g. through secondary linings in tunnels). This is reflected within the land and water quality RAG assessments.

Site (if specific)	Comment Summary	CWWTPR Response
Site area 3 continued	In particular, numerous respondents cited DEFRA's Magic Map showing a 'red risk designation' for the site and therefore raising concern of vulnerability to groundwater contamination.	The groundwater vulnerability of the strata below each site area are discussed within the land and water quality assessment. However, in relation to site area 3 there are unlikely to be any significant aquifer horizons within the chalk below site area 3, there are no groundwater abstractions from the chalk in the vicinity of the site area and the site is not within a groundwater SPZ. There are no significant existing contamination sources at site area 3. Any potential contamination risks to the chalk aquifer from proposed WWTP or associated infrastructure would be mitigated through design (e.g. through secondary linings in tunnel, appropriate drainage design etc.). This is discussed within the land and water quality assessment and reflected within the RAG evaluations.
	Concern was also raised regarding impacts to the chalk aquifer potentially contaminating a natural water source, and tunnelling crossing the River Cam potentially polluting the river and green sand layer.	Site area 3 is located on the Grey Chalk which is classified as a Principal aquifer. However, there are unlikely to be any significant aquifer horizons in the Chalk which underlies the site area or substantial groundwater yields from any boreholes in the Chalk in the vicinity of Site 3. There are no groundwater abstractions for public water supply from the Chalk in the vicinity of the site area and the site is not within a groundwater SPZ. Any potential contamination risks to the chalk aquifer from proposed WWTP or associated infrastructure would be mitigated through design (e.g. through secondary linings in tunnel, appropriate drainage design etc.). In regards to tunnelling under the River Cam, the waste water transfer tunnel would be constructed below the base of the river within the Gault Formation, which is an unproductive strata and as such there would not be a hydraulic connection between the tunnel and the River Cam. The River Cam crossing for the pipeline from Waterbeach to site area 3 would be constructed beneath the river by pipe-jacking or micro-tunnelling. Construction activities at the location would be undertaken either side of the river and away from the river banks. As a result, the construction of the crossing would not be expected to disturb the river. construction of the crossing does not disturb the river. Turbidity caused during tunnelling within the aquifers is expected to be minimal, and this is discussed within the report for both potential tunnelling methods.
	Comment that the in addition to potentially compromising the quality of drinking water, a plant on Site 3 would also threaten the Quy Fen wetland ecosystem and Stow Cum Quy Fen SSSI, where there are at least 15 long thin ponds that support a range of aquatic plants, some of which are	This is largely addressed within the nature conservation and biodiversity sections. These state that there are no discharge risks anticipated as all waste water will be treated and discharged to the river cam. they also state no hydrological impacts expected and that Infrastructure risk via the construction and operation of the treated effluent corridor unlikely to affect the qualifying features of the SSSI due to the distance from the WWTP

Site (if specific)	Comment Summary	CWWTPR Response
Site area 3 continued	uncommon species. The citation includes a statement that this open water habitat is rare in the British Isles.	development. Further to this, risks from changes in surface water/drainage patterns associated with the site and infrastructure would be accommodated within the design to ensure no negative impacts.
	Further comment that the discharge of effluent into the River Cam on the City side of Baits Bite Lock presents a risk to people living on houseboats, boat crews, etc in the event of accident or emergency. Comment that could be alleviated if the discharge were on the coast side of the Lock.	Current treated effluent is discharged to city side of Baits Bite Lock and so this situation would not change if site area 3 was selected. The new site would likely have improved effluent quality and so water quality would be improved.
	Some respondents did note that the proximity of Site 3 to the River Cam may provide more efficient discharge of treated effluent.	This is correct, since there would be a shorter length of tunnel/pipeline.

Drawings



Data Sources
Pipeline routes, access roads, site boundaries, shortlist site : Mott MacDonald 2019.
Landfill sites and SPZ: Contains Environment Agency information © Environment Agency and/or database right 2020.
Bedrock geology: Reproduced with the permission of the British Geological Survey ©UKRI. All rights Reserved.
Basemapping: Contains data from OS Zoomstack, Contains OS data © Crown Copyright and database right 2019
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M M MOTT MACDONALD 22 Station Road Cambridge CB1 2JD United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client					Title CWWTPR Project Stage 4 Final Site Selection Bedrock geology	Drawn	A Briggs					
	an glian water						Checked	M Rickard					
							Approved	J Newton					
												Scale at A3 1:50,000	
						Drawing Number 409071-MMD-00-XX-GIS-Y-0469			Security STD	Status PRE	Rev G		
					Rev	Date	Drawn	Description	Ch'k'd	App'd			
					G	01/21	AB	Final	MR	JN			

B.5 Carbon emissions

Assessment methodology

- B.5.1 A whole life carbon assessment of embodied and operational carbon has been carried out for the Stage 4 assessment. The assessment has focussed on infrastructure connections to and from the new WWTP as this varies significantly for each site. In contrast the carbon emissions for the WWTP itself will not vary significantly between sites and hence the WWTP emissions have not been included in the analysis.
- B.5.2 The most significant connection infrastructure is for the transfer of waste water to the new WWTP and return of treated effluent to the River Cam. However, other significant connecting infrastructure for the new WWTP include waste water transfer from Waterbeach, road access and connection to the power grid. Each of the proposed options and sub-options were assessed.
- 9.1.2 The assessment methodology was developed in accordance with the following guidance.
- A framework for accounting for embodied carbon in water industry assets (UK Water Industry Research, A framework for accounting for embodied carbon in water industry assets, 2012)
 - Workbook for Estimating Operational GHG emissions (UK Water Industry Research, 2019)
 - PAS 2080:2016 Carbon Management in Infrastructure (British Standards Institute, PAS 2080:2016 Carbon Management in Infrastructure , 2016)

Scope and approach

- B.5.3 This assessment included the following infrastructure for each of the three potential new WWTP locations:
- Tunnel and pumping station to transfer waste water from the existing Cambridge WWTP to the new WWTP
 - Tunnel or pipelines (two options) and pumping stations to return the treated effluent from the new WWTP to each of the potential outfall options
 - The pipeline transferring waste water from the Waterbeach development to the new WWTP
 - Road improvements – to connect the new WWTP to the existing road network
 - Power transfer cables – to connect the new WWTP to the nearest power grid sub-station
- B.5.4 Table B.30 lists the infrastructure components included in the embodied and operational carbon assessment.

Table B.30: Scope of carbon assessment

Infrastructure asset	Embodied carbon	Operational carbon
Tunnels	• Tunnels (excavation, lining and spoil removal). All tunnels assumed to be constructed using a bored segmental lining tunnelling technique. • Shafts (excavation, lining and spoil removal) - including initial, intermediate and terminal shafts • Additional (secondary) lining for shafts and tunnel sections passing through or close to aquifers • Pumping stations (civil works and equipment).	Power used to pump waste water or treated effluent
Pipelines	• Pipelines (pipelines and laying)	Power used to pump waste water or treated effluent

Infrastructure asset	Embodied carbon	Operational carbon
	- Road, rail and river crossings - Valves (chambers and valves)	
Road improvements to provide access	- Road surfacing materials - Road earthworks/embankments	Assumed no significant operational emissions
Power transfer cables	- Power cables (cables and laying) - Connections to grid and to new WWTP	Assumed no significant operational emissions

- B.5.5 The **embodied carbon emissions** estimates were prepared using embodied carbon models prepared by Mott MacDonald for Anglian Water which use typical asset designs (e.g. sizing of assets and assessment of appropriate materials and construction quantities) and industry standard carbon emissions factors for different materials.
- B.5.6 The **operational carbon emissions** associated with the transfer infrastructure would be due to consumption of electrical energy required for pumping both raw waste water and treated effluent. The electrical energy consumption was estimated using industry standard pump hydraulic design calculations taking into account flows, pipelines (diameters, materials and lengths), as well as ground elevations for the start and finish locations.
- B.5.7 The Defra 2019 carbon emissions factor for power consumption (0.2773 kgCO₂e/kWh)⁶⁷, which includes power generation as well as losses in power transmission and distribution, was used to convert power used for pumping into operational carbon emissions for each year. This gives a conservative estimate of operational carbon emissions as the UK Government forecasts that the power emissions factor should reduce by 75% between 2018 and 2035 as the grid is further 'decarbonised'⁶⁸.
- B.5.8 **Whole life carbon** emissions were estimated over 20 years, by combining the estimate of the embodied carbon and the annual operational carbon emissions to give a whole life carbon estimate for the proposed sites. These assume two years construction followed by 18 years of operation. A 20 year timescale was considered sufficient due to the expected fall in power related operational carbon emissions over this period due to further decarbonisation.
- Assumptions**
- B.5.9 The key assumptions used in estimating the carbon emissions in this study are described in this section. A full list of input assumptions for the carbon modelling of both unmitigated and mitigated options is provided in the next section.
- B.5.10 **Tunnels**
- B.5.11 A minimum internal diameter of 3.0m has been used for the new bored segmentally lined tunnel. This is larger than the existing tunnel to the current WWTP and the increase in tunnel diameter is due to (1) the need to provide space for additional tunnel lining for shafts and tunnel sections passing through or close to aquifers and (2) recent changes in minimum tunnel diameters required to provide safe access during construction and future maintenance.
- B.5.12 Based upon the requirement to install a Tunnel Boring Machine (TBM), the starting (drive) shafts for a 3.0m diameter tunnel would need to have an internal diameter of approx. 12.5m. The carbon footprint includes an allowance for removing spoil and its disposal within 15km of

⁶⁷ www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019, Conversion-Factors-2019-Condensed-set-for-most-users.xlsx. Value includes both emissions due to power generation and emissions associated with losses during power transmission and distribution.

