

# Chetwode Embankment- Environmental Setting and Site Design

## Environmental Setting and Site Design Report

On behalf of EKFB JV

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Chetwode Embankment-  
Environmental Setting and  
Site Design  
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## Quality Management

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# 1 INTRODUCTION

- 1.1.1 This report Environmental Setting and Site Design (ESSD) has been prepared to support an application for a bespoke Environmental Permit for the deposit of waste for recovery to develop a landscape and visual screening bund (landscape bund) at Chetwode Embankment, Preston Bissett Road, Chetwode, Buckinghamshire, MK18 4LF.
- 1.1.2 The application is being made by Eiffage Kier Ferroviaire BAM (EKFB) joint venture.
- 1.1.3 In producing this report, reference has been made to the EA Guidance “What to include in your environmental setting and site design report”.<sup>1</sup>

## 1.2 Background

- 1.2.1 HS2 is Britain’s new high speed rail line being built from London to the North-West. The route of the rail line will intercept some historic landfill sites, including the Fimmere landfill which will require excavating and removal of a proportion of the deposited waste. As part of the required mitigation for the scheme a number of landscape bunds need to be formed, including the landscaping bund at the Chetwode Embankment section of the development. Suitable waste from the the Fimmere historic landfill site is to be used to form the landscape bund and will be placed using a deposit for recovery permit.