⁶⁸ Updated Energy and Emissions Projections 2018, Department for Business, Energy and Industrial Strategy (BEIS), April 2019.

the tunnel excavation. The final (reception) tunnel shafts would have an internal diameter of 7.5m.

- B.5.13 All tunnel excavation would start from the site of the new WWTP.
- B.5.14 Where tunnel lengths are greater than 3km an intermediate shaft has been included along the tunnel, for both tunnel construction and future maintenance purposes. These intermediate shafts are assumed to have the same diameter as reception shafts.
- B.5.15 For the mitigated option carbon estimates, shafts and tunnels passing through or close to either the Lower Greensand aquifer or West Melbury Marly Chalk Formation aquifer, have a secondary lining to ensure water-tightness. No other changes are included in the 'with mitigation' carbon assessment.
- B.5.16 **Pipelines**
- B.5.17 It is assumed that Waterbeach flows would be transferred from the catchment to the new WWTP using a new pumping station and pumped pipelines. Two parallel pumped pipelines are assumed for both improved hydraulic operation and for resilience purposes.
- B.5.18 There is also an option to return treated effluent to the River Cam by pumped pipelines. In this case two parallel pumped pipelines are assumed, one for treated effluent and one for returned storm flows.
- B.5.19 For the larger diameter final effluent return pipelines the carbon emissions estimates include pipe jacked tunnel sections for crossing major roads and the railway. For the smaller diameter Waterbeach pipelines, crossings are assumed to use directional drilling techniques.
- B.5.20 The pipeline embodied carbon estimates also include allowances for ancillary items such as valves and valve chambers.
- B.5.21 **Pumps**
- B.5.22 The embodied carbon estimates for pumps are based on numbers of pumps (duty and standby) and pump size, defined in terms of a pump's power rating in kW. The power rating of pumps has been estimated using industry standard pump hydraulic design calculations taking into account flows, pipelines (diameters, materials and lengths), as well as ground elevations for the start and finish locations.
- B.5.23 The pump rating was then used to estimate operational power requirements in kWh (based on pump power consumption per hour and number of expected operational hours to pass annual average flows including waste water and storm flows) and hence operational carbon emissions.
- B.5.24 The RAG definitions for the carbon emissions assessment are provided in Table B.31.

Table B.31: Carbon assessment – RAG definitions

Green	Amber	Red
Within 130% of lowest option	<200% of lowest option	>200% of lowest option

Assumptions

Table B.32: Waste water transfer tunnel assumptions

Site	1Ai	1Bi	1Aii	1Bii	2Ai	2Bi	2Aii	2Bii	3Ai	3Aii
Return option	Tunnel	Tunnel	Pipeline	Pipeline	Tunnel	Tunnel	Pipeline	Pipeline	Tunnel	Pipeline
Outfall Location	Existing	New	Existing	New	Existing	New	Existing	New	Existing	Existing
Length of tunnel (m)	2550	2550	2550	2550	3000	3000	3000	3000	2650	2650
Length of tunnel (m)	2550	2550	2550	2550	3000	3000	3000	3000	2650	2650
Length requiring secondary lining (m) - unmitigated scenario	0	0	0	0	0	0	0	0	0	0
Length requiring secondary lining (m) - mitigated scenario	200	200	200	200	600	600	600	600	0	0
Intermediate shaft	no	no	no	no	no	no	no	no	no	no
Drive shaft depth (m)	23.53	23.53	23.53	23.53	26.09	26.09	26.09	26.09	23.65	23.65
lining required? (mitigated scenario)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Reception shaft depth (m)	17.34	17.34	17.34	17.34	17.34	17.34	17.34	17.34	17.34	17.34
lining required? (mitigated scenario)	no	no	no	no	no	no	no	no	no	no

Table B.33: Waterbeach to new treatment site rising main

Site	1Ai	1Bi	1Aii	1Bii	2Ai	2Bi	2Aii	2Bii	3Ai	3Aii
Return option	Tunnel	Tunnel	Pipeline	Pipeline	Tunnel	Tunnel	Pipeline	Pipeline	Tunnel	Pipeline
Outfall Location	Existing	New	Existing	New	Existing	New	Existing	New	Existing	Existing
total length of pipeline	4,510.00	4,510.00	4,510.00	4,510.00	6,270.00	6,270.00	6,270.00	6,270.00	6,460.00	6,460.00
directional drilling length	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00
Length of pipeline required (new TW location to existing discharge location)	4,360.00	4,360.00	4,360.00	4,360.00	6,120.00	6,120.00	6,120.00	6,120.00	6,310.00	6,310.00
Number of rising mains required	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Table B.34: Treated effluent return tunnel assumptions

Site	1Ai	1Bi	2Ai	2Bi	3Ai
Return option	Tunnel	Tunnel	Tunnel	Tunnel	Tunnel
Outfall Location	Existing	New	Existing	New	Existing
Length of tunnel (m)	3100	2600	4000	4000	1500
Length requiring secondary lining (m) - unmitigated scenario	0	0	0	0	0
Length requiring secondary lining (m) - mitigated scenario	0	0	0	0	100
Intermediate shaft	no	no	yes	yes	no
Drive shaft depth (m)	12.00	12.00	12.00	12.00	12.00
Lining required? (mitigated scenario)	yes	yes	yes	yes	yes
Intermediate shaft depth (m)	-	-	10.50	10.50	-
Lining required? (mitigated scenario)	yes	n/a	yes	yes	n/a
Reception shaft depth (m)	12.38	11.75	11.50	11.50	10.38
Lining required? (mitigated scenario)	no	no	no	no	no

Table B.35: Treated effluent return rising main assumptions

Site	1Aii	1Bii	2Ai	2Bi	3Ai
Return option	Pipeline	Pipeline	Tunnel	Tunnel	Tunnel
Outfall Location	Existing	New	Existing	New	Existing
Total pipeline length	3100	2600	0	0	0
Pipejacking for crossings	300	300	0	0	0
Length of pipeline required	3100	2600	0	0	0
Pipeline diameter (internal) - CAM + wb	1500	1500	1500	1500	1500
Pipejack diameter	2400	2400	2400	2400	2400
Shaft diameters for pipejacking	6500	6500	6500	6500	6500
nr shafts required	4	4	0	0	0
Number of rising mains required	2	2	2	2	2

Table B.36: Access road assumptions

	Site 3 (unmitigated)	Site 3 (mitigated)	Site 2 (mitigated and unmitigated)	Site 1 (mitigated and unmitigated)
Site clearance (m2)	6002	11596	4917	6218
Road area (m2)	5224	7512	3570	4536
Footpath area (m2)	562	0	1347	1682
Earthworks (m3)	3001	7486	2458.5	3109
Additional concrete for headwall to existing concrete (5m3)	no	yes	no	yes
Traffic signage (nr)	3	3	1	1
New traffic islands (nr)	3	3	3	3
Boundary fencing (m)	85	354	1091	1421
Traffic signal installation (nr)	0	2	0	0
Construction of additional structures over ditch (assumed 5m3 concrete)	Yes	Yes	No	No
Landscaping (m2)	2002	6317	0	0

Table B.37: HV cable assumptions

	site 1	site 2	site 3
Cable route length (m) - 2 x 300mm2 cables	3100	4000	1750
Length HPPE ducting required (m) - assumed 150mm duct per cable plus 1 spare	9300	12000	5250
Length laid open cut (m) - modelled as an open cut trench for 80mm pipe, which has a 0.55m width at the trench bottom, 1m deep. 1.4 factor uplift to account for laying 3 ducts	2650	3550	1600
Length constructed by directional drilling for road crossings (m) assumed 400mm diameter	300	300	0
Length constructed by directional drilling for rail crossings (m) assumed 400mm diameter	150	150	150

Assessment of unmitigated options

B.5.25 The results of the whole life carbon assessment of the embodied and operational carbon for each (unmitigated) site option are presented in Table B.38.

B.5.26 The following RAG definitions have been used in assessing options:

- Green: within 130% of lowest option whole life carbon
- Amber: <200% of lowest option whole life carbon
- Red: >200% of lowest option whole life carbon

Table B.38: Comparison of whole life carbon emissions for each site option

Site	Return option	Outfall Location	WLC tCO ₂ e - 20yrs	% compared to lowest option
1Ai	Tunnel	Existing	60,300	136%
1Bi	Tunnel	New	57,700	130%
1Aii	Pipeline	Existing	49,700	112%
1Bii	Pipeline	New	48,200	109%
2Ai	Tunnel	Existing	69,800	157%
2Bi	Tunnel	New	69,800	157%
2Aii	Pipeline	Existing	57,500	130%
2Bii	Pipeline	New	57,500	130%
3Ai	Tunnel	Existing	53,700	121%
3Aii	Pipeline	Existing	44,400	100%

B.5.27 It can be seen that, for the unmitigated case, Option 3Aii has the lowest whole life carbon estimate, followed by options 1Aii and 1Bii.

Assessment of mitigated options

B.5.28 The results of the whole life carbon assessment of the embodied and operational carbon for each mitigated site option are presented in Table B.39. Mitigation strategies included in this assessment include additional lining required in tunnels and shafts and alternative road layouts.

B.5.29 The following RAG definitions have been used in assessing options:

- Green: within 130% of lowest option whole life carbon
- Amber: <200% of lowest option whole life carbon
- Red: >200% of lowest option whole life carbon

Table B.39: Comparison of whole life carbon emissions for each site option

Site area option	Return option	Outfall Location	WLC tCO ₂ e - 20yrs	% compared to lowest option
1Ai	Tunnel	Existing	60,400	135%
1Bi	Tunnel	New	57,800	129%
1Aii	Pipeline	Existing	49,800	111%
1Bii	Pipeline	New	48,300	108%
2Ai	Tunnel	Existing	70,100	156%

Site area option	Return option	Outfall Location	WLC tCO ₂ e - 20yrs	% compared to lowest option
2Bi	Tunnel	New	70,100	156%
2Aii	Pipeline	Existing	57,800	129%
2Bii	Pipeline	New	57,800	129%
3Ai	Tunnel	Existing	54,100	121%
3Aii	Pipeline	Existing	44,800	100%

B.5.30 It can be seen that, for the unmitigated case, Option 3Aii has the lowest whole life carbon estimate, followed by options 1Aii and 1Bii.

Incorporating feedback

B.5.31 Phase one non-statutory consultation was held in order to share the proposals for relocating the WWTP with the public and stakeholders. There were limited specific comments on carbon emissions during the public consultation, however, there were a number of concerns raised in relation to climate change. Therefore, this section provides a summary of the feedback received from the public in relation to climate change and how the concerns, issues and opportunities raised have been considered within the assessment criteria for Stage 4 final site selection.

Table B.40: Climate change feedback

Sub-Theme	Site (if specific)	Feedback Summary	Response
General		Several comments included concern that odour impacts may become more prevalent in higher temperatures.	Prior to the submission of the planning application (Stage 4 of the DCO process), we will undertake a detailed odour assessment (including odour modelling) in line with the Institute of Air Quality Management (IAQM) Guidance on the assessment of odour for planning. We will mitigate odour impacts to all stakeholders to ensure 'negligible' impact, in line with the IAQM guidance.
		Those who showed support for the relocation had also referenced the benefit of creating a more modern WWTP.	The relocation of Cambridge WWTP will allow Anglian Water to continue to provide vital water recycling services to customers across Greater Cambridge in a modern, carbon efficient facility.
		Others criticised any impact to greenfield sites and biodiversity in light of the increasing climate emergency.	As described above the relocation provides the opportunity to construct modern, carbon efficient facility. In addition, the project will aim to achieve biodiversity net gain and the design of the scheme will follow the mitigation hierarchy to avoid impacts in the first instance (i.e. safeguard high quality habitats such as woodland, mature trees), followed by mitigation, compensation, and offsetting if required.
Site area 3		Although all sites sit within the greenbelt, this appeared to be a more relevant issue for those opposed to site 3.	Green belt has been considered in the planning assessment, specifically the Green Belt study in Appendix J.
		Many comments referred to this area as part of the 'green lung between Cambridge and Wicken Fen'.	The Wicken Fen Vision aims to create a range of habitats for a wide number of species, including many which are rare and threatened, as well as mitigating wider problems created by climate change through measures such as carbon capture and storage in wetlands and sustainable drainage systems to allow water to percolate into soils and replenish ground water. The CWWTP team will engage with stakeholders to incorporate the aims of the Wicken Fen Vision in the design of the scheme. The scheme will take a landscape scale approach when it comes to green infrastructure and will include habitat creation proposals that will work with the Wicken Fen Vision.

B.6 Noise

Assessment methodology

- B.6.1 Preliminary assessments have been undertaken to identify potential noise and vibration impacts on sensitive receptors and receptor groups to the proposed options. The assessment considers noise and vibration impacts during construction and operation phases.
- B.6.2 During construction, works have the potential to directly alter the noise and vibration baseline for sensitive receptors for a temporary period during the programme of construction activities. Adverse impacts are likely to be restricted to areas where the existing baseline noise levels are exceeded subject to the application of appropriate mitigation. This would be principally in the immediate vicinity (within 300m) of the proposed development (including any haul roads and construction compound areas).
- B.6.3 Assessment of construction noise and vibration assessment refers to methodology and guidance of BS 5228-1&2:2009+A1:2014 (British Standards Institute, 2008). Potential noise and vibration impacts during construction are a function of a number of factors including: the magnitude of impacts, sensitivity of receptors and duration of impacts. The exact location of construction work areas and methods are not known at this stage. It is understood sub-options will require different construction methods for pipeline/tunnel construction although comparative differences will be equivalent between options. On this basis no differentiation is made between construction methods for each sub-option for the purposes of this assessment and assessment of options per site only has been completed. Qualitative assessment of potential impacts has been made based on indicative site area locations and potential works with respect to sensitive receptors.
- B.6.4 Construction traffic using the wider road network during construction also has the potential to adversely impact sensitive receptors. Preliminary assessment has considered potential impacts at sensitive receptors within 50m of existing routes which are likely to increase existing noise levels by 1dB(A) or more due to construction traffic.
- B.6.5 Fixed plant and machinery, on site mobile plant and any associated vehicle movements (for deliveries and maintenance) are likely sources of noise during operation of the new site. Potential noise impacts may also result from changes in road traffic using the wider road network to access the site.
- B.6.6 There is potential that new noise sources during operation of the site will result in changes to baseline noise conditions at noise sensitive receptors. The magnitude of change may result in adverse noise impacts. In accordance with national and local policy, appropriate mitigation design would aim to minimise potential adverse noise impacts at the nearest noise sensitive receptors.
- B.6.7 Noise during operation of the proposed site therefore has the potential to impact a wide area subject to existing background noise levels and predicted noise levels during operation of the new site. However, the closest existing residential properties have the potential to be most affected. Details relating to operational noise sources are not available at this stage to enable quantitative assessment of potential noise impacts. A qualitative assessment of potential noise impacts has therefore been undertaken based on indicative locations of option elements with respect to nearby sensitive receptors.
- B.6.8 Vibration during operation of the site is unlikely to result in adverse effects due to the location of each option site area with respect to nearby vibration sensitive receptors. It is considered design of any individual significant vibration source within each option is independent of the site or

option selection process and would be subject to detailed design where necessary. Vibration during operation has therefore not been considered further within this selection assessment.

B.6.9 The RAG definitions for noise and vibration assessment are provided in Table B.41.

Table B.41: Noise and vibration assessment – RAG definitions

	Green	Amber	Red
Construction noise and vibration	Sensitive receptors are located at a distance greater than 300m from proposed work areas.	Sensitive receptors are located less than 300m from proposed work areas. Potential impacts are unlikely to be significant.	Sensitive receptors are located less than 300m from proposed work areas. Potential impacts are likely to be significant.
Construction traffic	Sensitive receptors are located at a distance greater than 50m from proposed construction traffic routes. Potential impacts are unlikely to be significant.	Sensitive receptors are located within 50m from construction traffic routes. Potential impacts are unlikely to be significant.	Sensitive receptors are located within 50m from construction traffic routes which would result in a potentially large increase in noise level for an extended period. Potential impacts are likely to be significant.
Operational noise and vibration	Receptors are not located close to operational noise sources and new noise sources are unlikely to be significant.	Receptors located close to operational noise sources. New noise sources have the potential to increase baseline noise levels and result in minor impacts.	Receptors located close to operational noise sources. New noise sources have the potential to increase baseline noise levels and result in significant impacts.

Assessment of unmitigated options

Construction

Site area 1, Option A

B.6.10 Site area 1 is located in a rural and relatively sparsely populated location. Noise and vibration impacts from construction of site area 1 are expected to be low due to its location with respect to nearby noise sensitive receptors. Tunnel and pipeline corridors and discharge points associated with Option 1A are generally located away from sensitive receptors which minimises potential construction noise and vibration impacts. However, temporary adverse impacts could occur where construction activities including construction of tunnel or pipeline corridors and diversions of the existing waste water transfer network navigate close to sensitive receptors including those on the outskirts of Waterbeach, Landbeach and Milton.

B.6.11 Preliminary assessment of construction traffic indicates vehicles would access Site Area 1 via the A10 and Butts Lane or by Landbeach Road. Construction traffic routes are however not fully developed for this site option. There is potential for temporary adverse impacts at a small number of sensitive receptors (less than 10) located on Butt Lane and Milton Road. Several construction phases would result in larger increases in construction traffic (e.g. during concrete pours) however the duration of these activities is unlikely to result in Significant Adverse Effects due to construction traffic. Impacts are subject however to developed design of construction routes.

Site area 1, Option B

B.6.12 Subject to the precise location of the treated effluent waste tunnel/pipeline associated with Option 1B, construction noise and vibration of the tunnel/pipeline has the potential to impact a

greater number of receptors on the northern edge of and surrounding Milton and Horningsea compared to Option 1A.

Site area 2, Option A

- B.6.13 Similar to site area 1, site area 2 is located in a rural and relatively sparsely populated location. Construction noise and vibration impacts from construction of the main site area 2 are expected to be low due to its location with respect to nearby noise sensitive receptors. Tunnel and pipeline corridors and discharge points associated with Option 2A are generally located away from sensitive receptors which minimises potential construction noise and vibration impacts. However, temporary adverse impacts could occur where construction activities including construction of tunnel or pipeline corridors and diversions of the existing waste water transfer network navigate close to sensitive receptors including those on the outskirts of Waterbeach, Landbeach and Milton.
- B.6.14 Preliminary assessment of construction traffic indicates vehicles would access Site Area 2 via the A10 and Butts Lane. Construction traffic routes are however not fully developed for this site option. There is potential for temporary adverse impacts at a small number of sensitive receptors (less than 10) located on Butt Lane and Milton Road. Several construction phases would result in larger increases in construction traffic (e.g. during concrete pours) however the duration of these activities is unlikely to result in Significant Adverse Effects due to construction traffic. Impacts are subject however to developed design of construction routes.

Site area 2, Option B

- B.6.15 Subject to the precise location of the treated effluent waste tunnel/pipeline associated with Option 2B, construction noise and vibration of the tunnel/pipeline has the potential to impact a greater number of receptors on the northern edge of and surrounding Milton and Horningsea compared to Option 2A.