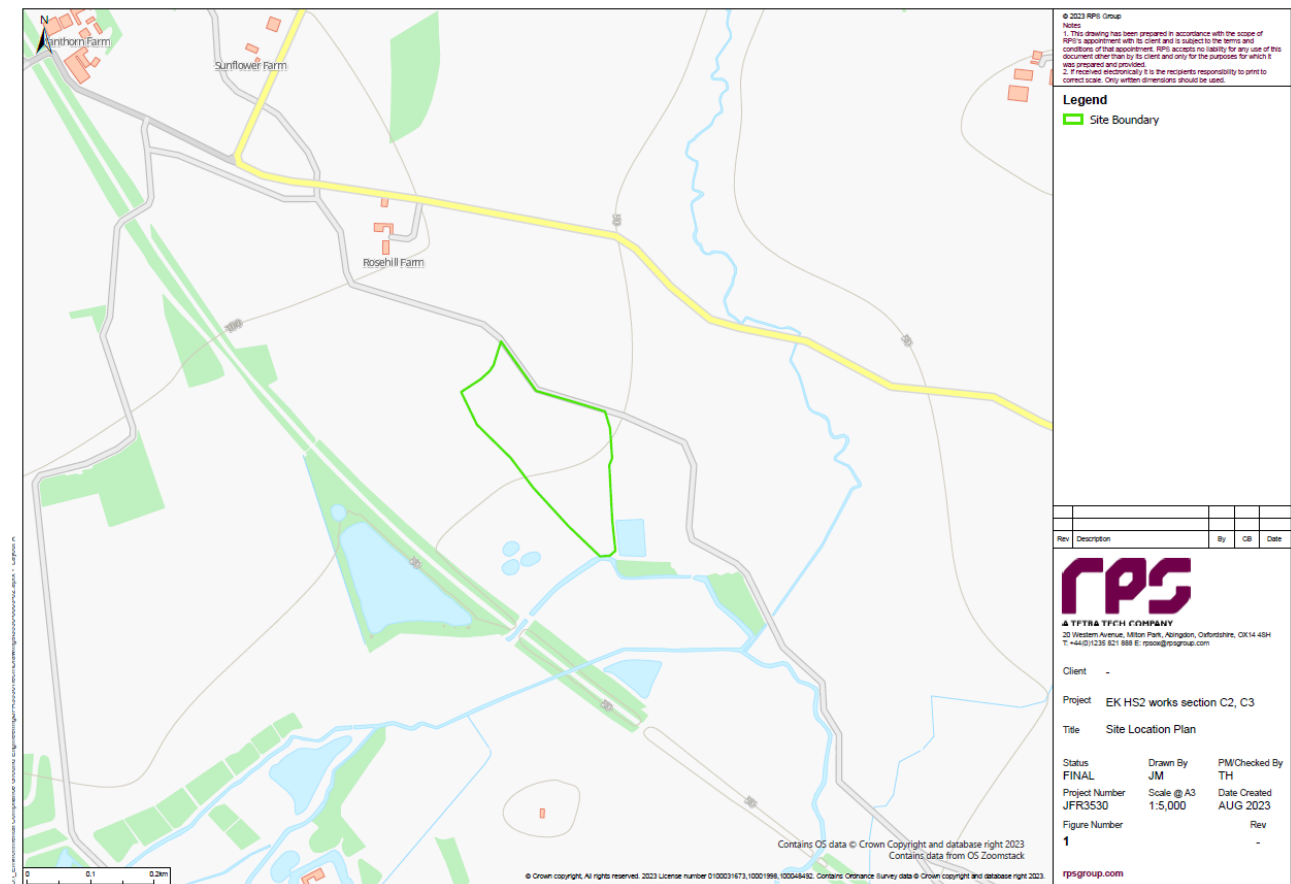
## 1.3 Site details

- 1.3.1 The Chetwode site lies in a largely open and rural location roughly, comprising agricultural land interspersed with woodland, halfway between Buckingham and Bicester and approximately 1.25 km south of the village of Chetwode. The centre of the site is at approximate grid reference SP 64678 28638, coordinates 464518, 228499. The site address is:  
  
Preston Bissett Road,  
  
Chetwode,  
  
Buckinghamshire,  
  
MK18 4LF
- 1.3.2 The landscape bund at Chetwode Embankment is located on the alluvial flood plain on the north side of the Great River Ouse Valley. The land slopes gently to the south with an elevation of approximately 87 m AOD.
- 1.3.3 The site location and permit boundary are shown in Figure 1-1 below:

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<sup>1</sup> [Landfill operators: environmental permits - What to include in your environmental setting and site design report - Guidance - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/landfill-operators-environmental-permits-what-to-include-in-your-environmental-setting-and-site-design-report)

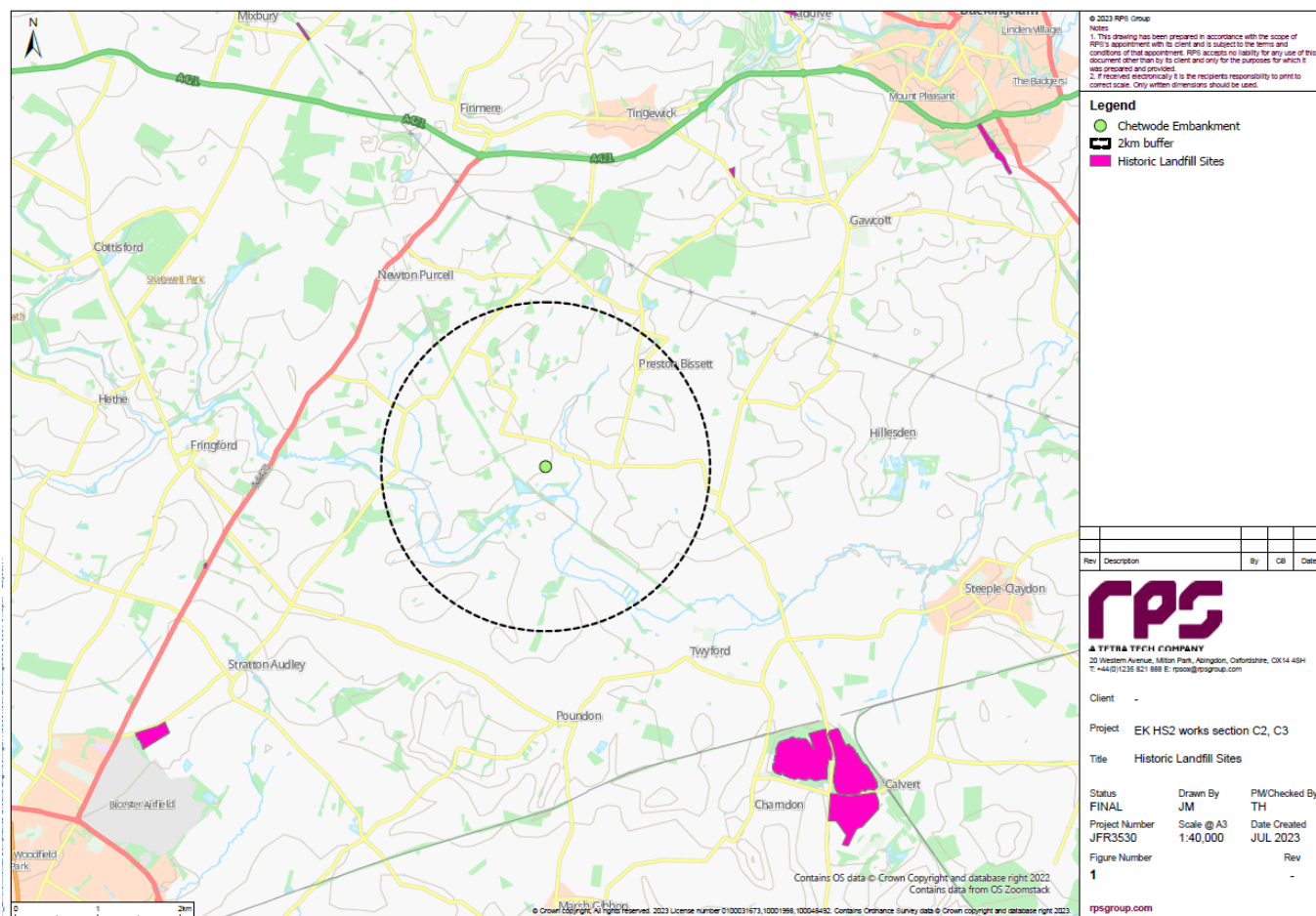
**Figure 1-1: Site Location and Permit Boundary**