Site area 3, Option A

- B.6.16 Site area 3 is located in a rural and relatively sparsely populated location. Construction noise and vibration impacts from construction of the site area 3 are expected to be low due to its location with respect to nearby noise sensitive receptors. Tunnel and pipeline corridors and discharge points are generally located away from sensitive receptors which minimises potential construction noise and vibration impacts. However, temporary adverse impacts could occur where construction activities including construction of tunnel or pipeline corridors navigate close to sensitive receptors including those on the outskirts of Waterbeach and Horningsea.
- B.6.17 Preliminary assessment of construction traffic indicates vehicles would access Site Area 3 via the A14, High Ditch Road and Low Fen Drove Way or via the A14 and Horningsea Road. Construction traffic routes are however not fully developed for this site option. There is potential for temporary adverse impacts at a small number of sensitive receptors located on High Ditch Road. Several construction phases would result in larger increases in construction traffic (e.g. during concrete pours) however the duration of these activities is unlikely to result in Significant Adverse Effects due to construction traffic. Impacts are subject however to developed design of construction routes.
- B.6.18 The following table summarises unmitigated construction noise and vibration RAG assessment of each option.

Table B.42: Construction Noise and Vibration RAG assessment

Site Option	Construction Noise and Vibration	RAG Rating
Site area 1 Option A	Construction of site area 1 is likely to be low due to its location with respect to nearby noise sensitive receptors. Temporary adverse impacts during tunnel or pipeline corridor works at nearby receptors including those on the outskirts of Waterbeach, Landbeach and Milton. Temporary adverse impacts due to construction traffic at a small number of receptors on Butts Lane and Milton Road subject to developed design of routes.	Amber
Site area 1 Option B	Construction of site area 1 is likely to be low due to its location with respect to nearby noise sensitive receptors. Temporary adverse impacts during tunnel or pipeline corridor works at nearby receptors including those on the outskirts of Waterbeach, Landbeach, on the northern edge of and surrounding Milton and Horningsea. Temporary adverse impacts due to construction traffic at a small number of receptors on Butts Lane and Milton Road subject to developed design of routes.	Amber
Site area 2 Option A	Construction of site area 2 is likely to be low due to its location with respect to nearby noise sensitive receptors. Temporary adverse impacts during tunnel or pipeline corridor works at nearby receptors including those on the outskirts of Waterbeach, Landbeach and Milton. Temporary adverse impacts due to construction traffic at a small number of receptors on Butts Lane and Milton Road subject to developed design of routes.	Amber
Site area 2 Option B	Construction of site area 2 is likely to be low due to its location with respect to nearby noise sensitive receptors. Temporary adverse impacts during tunnel or pipeline corridor works at nearby receptors including those on the outskirts of Waterbeach, Landbeach, on the northern edge of and surrounding Milton and Horningsea. Temporary adverse impacts due to construction traffic at a small number of receptors on Butts Lane and Milton Road subject to developed design of routes.	Amber
Site area 3 Option A	Construction of site area 3 is likely to be low due to its location with respect to nearby noise sensitive receptors. Temporary adverse impacts during tunnel or pipeline corridor works at nearby receptors including those on the outskirts of Waterbeach and Horningsea. Temporary adverse impacts due to construction traffic at a small number of receptors on High Ditch Road subject to developed design of routes.	Amber

Operation

Site area 1, Option A

B.6.19

Noise impacts from site area 1 during the operational phase at the nearest receptors are expected to be low due to its location with respect to nearby noise sensitive receptors. Noise sources associated with operation of pipelines, or ancillary pumping stations along the pipeline or discharge locations, have the potential to result in adverse effects if located near to sensitive receptors. At this stage it is not known where these additional fixed plant items would be located, or noise levels generated by these elements. Operational noise impact from the discharge point is expected to be low due to its distance from sensitive receptors.

- B.6.20 Operational HDV movements to site area 1 will exceed 100 daily movements. Vehicular access will be via Butt Lane, A10 Ely Road or Landbeach Road. The location of new access road may result in minor adverse noise effects at individual receptors for access routes via Butt Lane. Changes in road traffic using the existing road network due to additional vehicle movements may also result in minor adverse noise effects. Further assessment is required to determine the extent of noise impacts due to changes in road traffic.

Site area 1, Option B

- B.6.21 The potential noise impacts for Option 1B are very similar to Option 1A. The difference in impacts due to Option 1B compared to Option 1A are subject to the precise location for the discharge or pumping stations location which may be closer to receptors. However, the operation of this part of the water treatment infrastructure is unlikely to result in significance adverse effects on these receptors.

Site area 2, Option A

- B.6.22 Noise impacts from site area 2 during the operational phase at the nearest receptors are expected to be low due to its location with respect to nearby noise sensitive receptors. Noise sources associated with operation of pipelines or ancillary pumping stations along the pipeline or discharge locations have the potential to result in adverse effects if located near to sensitive receptors. At this stage it is not known where these additional fixed plant items would be located, or noise levels generated by these elements. Operational noise impact from the discharge point is expected to be low due to its distance from sensitive receptors.
- B.6.23 Operational HDV movements to site area 2 will exceed 100 daily movements. Vehicular access will be via Butt Lane. The location of new access road may result in minor adverse noise effects at individual receptors on Butt Lane. Changes in road traffic using the existing road network due to additional vehicle movements may also result in minor adverse noise effects. Further assessment is required to determine the extent of noise impacts due to changes in road traffic.

Site 2, Option B

- B.6.24 The potential noise impacts for Option 2B are very similar to Option 2A. The difference in impacts due to Option 2B compared to Option 2A are subject to the precise location for the discharge or pumping stations location which may be closer to receptors. However, the operation of this part of the water treatment infrastructure is unlikely to result in significance adverse effects on these receptors.

Site 3, Option A

- B.6.25 Noise impacts from site area 3 during the operational phase at the nearest receptors are expected to be low due to its location with respect to nearby noise sensitive receptors. Noise sources associated with operation of pipelines or ancillary pumping stations along the pipeline or discharge locations have the potential to result in adverse effects if located near to sensitive receptors. At this stage it is not known where these additional fixed plant items would be located. Operational noise impact from the discharge point is expected to be low due to its distance from sensitive receptors.
- B.6.26 Operational HDV movements to site area 3 will exceed 100 daily movements. Vehicular access will be via Horningsea Road in an unmitigated scenario. The location of new access road may result in minor adverse noise effects at individual receptors on Horningsea Road. Changes in road traffic using the existing road network due to additional vehicle movements may also result in minor adverse noise effects. Further assessment is required to determine the extent of noise impacts due to changes in road traffic.

B.6.27 The following table summarises the unmitigated operational noise RAG assessment of each option.

Table B.43: Operational Noise RAG Assessment

Site Option	Operational Noise	RAG Rating
Site area 1 Option A	Noise impacts from site area 1 at the nearest receptors are expected to be low due to its location with respect to nearby noise sensitive receptors. Potential adverse impacts may occur at receptors near to fixed plant elements including pumping stations or due to changes in road traffic from site traffic.	Amber
Site area 1 Option B	Noise impacts from site area 1 at the nearest receptors are expected to be low due to its location with respect to nearby noise sensitive receptors. Potential adverse impacts may occur at receptors near to fixed plant elements including pumping stations or due to changes in road traffic from site traffic.	Amber
Site area 2 Option A	Noise impacts from site area 2 at the nearest receptors are expected to be low due to its location with respect to nearby noise sensitive receptors. Potential adverse impacts may occur at receptors near to fixed plant elements including pumping stations or due to changes in road traffic from site traffic.	Amber
Site area 2 Option B	Noise impacts from site area 2 at the nearest receptors are expected to be low due to its location with respect to nearby noise sensitive receptors. Potential adverse impacts may occur at receptors near to fixed plant elements including pumping stations or due to changes in road traffic from site traffic.	Amber
Site area 3 Option A	Noise impacts from site area 3 at the nearest receptors are expected to be low due to its location with respect to nearby noise sensitive receptors. Potential adverse impacts may occur at receptors near to fixed plant elements including pumping stations or due to changes in road traffic from site traffic.	Amber

Mitigation identified

Site area 1

B.6.28 Where significant adverse noise and vibration impacts are identified for works within the construction phase, appropriate mitigation measures will be applied including the use of Best Practicable Means (BPM) in accordance with BS5228-1&2:2009+A1:2014 guidance. Mitigation may comprise a number of measures including management of construction hours, selection of low noise and vibration construction plant, use of screening (enclosures, barriers or bunds), noise and vibration monitoring.

B.6.29 Mitigation of construction traffic would include implementation of a Construction Management Plan.

B.6.30 Mitigation of operational noise would be applied through design to minimise potential adverse noise impacts at the nearest noise sensitive receptors. Measures may include selection of plant and equipment, location and orientation of fixed plant items and use of screening (e.g. acoustic enclosures, barriers or bunds).

Site area 2

B.6.31 The mitigation outlined for site area 1 is also appropriate for site area 2.

Site area 3

B.6.32 The mitigation outlined for site area 1 is also appropriate for site area 3.

Assessment of mitigated options

B.6.33 It is considered that where mitigation is applied appropriately that construction noise and vibration effects could be effectively minimised or managed to prevent significant disturbance and adverse effects.

B.6.34 The following table summarises mitigated construction noise and vibration RAG assessment of each option.

Table B.44: Construction Noise and Vibration RAG Assessment

Site Option	Construction Noise and Vibration	Mitigated RAG Rating
Site 1 Option A	Noise and vibration from construction works does not exceed significant adverse effect level thresholds for extended periods at receptor locations.	Green
Site 1 Option B	Noise and vibration from construction works does not exceed significant adverse effect level thresholds for extended periods at receptor locations.	Green
Site 2 Option A	Noise and vibration from construction works does not exceed significant adverse effect level thresholds for extended periods at receptor locations.	Green
Site 2 Option B	Noise and vibration from construction works does not exceed significant adverse effect level thresholds for extended periods at receptor locations.	Green
Site 3 Option A	Noise and vibration from construction works does not exceed significant adverse effect level thresholds for extended periods at receptor locations.	Green

B.6.35 The following table summarises mitigated operational noise RAG assessment of each option.

Table B.45: Operational Noise RAG Assessment

Site Option	Operational Noise	Mitigated RAG Rating
Site 1 Option A	Design of site to include appropriate measures such that noise from fixed plant or changes in road traffic does not result in significant changes to baseline noise conditions or significant adverse effects.	Green
Site 1 Option B	Design of site to include appropriate measures such that noise from fixed plant or changes in road traffic does not result in significant changes to baseline noise conditions or significant adverse effects.	Green
Site 2 Option A	Design of site to include appropriate measures such that noise from fixed plant or changes in road traffic does not result in significant changes to baseline noise conditions or significant adverse effects.	Green
Site 2 Option B	Design of site to include appropriate measures such that noise from fixed plant or changes in road traffic does not result in significant changes to baseline noise conditions or significant adverse effects.	Green
Site 3 Option A	Design of site to include appropriate measures such that noise from fixed plant or changes in road traffic does not result in significant changes to baseline noise conditions or significant adverse effects.	Green

Incorporating feedback

B.6.36 Phase one non-statutory consultation was held in order to share the proposals for relocating the WWTP with the public and stakeholders. This section provides a summary of the feedback received from the public in relation to noise and how the concerns, issues and opportunities raised have been considered within the assessment criteria for Stage 4 final site selection.

Table B.46: Noise feedback

Sub-Theme	Site (if specific)	Feedback Summary	Response
Construction	Site area 1	Particular concern raised regarding significant traffic noise of construction vehicles using A10 and Landbeach Road.	It is understood that the majority of construction traffic would access the site via the A14 and A10. It is considered unlikely that the addition of construction vehicles using these routes to the site would result in significant adverse effects due to increases in traffic. Mitigation including management of delivery hours to site would be applied to reduce potential noise impacts. Further assessment would be undertaken during detailed design stages to consider potential impacts and mitigation measures.
		Further comment that construction noise will be a concern for all in local villages, particularly with an increased number working from home.	Mitigation including Best Practicable Means would be applied to reduce potential temporary impacts from construction noise and vibration.
		It was commented that there will be an increase in traffic and noise to an already over used road, and that the area around Site 1 already experiences significant noise pollution from A10 traffic.	As described above the impacts are considered unlikely to result in significant adverse effects however mitigation would be applied to reduce potential noise impacts. Further assessment would be undertaken during detailed design stages to consider potential impacts and mitigation measures.
	Site area 3	Comment that Fen Ditton already experiences significant noise impacts so would experience less relative additional disruption.	Existing baseline noise levels at Fen Ditton are understood to include noise from road traffic using the A14. Potential noise from site area 3 would be masked to some degree by existing ambient noise sources. Further assessment would be undertaken during detailed design stages to consider potential noise impacts at this community area and nearby sensitive receptors and support the design of mitigation measures.
Operation	General	Some respondents have raised concerns regarding operational noise for all three sites. Some respondents asked for the site to be relocated further north, away from any communities.	Preliminary assessment indicates potential operational noise impacts are similar for all three site options. Noise impact assessments will be undertaken and mitigation measures included to minimise and prevent significant adverse noise effects during detailed design.

B.7 Air quality

Assessment methodology

- B.7.1 A high-level assessment was undertaken to identify potential air quality impacts on sensitive receptors from the proposed site areas and their associated transfer corridors and access routes during construction and operation.
- B.7.2 During construction, dust and vehicle emissions have the potential to affect sensitive receptors through dust deposition and health effects. Potential dust effects have been identified by measuring distances from site areas to nearby receptors, aligned with the Institute of Air Quality Management's (IAQM) 'Guidance on the assessment of dust from demolition and construction'⁶⁹. Using this guidance, factors such as construction magnitudes, proximity and number of sensitive receptors, duration of impacts and number of Heavy-Duty Vehicle (HDV) movements are used to determine the likely level of dust risk and inform the most appropriate dust mitigation. Construction work areas, quantities and methods of working are unknown at this stage, although it is understood that different construction methods may be required for pipeline construction. Construction methods for each site option are assumed to be the same for the purposes of this assessment. Qualitative assessment of potential impacts has been made based on indicative site area locations and potential works with respect to locations of sensitive receptors.
- B.7.3 Vehicle movements are sources of pollutant emissions, and construction and operation of the new site may result in additional traffic movements near sensitive receptors. Increased vehicle movements may result in adverse air quality impacts and significant effects at sensitive receptors. The Preliminary TA in Appendix K provides provisional traffic numbers for construction and operation, indicating that construction HDV movements will be approximately 70 annual average daily traffic (AADT) movements and that operational HDV will have approximately 146 AADT movements.
- B.7.4 Operational traffic may require further assessment within an EIA as the vehicle movements likely exceed the HDV assessment threshold of 100 AADT within the Environmental Protection United Kingdom (EPUK) and IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality'⁷⁰. Construction traffic may also require assessment for affected roads within the A14 Corridor Air Quality Management Area (AQMA), an air quality sensitive area designated by South Cambridgeshire District Council (SCDC)⁷¹. The EPUK/IAQM guidance has an HDV assessment threshold of 25 AADT within AQMAs, exceeded by the predicted construction HDV traffic movements. It is worth noting that the operational traffic through the AQMA is predicted to be similar to the movements from the existing WWTP site, with a small uplift of 16 HDVs, therefore it is unlikely that significant effects will occur within the AQMA as a result of operational traffic.
- B.7.5 All sites will include Combined Heat and Power (CHP) engines, standby boilers and backup generators, in case of emergencies. Energy plant emits pollutant emissions, which may have adverse impacts on air quality and significant effects on nearby human receptors. Combustion plant on site will comply with Environmental Permitting Regulations, as required, and emissions will be regulated and mitigated accordingly. Impacts on air quality from combustion plant will

⁶⁹ Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction http://iaqm.co.uk/wp-content/uploads/guidance/iaqm_guidance_report_draft1.4.pdf

⁷⁰ Environmental Protection UK and Institute of Air Quality Management (January 2017) Land-Use Planning and Development Control: Planning for Air Quality (version 1.2) <http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

⁷¹ Cambridge City Council, Huntingdonshire District Council & South Cambridgeshire District Council (2009) Air Quality Action Plan for the Cambridgeshire Growth Areas. <https://www.scambs.gov.uk/media/6727/air-quality-action-plan.pdf>

therefore be comprehensively assessed through the permitting process and any resultant significant effects identified will be required to be fully mitigated prior to operation. As such the energy plant emissions have not been considered in this report.

B.7.6 The RAG definitions for the air quality assessment are provided in Table B.47.

Table B.47: Air quality assessment – RAG definitions

Green	Amber	Red
Air quality impacts are unlikely to lead to significant effects at affected sensitive receptors. i.e. existing baseline conditions do not exceed the national air quality objectives, no receptors are located within 350m of the site or 200m of affected roads, the site is not expected to have any adverse impacts upon air quality, mitigation expected to negate all adverse impacts.	Air quality impacts have the potential to lead to significant effects at affected sensitive receptors. i.e. existing baseline conditions are close to or exceeding the national air quality objectives, receptors are located within 350m of the site or 200m of affected roads, the site is expected to have adverse impacts upon air quality.	Air quality impacts are likely to lead to significant effects at affected sensitive receptors. i.e. existing baseline conditions are exceeding the national air quality objectives, receptors are located within 350m of the site or 200m of affected roads, the site is expected to have adverse impacts upon air quality.

Assessment of unmitigated options

Construction

Site area 1, Option A

B.7.7 Under this option, the Waterbeach transfer pipeline corridor will be within 250m of residential receptors in Waterbeach, the treated effluent pipeline within 50m of residential receptors in Milton and the diversions of the existing waste water transfer network within 50m of residential receptors in Kings Hedges. These pipeline corridors may result in increased dust effects due to excavation, either at shaft and portal sites, in the case of tunnelling, or along the entire length of the pipeline if a trench is required. Dust deposition and human health effects from dust may also occur at sensitive receptor locations close to site area 1, due to construction works, although receptors are greater than 200m from the site boundary.

B.7.8 Approximately 70 heavy-duty vehicle (HDV) movements per day are anticipated over the 4-year construction period, with the potential to increase vehicle and dust emissions and associated pollutant (nitrogen dioxide and particulate) concentrations along local roads. It is assumed that access to site area 1 would be via Butt Lane off the A10 Ely Road. Some construction traffic will travel within the A14 Corridor AQMA, and therefore may require further assessment if the vehicle movements along the A14 exceed the assessment thresholds within the EPUK/IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017).

Site area 1, Option B

B.7.9 Under this option, the Waterbeach transfer pipeline corridor will be within 250m of residential receptors in Waterbeach, the treated effluent pipeline within 50m of residential receptors in Milton and the diversions of the existing waste water transfer network within 50m of residential receptors in Kings Hedges. These pipeline corridors may result in increased dust effects due to excavation, either at shaft and portal sites, in the case of tunnelling, or along the entire length of the pipeline if a trench is required. Dust deposition and human health effects from dust may also occur at sensitive receptor locations close to site area 1, due to construction works, although receptors are greater than 200m from the site boundary.

B.7.10 Approximately 70 heavy-duty vehicle (HDV) movements per day are anticipated over the 4-year construction period, with the potential to increase vehicle and dust emissions and associated

pollutant (nitrogen dioxide and particulate) concentrations along local roads. It is assumed that access to site area 1 would be via Butt Lane off the A10 Ely Road. Some construction traffic will travel within the A14 Corridor AQMA, and therefore may require further assessment if the vehicle movements along the A14 exceed the assessment thresholds within the EPUK/IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017).