- 1.3.4 The site is designated as poor quality agricultural land.
- 1.3.5 EA Nature and Heritage Conservation Screening Report (Bespoke Waste) EPR/LB3404KN/A001 (appended to the Environmental Risk Assessment (ERA) that also forms part of this application) identified the following ecological receptors:
- Code 2 protected species – within 500m
  - Deciduous woodland – within 50m
- 1.3.6 Upon further detailed screening by RPS (detailed within the Environmental Risk Assessment) none of the above identified receptors are within screening distances for environmental permitting and, therefore, are not expected to experience negative impacts from the operation of the scheme. See the receptor plan in Appendix C to this report.
- 1.3.7 The perimeter of the site will be secured by fencing. Access to the site will be controlled at the site entrance.

1.3.8 The DEFRA data services platform<sup>2</sup> has been reviewed for historic landfills and it has been confirmed that there are a number of historic areas of landfill close to the site as shown in Figure 1-2: Historic Landfills below.

**Figure 1-2: Historic Landfills**



<sup>2</sup> <https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/HistoricLandfill&Mode=spatial>

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## 1.4 Site Development

### Historical Development

- 1.4.1 From the earliest historical maps, dating back to 1880, no development of the land is indicated. It is therefore assumed to have been in agricultural use since that time.
- 1.4.2 Historic nearby land uses were mainly associated with the Great Central Railway, which ran approximately 70m from the site boundary, and is limited to cuttings, the nearest of which is approximately 190m from the site boundary.
- 1.4.3 An “unspecified mill” is indicated approximately 225m to the southeast of the site on the 1880 and 1900 maps but disappeared from maps by 1959 at the latest.
- 1.4.4 An “unspecified tank” was marked on a 1922 map, associated with Rosehill Farm, over 200m north of the site boundary.
- 1.4.5 A copy of the Groundsure report used to inform this ESSD Report is included within Appendix A. The Groundsure report listed a registered waste exemption, reference: WEX216695, within the site. The exemption related to a composting activity and use of compost. However, a search of the Environment Agency public register found no record of the exemption and none within a kilometre of the postcode area. The exemption is therefore, assumed to have been surrendered or expired.
- 1.4.6 There are three historical licensed discharges to controlled waters within 500m of the site boundary. All seem to be associated with treated septic tank effluent and all were revoked between February 1991 and February 1992.

### Proposed Development

- 1.4.7 The site has been acquired for the route of the HS2 high speed rail line from London to Birmingham. At the Chetwode Embankment section of the railway a landscape bund is to be constructed.
- 1.4.8 The landscape bund will be constructed of circa 20% waste from Finmere Quarry historic landfill and circa 80% of non-waste material comprising virgin clay.
- 1.4.9 The construction using waste material constitutes a recovery activity.
- 1.4.10 In total, approximately 60,000 m<sup>3</sup> of waste will be used to form the landscape bund.
- 1.4.11 The waste material will be placed in a 100mm – 200mm thick layers and compacted. The non-waste material will be virgin high plasticity clays.



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## 2 PATHWAY AND RECEPTOR

### 2.1 Geology<sup>3</sup>

- 2.1.1 Ground investigations and published geology specific to the site indicate this section of the HS2 route to be underlain by the following geological stratigraphy.
- 2.1.2 Superficial geology underlying the site on this section of the route is indicated to be Glacial Till, comprising soft to stiff silty clay with limited discontinuous pockets of sand. River Terrace Deposits are indicated to be present immediately south-east of the site, and generally comprise silts, sands and gravels. Alluvium is indicated to be present immediately south of the site which is heterogenous in nature and can comprise varying proportions of granular and cohesive soils.
- 2.1.3 The bedrock geology of the site comprises firm to stiff clays of Oxford Clay Formation (typically 2.5m thick) underlain by clayey sand and gravels and stiff clays of the Kellaways Formation (about 5m thick). This is underlain sequentially by the Cornbrash, Forest Marble and White Limestone Formations of the Great Oolite Group (15m+ thick) with base at 20 m+ bgl.
- 2.1.4 Geotechnical and hydrogeological testing of the Glacial Till and Oxford Clay indicates that the units generally have similar physical properties (composition, plasticity and permeability). The combined thickness of the two units ranges between 5 and 9 metres from south to north.
- 2.1.5 .

### 2.2 Hydrology

- 2.2.1 The site falls within the catchment of Padbury Brook that flows adjacent to the southeast boundary of the site at its closest point. According to Environment Agency records from 2019 Padbury Brook has a “Moderate” overall ecological status, with “Fail” Chemical rating and “Moderate” ecological rating.
- 2.2.2 The Padbury Brook WFD water body has been assessed as ‘Amber’ risk of deterioration due to the potential for cumulative impacts. This is primarily related to diversion of the main watercourse and presence of multiple culverts and is not influenced by the hydrogeological regime.
- 2.2.3 Monthly rainfall data is provided in Table 4-1.

#### Surface Water Abstractions

- 2.2.4 There are two surface water abstractions within 1 km of the site for “spray irrigation”, at a distance of 116m to the west and 174m to the south. Both are granted under the same licence.

#### Flooding

- 2.2.5 The EA flood risk maps<sup>4</sup> have been consulted and it is shown that the site is located in flood zone 1, an area with a low probability of flooding.

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<sup>3</sup> Twyford Viaduct to Barton Hartshorn Embankment: Hydrogeological Appraisal Report 1MC06-CEK-EV-REP-CS06\_CL10-000026

<sup>4</sup> [Flood map for planning - GOV.UK \(flood-map-for-planning.service.gov.uk\)](https://www.gov.uk/flood-map-for-planning)

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- 2.2.6 The site is not located in a flood alert or flood warning zone and is at a very low risk from flooding, from rivers. Very low risk means that each year this area has a chance of flooding of less than 0.1%. This takes into account the effect of any flood defences in the area. These defences reduce, but do not completely stop the chance of flooding as they can be overtopped or fail.
- 2.2.7 The site lies in an area at “negligible” risk of groundwater flooding, based on a 1 in 100-year return period and a 5m Digital Terrain Model (DTM).

## 2.3 Hydrogeology

- 2.3.1 The site is underlain by superficial deposits (Glacial Till beneath site), (River Terrace Deposits immediately south east) and (Alluvium immediately south).
- 2.3.2 River Terrace Deposits are classified as a Secondary A aquifer and intragranular flow will occur locally.
- 2.3.3 The alluvium is classified as a Secondary A Aquifer, however GI data includes 162 field description entries for alluvium, 144 of which are recorded as ‘clay’. The clay dominated nature of the alluvium means that groundwater flow will be limited.
- 2.3.4 The Glacial Till is classified as a Secondary A Aquifer, however geotechnical testing indicates the strata to generally comprise low permeability cohesive soil similar to that of the underlying Oxford Clay. It is indicated to comprise occasional pockets of sand however these are limited and discontinuous.
- 2.3.5 The Oxford Clay Formation of the bedrock is classified as an Unproductive Strata, i.e., rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. The Oxford Clay Formation is the shallowest formation that will principally be affected by the planned works. Limited published data is available for this formation, but the available data indicates that low permeability conditions will predominate across the Formation.
- 2.3.6 Underlying the Oxford Clay Formation, the Kellaways Formation is classified as a Secondary A Aquifer. These formations are formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers. intragranular flow.
- 2.3.7 The Great Oolite Group (GOG) (a collective name for Cornbrash Formation, Forest Marble Formation, White Limestone Formation, Rutland Formation, Taynton Limestone Formation and Sharp’s Hill Formation) underlies the Kellaways Formation. Of the GOG Formation the Cornbrash Formation and Forest Marble Formation are also classified as Secondary A Aquifers, while the White Limestone Formation is classified as a Principal Aquifer. These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
- 2.3.8 The Glacial Till and Oxford Clay underlying the site are considered to represent a combined low permeability unit of considerable thickness (5 to 9 metres) that will restrict potential contaminant pathways from the treated waste within the bund to the underlying Aquifer. Alluvium and River Terrace Deposits present immediately off-site will also be underlain by the low permeability Oxford Clay.
- 2.3.9 There are no identified Groundwater Source Protection Zones (GSPZ) within a 2 km radius of the site. The Groundwater Vulnerability Maps show the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and

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soil properties within a single square kilometre. By virtue of lying over an unproductive aquifer with no superficial aquifer, groundwater vulnerability at this site is classified as low.