Operation

Site area 1, Option A

- B.7.11 Operational HDV movements will likely exceed 100 daily movements. It is assumed that all site traffic will enter and exit the site via Butt Lane off the A10 Ely Road. Operational traffic may require further assessment as the vehicle movements exceed the assessment thresholds within the EPUK/IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017).

Site area 1, Option B

- B.7.12 Operational HDV movements will likely exceed 100 daily movements. It is assumed that the all site traffic will enter and exit the site via Butt Lane off the A10 Ely Road. Operational traffic may require further assessment as the vehicle movements exceed the assessment thresholds within the EPUK/IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017).

Table B.48: Air quality – unmitigated RAG evaluation for site area 1, Options A and B

Site area	Construction	Operational		
	Evaluation	Unmitigated RAG rating	Evaluation	Unmitigated RAG rating
Site area 1 – Option A	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Potential for dust deposition effects at closest receptors to site and pipeline corridors. Construction site traffic may impact upon the air quality within the A14 AQMA, potentially causing significant effects at receptors along the A14. Further assessment is required to determine the likely impacts upon air quality.	Amber	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Operational traffic may impact upon the air quality on local roads, potentially causing significant effects at receptors close to affected roads. Further assessment is required to determine the likely impacts upon air quality.	Amber
Site area 1 – Option B	As with Option A.	Amber	As with Option A.	Amber

Construction

Site area 2, Option A

B.7.13 Under this option, Waterbeach transfer pipeline corridor is within 250m of residential receptors in Waterbeach, the treated effluent pipeline within 50m of residential receptors in Milton, and the diversions of the existing waste water transfer network within 50m of residential receptors in King's Hedges. These pipeline corridors may result in increased dust effects due to excavation, either at shaft and portal sites, in the case of tunnelling, or along the entire length of the pipeline if a trench is required. The pipeline-related dust effects are considered to be similar to those for site area 1. Dust deposition and human health effects from dust may also occur at sensitive receptor locations close to the site area 1, due to construction works, although receptors are located more than 200m from the site boundary.

B.7.14 Approximately 70 heavy-duty vehicle (HDV) movements per day are anticipated over the 4-year construction period, with the potential to increase vehicle and dust emissions and associated pollutant (nitrogen dioxide and particulate) concentrations along local roads. It is assumed that access to site area 2 would be via Butt Lane off the A10 Ely Road. Some construction traffic will travel within the A14 Corridor AQMA, and therefore may require further assessment if the vehicle movements along the A14 exceed the assessment thresholds within the EPUK/IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017). The traffic emission effects are considered to be similar to those for site area 1.

Site area 2, Option B

B.7.15 This option puts the Waterbeach transfer pipeline corridor within 250m of residential receptors in Waterbeach, the treated effluent pipeline within 50m of residential receptors in Milton, and the

diversions of the existing waste water transfer network within 50m of residential receptors in King's Hedges. These pipeline corridors may result in increased dust effects due to excavation, either at shaft and portal sites, in the case of tunnelling, or along the entire length of the pipeline if a trench is required. The pipeline-related dust effects are considered to be similar to Site 1. Dust deposition and human health effects from dust may also occur at sensitive receptor locations close to the main Site, due to construction works, although receptors appear to be located >200m from the Site boundary.

- B.7.16 Approximately 70 heavy-duty vehicle (HDV) movements per day are anticipated over the 4-year construction period, with the potential to increase vehicle and dust emissions and associated pollutant (nitrogen dioxide and particulate) concentrations along local roads. It is assumed that access to site area 2 would be via Butt Lane off the A10 Ely Road. Some construction traffic will travel within the A14 Corridor AQMA, and therefore may require further assessment if the vehicle movements along the A14 exceed the assessment thresholds within the EPUK/IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017). The traffic emission effects are considered to be similar to those for site area 1.

Operation

Site area 2, Option A

- B.7.17 Similar to site area 1, the operational HDV movements will likely exceed 100 daily movements. It is assumed that the all site traffic will enter and exit the site via Butt Lane off the A10 Ely Road. Operational traffic may require further assessment as the vehicle movements exceed the assessment thresholds within the EPUK/IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017).

Site area 2, Option B

- B.7.18 Similar to site area 1, the operational HDV movements will likely exceed 100 daily movements. It is assumed that the all site traffic will enter and exit the site via the Butt Lane off the A10 Ely Road. Operational traffic may require further assessment as the vehicle movements exceed the assessment thresholds within the EPUK/IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017).

Table B.49: Air quality – unmitigated RAG evaluation for site area 2, Operation A and B

Site area	Construction	Operational		
	Evaluation	Unmitigated RAG rating	Evaluation	Unmitigated RAG rating
Site area 2 – Option A	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Potential for dust deposition effects at closest receptors to site and pipeline corridors. Construction site traffic may impact upon the air quality within the A14 AQMA, potentially causing significant effects at receptors along the A14. Further assessment is required to determine the likely impacts upon air quality.	Amber	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Operational traffic may impact upon the air quality on local roads, potentially causing significant effects at receptors close to affected roads. Further assessment is required to determine the likely impacts upon air quality.	Amber
Site area 2 – Option B	As with Option A.	Amber	As with Option A.	Amber

Construction

Site area 3

- B.7.19 Under this option, the Waterbeach transfer pipeline corridor is within 50m of residential receptors in Clayhithe and Horningsea and the treated effluent pipeline within 20m of residential receptors at Biggin Abbey Cottages. These pipeline corridors may result in increased dust effects due to excavation, either at shaft and portal sites, in the case of tunnelling, or along the entire length of the pipeline if a trench is required. Dust deposition and human health effects from dust may also occur at sensitive receptor locations close to the site area 3, due to construction works, although receptors are located >300m from the site boundary. There are fewer air quality sensitive human receptors located near to site area 3, compared to site areas 1 and 2.
- B.7.20 Approximately 70 heavy-duty vehicle (HDV) movements per day are anticipated over the 4-year construction period, with the potential to increase vehicle and dust emissions and associated pollutant (nitrogen dioxide and particulate) concentrations along local roads. It is assumed that access to site area 3 would be via junction 34 (Fen Ditton) of the A14 and Horningsea Road. Some construction traffic will travel within the A14 Corridor AQMA, and therefore may require further assessment if the vehicle movements along the A14 exceed the assessment thresholds within the EPUK/IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017). The traffic emission effects are considered to be similar to those for site area 1.

Operation

- B.7.21 Similar to site area 1, the operational HDV movements will likely exceed 100 daily movements. It is assumed that access to site area 3 would be via junction 34 (Fen Ditton) of the A14 and

Horningsea Road. Operational traffic may require further assessment as the vehicle movements exceed the assessment thresholds within the EPUK/IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017).

Table B.50: Air quality – unmitigated RAG evaluation for site area 3

Site area	Construction	Operational		
	Evaluation	Unmitigated RAG rating	Evaluation	Unmitigated RAG rating
Site 3 – Option A	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Potential for dust deposition effects at closest receptors to site and pipeline corridors. Construction site traffic may impact upon the air quality within the A14 AQMA, potentially causing significant effects at receptors along the A14. Further assessment is required to determine the likely impacts upon air quality.	Amber	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Operational traffic may impact upon the air quality on local roads, potentially causing significant effects at receptors close to affected roads. Further assessment is required to determine the likely impacts upon air quality.	Amber

Mitigation identification

Site area 1

- B.7.22 The following mitigation measures should be implemented to reduce adverse effects from reductions in air quality.
- Dust control measures consistent with best practice environmental management will be implemented.
 - Construction and operational traffic may require further assessment as the vehicle movements exceed the assessment thresholds within the Environmental Protection UK and Institute of Air Quality Management guidance 'Land-Use Planning and Development Control: Planning for Air Quality' (2017).
 - Dispersion modelling would be used to quantitatively assess the likely impacts from construction and operation along likely site access and haulage routes; if significant effects are found to be likely, appropriate mitigation will be recommended as necessary.

Site area 2

- B.7.23 The mitigation outlined for site area 1 is also appropriate for site area 2.

Site area 3

- B.7.24 The mitigation outlined for site area 1 is also appropriate for site area 3.

Assessment of mitigated options

B.7.25 The RAG ratings for each site area in a mitigated scenario are detailed in Table B.51.

Table B.51: Air quality – mitigated RAG evaluation for scenarios

Site area	Construction	Mitigated RAG rating	Operational	Mitigated RAG rating
	Evaluation		Evaluation	
Site 1 – Option A	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Dust deposition effects at closest receptors to site and pipeline corridors will be negated with appropriate dust control measures. Construction site traffic may impact upon the air quality within the A14 AQMA, potentially causing significant effects at receptors along the A14. Further assessment is required to determine the likely impacts upon air quality and mitigation recommended if significant effects identified. Mitigation is anticipated to reduce the likely impacts to negligible.	Green	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Operational traffic may impact upon the air quality on local roads and within the A14 AQMA, potentially causing significant effects at receptors close to affected roads. Further assessment is required to determine the likely impacts upon air quality and mitigation recommended if significant effects identified. Mitigation is anticipated to reduce the likely impacts to negligible.	Green
Site 1 – Option B	As with Site 1 Option A.	Green	As with Site 1 Option A.	Green
Site 2 – Option A	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Potential for dust deposition effects at closest receptors to site and pipeline corridors. Construction site traffic may impact upon the air quality within the A14 AQMA, potentially causing significant effects at receptors along the A14. Further assessment is required to determine the likely impacts upon air quality and mitigation recommended if significant effects identified. Mitigation is anticipated to reduce the likely impacts to negligible.	Green	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Operational traffic may impact upon the air quality on local roads and within the A14 AQMA, potentially causing significant effects at receptors close to affected roads. Further assessment is required to determine the likely impacts upon air quality and mitigation recommended if significant effects identified. Mitigation is anticipated to reduce the likely impacts to negligible.	Green
Site 2 – Option B	As with Site 1 Option A.	Green	As with Site 2 Option A.	Green

Site area	Construction	Operational		
	Evaluation	Mitigated RAG rating	Evaluation	Mitigated RAG rating
Site 3 – Option A	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Potential for dust deposition effects at closest receptors to site and pipeline corridors. Construction site traffic may impact upon the air quality within the A14 AQMA, potentially causing significant effects at receptors along the A14. Further assessment is required to determine the likely impacts upon air quality and mitigation recommended if significant effects identified. Mitigation is anticipated to reduce the likely impacts to negligible.	Green	Existing baseline conditions do not exceed the national air quality objectives. Receptors are located within 350m of the site or 200m of affected roads. Operational traffic may impact upon the air quality on local roads and within the A14 AQMA, potentially causing significant effects at receptors close to affected roads. Further assessment is required to determine the likely impacts upon air quality and mitigation recommended if significant effects identified. Mitigation is anticipated to reduce the likely impacts to negligible.	Green

Incorporating feedback

B.7.26 Phase one non-statutory consultation was held in order to share the proposals for relocating the WWTP with the public and stakeholders. This section provides a summary of the feedback received from the public in relation to air quality and odour and how the concerns, issues and opportunities raised have been considered within the assessment criteria for Stage 4 final site selection.

Table B.52: Air quality and odour feedback

Sub-Theme	Site (if specific)	Feedback Summary	Response
Odour and Air Quality	General	Odour was the most frequently raised concern, primarily regarding anticipated impacts to nearby residential communities.	Comments provided below
		Several comments referred to current odour pollution from the existing site and concerns of this being exacerbated.	The odour assessment undertaken identified minor adverse impacts only even using 'worst-case' summer odour emission rates from the existing site and found only minor adverse effects at nearby receptor locations.
		Some feedback suggested a new site should be proposed further north in a more rural location.	The study area used in site selection was determined during the initial options appraisal in which the potential to relocate the WWTP outside of the drainage catchment area to the north was also considered. This option was not deemed appropriate due to the study area that was deemed appropriate for the relocation of Cambridge WWTP. There were several potential site areas identified in the north of the study area.
		Some comments also challenged the modelling / assessment of odour impacts presented in the site selection work. For example, it was remarked that a 400m buffer zone is not proportionate to the magnitude of the proposed plant and suggested a buffer zone of 1000m be used instead. Another suggestion was that the 400m buffer zone should also be applied to academic facilities.	The odour assessment has found that at the closest receptors there is only a slight adverse impact without mitigation at site area 1. Further away from the site, there would be less of an impact. Mitigation would reduce this impact further.
		As well as odour, broader concerns about the health and wellbeing impacts on local residents were also commonly noted. This included in relation to local amenity and traffic and transport impacts on noise and air quality particularly during peak hours, such as on non-motorised users (NMUs) and PROWs, and around sensitive receptors such as schools and nurseries especially.	The results of the air quality, odour, noise and traffic assessments have been utilised to assess the potential impacts on local amenity for all of the proposed sites and the associated, the assessments can be found in the community sections of this report. Peak traffic is not a major concern for air quality unless there is potential for the hourly NO ₂ national objective to be breached. This would generally occur in locations with a high existing baseline, such as near roads in central London, and therefore is unlikely in rural Cambridgeshire.

Sub-Theme	Site (if specific)	Feedback Summary	Response
	Site area 1	A significant number of concerns were raised regarding potential odour impacts from Site 1 to nearby communities and amenities (such as Landbeach, Waterbeach, Milton, Histon, Impington and Orchard Park). It was widely considered that these impacts would be significant given distance and wind directions. Socio-economic concerns were also raised about the potential impacts of odour on business and employment.	The odour assessment undertaken identified minor adverse impacts only even using 'worst-case' summer odour emission rates in an unmitigated scenario, but also recommends that <i>"the odour assessment, including odour modelling, be redone based on the final process design, site layout and plant elevations during detailed design stage, to confirm the odour mitigation measures required to match the chosen process configuration"</i> .
		Several comments promoted the importance of good air quality for health and wellbeing with concern that this would be compromised at nearby schools, hospital, and open / recreational spaces (such as the Mere Way, Impington Village College, Milton Maze and The Wendy House Nursery), as well more historically sensitive sites such as Milton Cemetery and the Tithe Barn.	See above comment.
		Concern was also raised regarding the danger of soil contaminants from previous landfill site becoming air-borne/ water-borne during excavations.	A ground investigation (GI), including groundwater monitoring, will be used to investigate ground conditions. Following GI, a conceptual site model will be produced to ensure that risks from landfill are low. Potential impacts will further be mitigated through dust control and site management measures implemented through a CEMP.
		However, other comments suggested site 1 would result in lower relative odour impacts, given prevailing wind directions and its proximity to the existing recycling centre site (off Butt Lane), the current CWWTP, and busy roads (A14 and A10).	The odour assessment identified that site area 3 is likely to have the least impact on receptors as there are no receptors close by.
	Site area 2	A significant number of the comments relating to Site 1, such as the proximity to residential areas, were also considered to apply to Site 2.	See above comment.
	Site area 2	It was commented that Site 2 is very close to an Air Quality Management Area around the A14, and that any further reduction to air quality in the needs to be avoided and could be illegal.	Traffic from all of the proposed site areas will travel within the A14 AQMA, which has been considered in the air quality assessment. However, it is noted that traffic travelling within the AQMA will not be dissimilar to current movements from the existing WWTP site.
	Site area 3	A number of respondents commented that Site 3 would be the most appropriate from an odour perspective, as the areas downwind of the site are considered to be less densely populated.	This feedback reflects the conclusion of odour assessment that there would be no sensitive receptors expected to experience odour nuisance
Construction Impacts	General	Concern was raised regarding the potential air pollution caused by the clearing of the existing CWWTP site, and the construction of a new a site and necessary access infrastructure.	These potential impacts will be mitigated through dust control and site management measures implemented through a CEMP.
Climate change	General	Several comments included concern that odour impacts may become more prevalent in higher temperatures.	The odour assessment undertaken identified negligible impacts at nearby receptors (IAQM guidance ratings), using summer odour emission rates (worst case) from the exiting site. This was used all year long, rather than applying reductions for spring, autumn and winter. Furthermore, we have

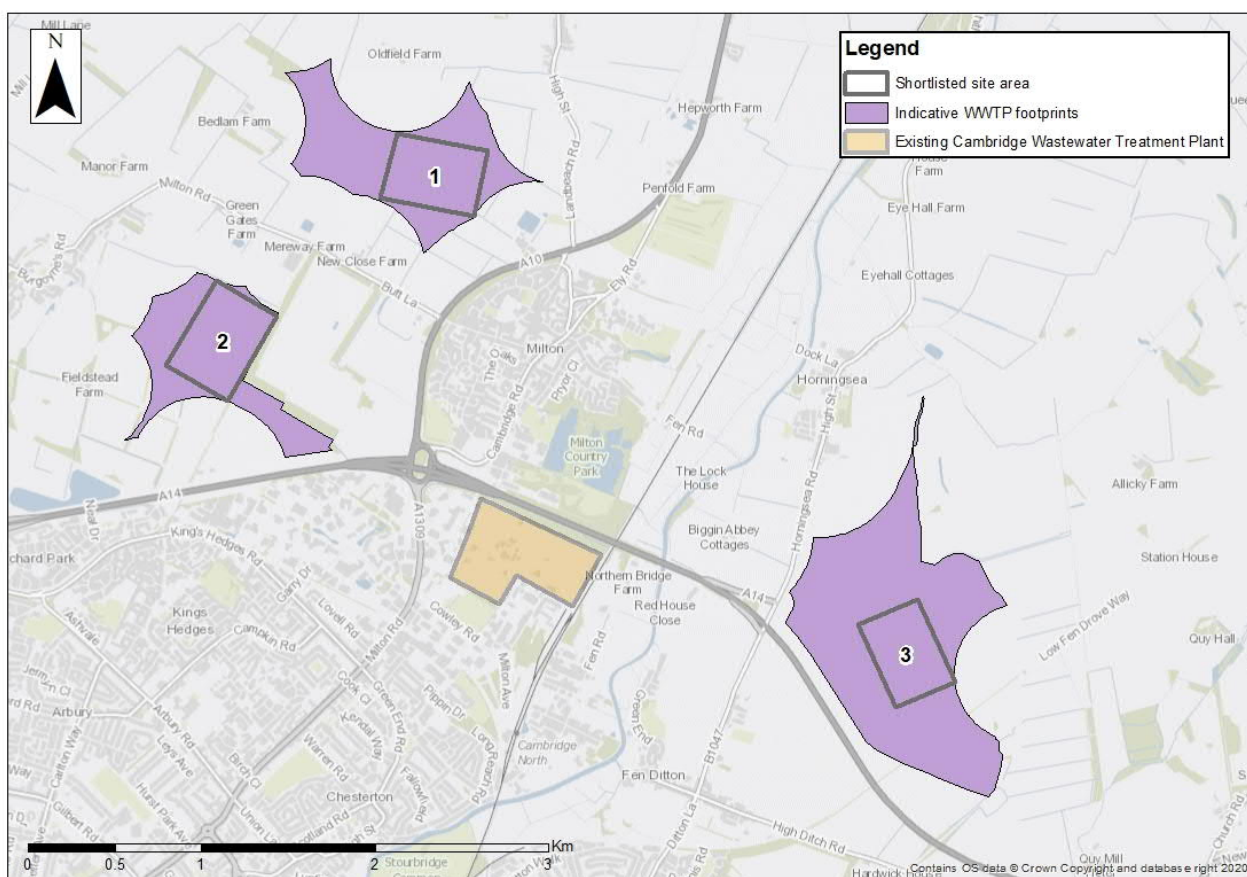
Sub-Theme	Site (if specific)	Feedback Summary	Response
			used best practice odour modelling techniques, which requires screening several years' MET data and choosing the worst year of the data set to carry out the odour modelling exercise. These worst case viewpoints encompasses both the potential for longer summers and changes in weather patterns.