## Groundwater Flow

- 2.3.10 Average groundwater levels for the Twyford Viaduct to Barton Hartshorn Embankment study area which includes the area for the landscape bund at Chetwode Embankment range from approximately 0.05 m bgl to 19 m bgl. Given the linear nature of ground investigation monitoring points it is not possible to accurately provide a groundwater contour plan due to the large degree of interpolation outside of the immediate line of monitoring. The available data suggests that groundwater flow directions broadly follow topographical gradients.
- 2.3.11 Groundwater flow through the superficial deposits will be limited due to the largely clay dominated nature of the deposits. Intergranular flow will occur through the Alluvium and River Terrace Deposits where locally present.
- 2.3.12 Groundwater occurrence and flow through the Oxford Clay Formation is expected to be negligible due to the extremely low hydraulic conductivity and cohesive nature of the formation. Some intergranular groundwater flow can be expected through the underlying Kellaways Formation although this will be controlled by the sand content of the formation in the area which is understood to be regionally variable.
- 2.3.13 Groundwater flow through the underlying Great Oolite Group (GOG) formations in this area will be controlled by the extent of secondary permeability development present within the limestone units. For this study it is assumed that the GOG formations are in hydraulic continuity and are confined by the overlying Oxford Clay and Kellaways Formations.

## Groundwater Quality

- 2.3.14 The site is on an unproductive aquifer therefore groundwater quality does not need to be assessed. The site is not also within a groundwater source protection zone (GSPZ).

## 2.4 Man-made Subsurface Pathways

- 2.4.1 The site lies in a rural setting approximately 150m from an isolated farm and cottages and 250m from the nearest public highway, Preston Bissett Road. Consequently, it is not anticipated that there will be underground utilities located within close proximity of the site.

## 2.5 Receptors and Compliance Points

- 2.5.1 The receptors and compliance points to be used in the detailed risk assessments enclosed with the Environmental Permit application are detailed within this section.

## Human Health

- 2.5.2 Human health receptors are considered to include future site users. The treated waste within the landscaping bund will pass the agreed Zone 3 material re-use criteria and will be placed within low permeability engineered Oxford Clay.
- 2.5.3 The landscaping bund will be topped by a cover layer designed to a specific landscaping specification and reuse requirements. The cover layer will be demarcated by an orange layer simply to indicate the presence of treated waste beneath.

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- 2.5.4 Pathways of dermal contact, ingestion and inhalation will therefore be restricted by the depth of placement and the presence of a the restoration layer.
  - 2.5.5 This pathway and receptor is considered in the CSM provided within Appendix D.

## **Groundwater**

- 2.5.6 Previous investigations indicate that groundwater underlying the site was encountered at the top of the Kellaways Formation, confined by the overlying low permeability Oxford Clay and Glacial Till.
- 2.5.7 There are no identified GSPZ within a 2 km radius of the site. The mudstone has low permeability that has negligible significance for water supply or river base flow and is therefore considered unproductive.
- 2.5.8 The landscaping bund will be filled with material that has been treated offsite and will not contain any hazardous pollutants. The works are considered to have negligible effect on groundwater. Therefore, no compliance points are proposed for groundwater.

## **Surface Water**

- 2.5.9 The nearest surface water receptor Padbury Brook, which is located approximately 190m to the southeast of the site boundary. It is proposed that existing off-site tributaries to this surface water receptor will be culverted and lined. This will restrict potential pathways from the treated waste within the bund.
- 2.5.10 There are no residential properties with gardens that would be considered vulnerable to run-off due to the proposed profile of the site.
- 2.5.11 The landscape bund at Chetwode Embankment lies in a slight depression. Therefore, it is not considered that there are any down gradient receptors that could be affected by the development.
- 2.5.12 This pathway and receptor is considered in the CSM provided with Appendix D.