B.8 Odour

Assessment methodology

- B.8.1** This criterion was devised to differentiate between the site areas in terms of the potential odour impacts from a new WWTP. This was undertaken using the results of a preliminary odour study (See Appendix M), which estimated odour emissions from a WWTP located at an indicative footprint within each site area as shown on Figure B.1. The results of the study were used to identify the potential odour impacts on receptors in close proximity to the proposed site areas.

Figure B.1: Indicative WWTP footprints



Source: Mott MacDonald

- B.8.2** The preliminary study established a baseline scenario using an indicative WWTP layout utilising similar technology to the existing WWTP but with the following changes:
- Covering and venting of air from the terminal pumping station (TPS) and inlet works through odour control units (OCUs). This will reduce the odour impact associated with potentially receiving sewage out of the network of unpredictable quality.
 - Improvements in the design configuration of the sludge treatment centre (STC) with all tanks in the STC being covered and either vented to OCU or connected to the biogas collection and utilisation system. This will reduce the odour impact of the STC.

- The proposed site will be more compact in nature than the existing WWTP site: approximately 22 hectares for the new, compared to approximately 48 hectares for the existing. The existing site includes several areas planted with trees around the site, which provides natural odour dispersion. It is noted that landscape mitigation for the new WWTP will include woodland planting around the site boundary to provide long term screening of views from nearby visual receptors, which will also assist with natural odour dispersion.

- B.8.3 Conservative odour emissions based on the existing WWTP and local meteorological information (prevailing wind directions and speeds) were then used to estimate the dispersion of odour from a new WWTP on each site area.
- B.8.4 The baseline scenario using odour emissions from the existing WWTP and changes as described in B.8.2, is considered to represent a reasonable, yet worst case for an unmitigated scenario of potential odour impacts from the new WWTP.
- B.8.5 In order to define the potential odour impact of a new WWTP at each of the proposed site areas, the receptors that could potentially be impacted by odour require identification.
- B.8.6 The Institute of Air Quality Management's (IAQM) guidance for the assessment of odour for planning (Institute of Air Quality Management, 2018) establishes the level of sensitivity of receptors to odour impacts. This classification system was adopted in the preliminary study to assess the potential odour impacts on receptors in proximity to the site areas, due to operation of a new WWTP in an unmitigated scenario.
- B.8.7 It is noted that the IAQM guidance (Institute of Air Quality Management, 2018) classifies PROWs and farmland as low sensitivity receptors, commercial properties as medium sensitivity receptors and residential dwellings as high sensitivity receptors. These types of receptors have, therefore, been considered as such in the assessment of potential odour impacts.
- B.8.8 The RAG definitions for the odour assessment are provided in Table B.53.

Table B.53: Odour assessment – RAG definitions

Green	Amber	Red
Negligible ⁷² odour impacts for all receptors in accordance with the Institute of Air Quality Management's (IAQM) guidance for the assessment of odour for planning	Slight odour impacts for one or more receptors in accordance with the Institute of Air Quality Management's (IAQM) guidance for the assessment of odour for planning	Moderate or substantial odour impacts for one or more receptors in accordance with the Institute of Air Quality Management's (IAQM) guidance for the assessment of odour for planning

- B.8.9 In the event that the unmitigated scenario indicates that receptors could be adversely impacted by a new WWTP, additional measures would be factored into the cost of the scheme in a mitigated scenario to minimise potential odour impacts.
- B.8.10 Additional control measures may be required to reduce the potential odour impact at the impacted receptor(s) to negligible in accordance with the IAQM's guidance for the assessment of odour for planning (Institute of Air Quality Management, 2018). It is noted that further odour assessment, including odour modelling, will be carried out based on the final process design, site layout and plant elevations during detailed design stage, to confirm the odour mitigation measures required to match the chosen process configuration.

⁷² Negligible impact is defined as an odour exposure level of <1.5 C₉₈ OUE/m³ for high sensitivity receptors (residential properties), see Appendix M for further details and odour exposure levels for lower sensitivity receptors

Assessment of unmitigated options

B.8.11 The results of the indicative unmitigated odour scenario from the site areas were compared with the location of the receptors. This comparison indicated that that some receptors in proximity to the site areas could experience odour impacts in an unmitigated scenario.

B.8.12 The RAG ratings for each site area in an unmitigated scenario are detailed in Table B.54.

Table B.54: Odour – unmitigated RAG evaluation for scenarios

Site area	Evaluation	Unmitigated RAG rating
Site 1 – Option A	Potential for odour impacts at housing on the west side of the High Street in Landbeach and housing to the south of Akeman Street in Landbeach, identified in odour assessment. A section of Mere Way to the west of site area 1 and farmland surrounding the indicative WWTP footprint are also located within the area that could experience odour nuisance. However, the level of impact on these receptors is considered to be negligible in the odour assessment.	Slight impact
Site 1 – Option B	As with Site 1 Option A.	Slight impact
Site 2 – Option A	Odour assessment indicated that commercial properties at Evolution Business Park on Butt Lane, the section of Mere Way east of site area 2 and farmland surrounding the indicative WWTP footprint are located within the area that could experience odour impacts. However, due to the lower sensitivity of these receptors, according to the IAQM guidance, the level of impact is considered to be negligible in the odour assessment. No other receptors at risk of odour impact identified in the vicinity of the site. Minimal potential for odour impacts.	Negligible impact
Site 2 – Option B	As with Site 2 Option A.	Negligible impact
Site 3 – Option A	A section of the Low Fen Drove Way public byway and farmland surrounding the indicative WWTP footprint are also located within the area that could experience odour impacts. However, due to the lower sensitivity of these receptors, according to the IAQM guidance, the level of impact is considered to be negligible in the odour assessment. No other receptors at risk of odour impact identified in the vicinity of the site. Minimal potential for odour impacts.	Negligible impact

B.8.13 The results above indicate that there is some differentiation between the site areas in an unmitigated scenario. The differentiation is mainly due to the location of receptors in relation to the prevailing wind direction from the site areas.

B.8.14 For site area 1 there are some receptors located close enough downwind that may be affected slightly in an unmitigated scenario. In contrast, for site areas 2 and 3 there are no receptors located in close proximity to the indicative WWTP location for which an odour impact beyond 'negligible' is predicted for the operation of a WWTP in an unmitigated scenario.

- B.8.15 It is noted that although there are other receptors at similar distances from the site areas in other directions, such as other residential areas and commercial properties, the results of the preliminary study indicated that they are not within areas that would likely experience odour impacts.

Mitigation identification

Site area 1

- B.8.16 The preliminary odour study identified that some receptors could experience odour impacts in an unmitigated scenario. Therefore, additional odour control measures would be required to further reduce the odour emissions beyond the boundary of the WWTP such as installing covers on additional process units, orientation and design of the WWTP such that process units would be further away from receptors.

Site area 2

- B.8.17 The preliminary odour study identified that there are no receptors likely to experience odour impacts in an unmitigated scenario (negligible impacts in accordance with the IAQM guidance). Therefore, no additional odour control measures would be required.

Site area 3

- B.8.18 The preliminary odour study identified that there are no receptors likely to experience odour impacts in an unmitigated scenario (negligible impacts in accordance with the IAQM guidance). Therefore, no additional odour control measures would be required.

Assessment of mitigated options

- B.8.19 The RAG ratings for each site area in a mitigated scenario are detailed in Table B.55.

Table B.55: Odour – mitigated RAG evaluation for scenarios

Site area	Evaluation	Mitigated RAG rating
Site 1 – Option A	Potential for odour impacts at housing on the west side of the High Street in Landbeach and housing to the south of Akeman Street in Landbeach, identified in odour assessment. Mere Way and farm land also within area that could experience odour impacts. However, due to the lower sensitivity of these receptors the level of impact is considered to be negligible in both unmitigated and mitigated scenarios. Proposed mitigation comprises a combination of installing covers on additional process units, orientation and design of the WWTP such that process units would be further away from receptors. Mitigation is anticipated to reduce the likelihood of odour impacts to negligible for all receptors.	Negligible impact
Site 1 – Option B	As with Site 1 Option A.	Negligible impact
Site 2 – Option A	Odour assessment indicated that commercial properties at Evolution Business Park on Butt Lane, the section of Mere Way east of site area 2 and farm land surrounding the indicative WWTP footprint are located within the area that could experience odour impacts. However, due to the lower sensitivity of these receptors, according to the IAQM guidance, the level of impact is considered to be negligible in both unmitigated and mitigated scenarios. No other receptors at risk of odour impact identified in the vicinity of the site. Minimal potential for odour impacts. Therefore, no additional odour mitigation is required for site area 2.	Negligible impact

Site area	Evaluation	Mitigated RAG rating
Site 2 – Option B	As with Site 2 Option A.	Negligible impact
Site 3 – Option A	A section of the Low Fen Drove Way public byway and farm land surrounding the indicative WWTP footprint are located within the area that could experience odour impacts. However, due to the lower sensitivity of these receptors, according to the IAQM guidance, the level of impact is considered to be negligible in both unmitigated and mitigated scenarios. No other receptors at risk of odour impact identified in the vicinity of the site. Minimal potential for odour impacts. Therefore, no additional odour mitigation is required for site area 3.	Negligible impact

Incorporating feedback

B.8.20

Phase one non-statutory consultation was held in order to share the proposals for relocating the WWTP with the public and stakeholders. A summary of the feedback received from the public in relation to air quality and odour and how the concerns, issues and opportunities raised have been considered within the assessment criteria for Stage 4 final site selection is provide in the Appendix B.7.