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## **POLLUTION CONTROL MEASURES**

### **2.6 Site Engineering**

#### **Slope Stability**

- 2.6.1 Construction Quality Assurance (CQA) plans will govern all construction activities necessary in the development. These CQA plans will be prepared by competent and suitably qualified persons. A competent and suitably qualified person will supervise the construction activities.
- 2.6.2 The CQA plan preparation, along with the competent and suitably qualified person to supervise the construction activities will be a requirement of the groundworks contractor.

#### **Capping**

- 2.6.3 The waste materials imported to the site make up approximately 20% of the total materials used to construct the landscape bund. An orange demarcation layer will be installed between treated waste and restoration cover layer. The landscape bund will be capped with existing ground and non-waste material as per landscaping design and reuse requirements.

### **2.7 Restoration**

- 2.7.1 Other than the capping material described in paragraph 2.6.3 above, no further restoration will take place at the site.

### **2.8 Surface Water Management**

- 2.8.1 Surface water at the site will be generated from incidental rainfall only.
- 2.8.2 During the course of the earthworks, it will be necessary to ensure the working platform is carefully maintained and profiled to ensure no deterioration of the surface from an engineering perspective, and to ensure run-off is intercepted and managed in a controlled manner. Areas of ponded water will be pumped out or otherwise dealt with by the contractor.

### **2.9 Post Closure Controls**

- 2.9.1 The landscape bund will be constructed to the achieve levels approved by Buckinghamshire Council.
- 2.9.2 There is no requirement for a Closure and Aftercare Plan for recovery activities.
- 2.9.3 Upon completion of the recovery activity, a completion report shall be prepared detailing the waste accepted as part of the recovery activity, outcomes of monitoring throughout the life of the permit and confirmation that no pollution incidents or contamination have occurred at the site. If any pollution incidents or contamination are identified, details of any investigation and remediation shall be confirmed.
- 2.9.4 Upon permit surrender the surrender application will include records of the waste types recovered during the operational phase. Evidence will be provided to show that only permitted wastes have been accepted and that the site is in a satisfactory state.

## 3 MONITORING

### 3.1 Weather

- 3.1.1 Average annual precipitation recorded for the region is 647.8 mm as recorded between 1991 – 2020 at Woburn<sup>5</sup>, located approximately 26km east of the site. Climate data for this climate station are summarised below using Met Office data:

**Table 4-1: Climate Summary**

Month	Max. temp (°C)	Min.temp (°C)	Days of air frost (days)	Sunshine (hours)	Rainfall (mm)	Days of rainfall ≥ 1 mm (days)
January	7.38	1.63	9.66	52.95	55.36	11.68
February	7.98	1.50	9.97	72.27	44.57	9.97
March	10.64	2.72	6.88	114.93	39.60	9.33
April	13.78	4.08	4.30	151.94	48.28	9.70
May	16.94	6.80	1.30	191.49	51.86	8.70
June	19.97	9.75	0.00	185.69	54.18	9.23
July	22.42	11.93	0.00	198.40	51.20	8.45
August	22.08	11.96	0.00	185.30	58.61	9.41
September	18.96	9.75	0.03	141.58	55.35	9.05
October	14.66	7.27	1.57	104.48	70.67	10.97
November	10.34	4.10	5.27	62.04	64.46	11.67
December	7.70	1.80	10.20	48.32	58.18	11.50
Annual	14.44	6.13	49.18	1509.39	652.32	119.66

- 3.1.2 Further meteorological information will be obtained from the Woburn local Met Office Station. Data collected will include the total rainfall and effective rainfall, the prevailing wind direction and strength will also be obtained from an online source.

### 3.2 Gas Monitoring

- 3.2.1 Gas monitoring is not required as the waste to be accepted is inert and therefore not expected to generate gas.

### 3.3 Settlement Monitoring

- 3.3.1 Calculations and modelling of slope stability were undertaken at the design stage and published in the Chetwode Embankment Geotechnical Design Report (GDR) (MC06-CEK-GT-REP-CS06\_CL10-000032).
- 3.3.2 The static global stability of earthworks was calculated, adopting the principles of limit state equilibrium in accordance with Eurocode 7. Analysis of results was undertaken in accordance with the methodology given in the Technical Standard for Earthworks, also using Eurocode 7.

<sup>5</sup> <https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages>

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- 3.3.3 In accordance with Eurocode 7, slope geometries are considered stable when the minimum reported Factor of Safety (FoS) is  $\geq 1$ . The GDR reported that all calculated and modelled FoS results for static and seismic stability at Chetwode Embankment were  $>1$  (Table 4-22: Slope Stability results in the Chetwode GDR). Therefore, no mitigation for slope stability is deemed necessary.

## **3.4 Amenity Monitoring**

- 3.4.1 Daily monitoring will be undertaken in accordance with operating procedures for amenity issues such as dust. This will be achieved via visual inspections.

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## 4 SITE CONDITION REPORT

4.1.1 A Site Condition Report (SCR) is not necessary for a permitted activity for the permanent deposition of waste. Therefore, a SCR is not included as part of the Environmental Permit application. Notwithstanding see ASC's CSM report provided as Appendix D.



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## REFERENCES

[Landfill operators: environmental permits - What to include in your environmental setting and site design report - Guidance - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/landfill-operators-environmental-permits-what-to-include-in-your-environmental-setting-and-site-design-report)

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## Appendices

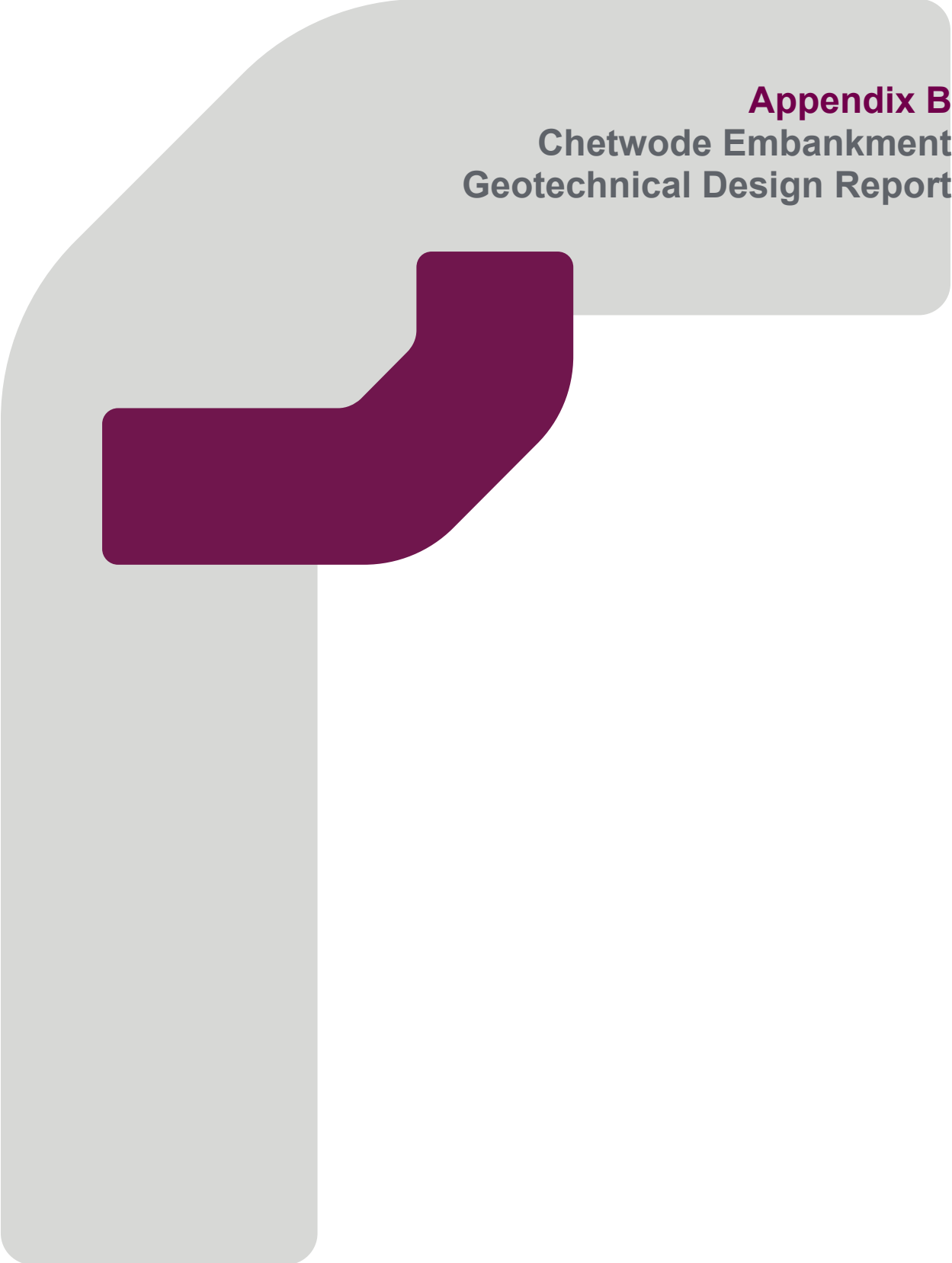
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## Appendix A

### Groundsure Report

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## **Appendix B**

### **Chetwode Embankment Geotechnical Design Report**

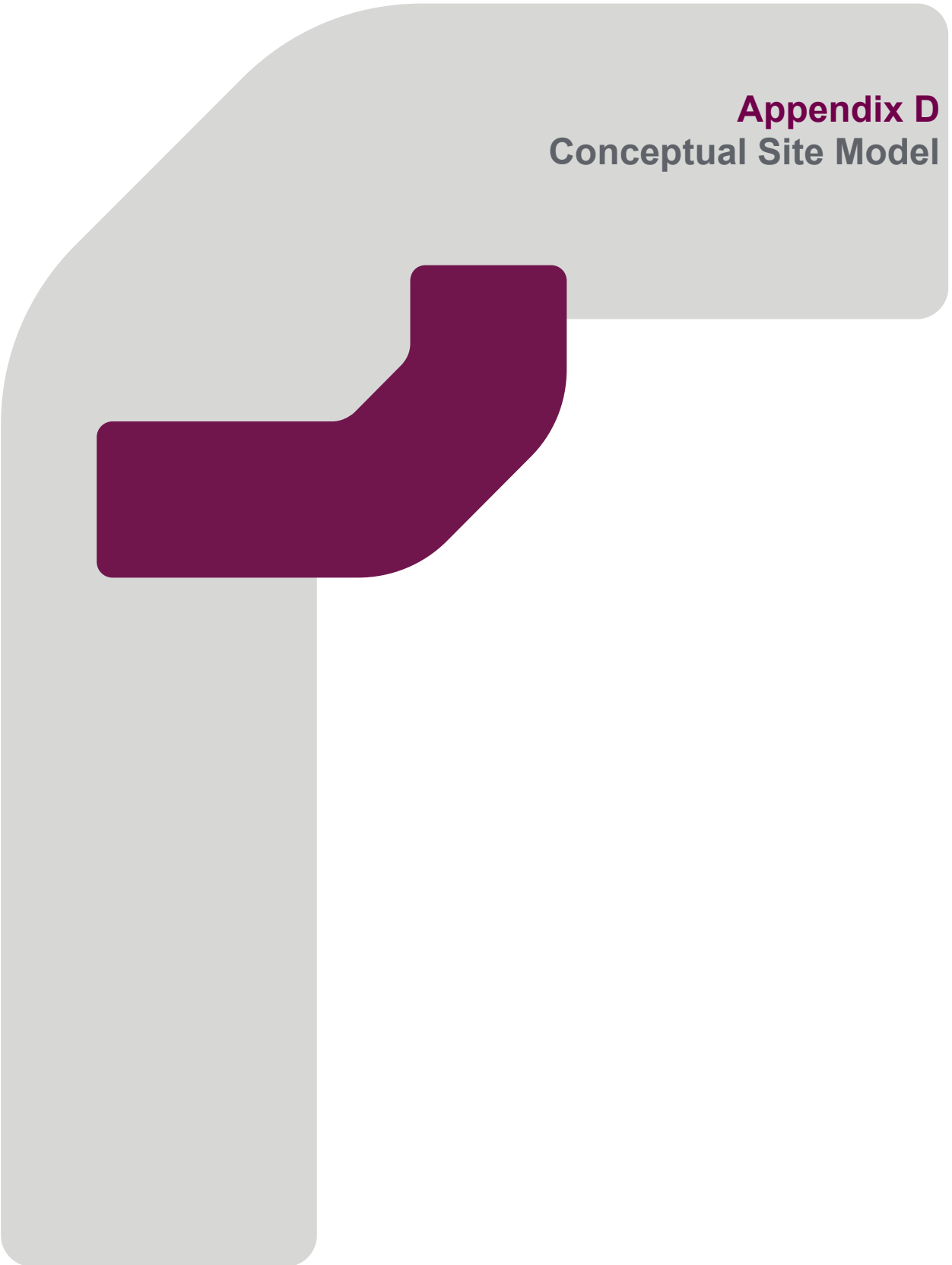
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## **Appendix C**

### **Receptors Plan**

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## **Appendix D**

### **Conceptual Site Model**