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**Thorpe Marsh Green Energy Hub Limited**

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# **THORPE MARSH LANDFILL (EPR/CP3091SC/V002 SUPPORTING INFORMATION AND NON- TECHNICAL SUMMARY**

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## 1. NON-TECHNICAL SUMMARY

Thorpe Marsh Landfill is a regulated waste disposal site covered by an Environmental Permit (WML number WD20D53, originally granted in 1977, now EPR/CP3091SC/V002). The site is located to the west of the former Thorpe Marsh Power Station (which was active between 1963 and 1994), approximately 6 km north of Doncaster town centre. The approximate centre of the site is at National Grid Reference 459480, 409490.

The permit allowed the disposal of pulverised fuel ash (PFA) as well as domestic, commercial and industrial wastes from the adjacent Thorpe Marsh Power Station. The landfill was operated prior to the implementation of the 2001 Landfill Directive (LfD) and was designed as a 'dilute and disperse' land-raise landfill. Some PFA deposition also occurred between 1963 when the power station opened and 1977 when the WML was granted. The volume of PFA deposited during this earlier period is unknown, although anecdotal evidence indicates that some material was used in local infrastructure projects.

The current landfill was formed by the construction of a three sided, 'U' shaped ("horseshoe") bund using PFA. Within the cell, the PFA waste was co-disposed with other permitted waste types (untreated domestic and commercial waste, and demolition waste) within the southern end of the site. In addition, anecdotal evidence from 1994 indicates that there are two areas where asbestos has been deposited beneath a covering layer of PFA, one of which is partially outside the landfill permit boundary. The early closure of the Power Station in 1994 resulted in the cell being only partially infilled and the landfill was put into closure. However, the landfill's environmental permit was not surrendered.

The site is to be redeveloped with a Battery Energy Storage Scheme (BESS), known as Thorpe Marsh Green Energy Hub (TMGEH). This is a nationally significant renewable energy scheme as documented in the supporting statement from the Client.

In accordance with the landfill guidance the scheme has inherently considered sustainability and the need to re-use on-site materials where possible and justifiable. EA Guidance<sup>1</sup> states:

*"Sustainability: demands that on-site or local materials are used where feasible. The Environment Agency actively encourages the use of low- grade materials, processed to make them acceptable, in appropriate situations within landfills"*

To construct the BESS requires a variation of the existing environmental permit to re-open the landfill and facilitate creation of a development platform by re-profiling some of the PFA from the eastern and western arms of the 'U' shaped bund. Proposals include excavation and re-deposition of PFA on top of the remaining PFA deposits only, with other localised co-disposed wastes including asbestos remaining in-situ (and not being disturbed). In-situ PFA slopes will also be regraded to aid stability. Waste from off-site sources will not be accepted as part of the variation. Ground investigation in 2024 has confirmed the current landfill material to comprise almost entirely PFA. However, a quarantine area will be developed if out of scope materials are identified during the excavation and re-disposition of the PFA. Any out-of-scope materials will be disposed of appropriately under waste duty of care.

Approximately 600,000 m<sup>3</sup> will be excavated and repositioned, which is approximately 13.5% of the estimated total volume of PFA in the landfill (estimates have been calculated from intrusive investigation data and engineering calculations). The new landfill cell will comprise an area of 26.1 hectares, with thicknesses of PFA in the new cell ranging from between 0.0 m (where the new cell will be formed by excavation into existing slopes) and 9.9 m at its deepest point.

A Conceptual Site Model has been developed, using information obtained from both historical and recent ground investigations and monitoring programmes. This includes ground gas monitoring, sampling and analysis of nearby surface water courses and groundwater in the PFA, and also the underlying drift deposits and sandstone bedrock.

Given the age and nature of the existing landfill (dilute and disperse), it is anticipated that the majority of leaching of contamination from the PFA has already occurred, as observed by elevated concentrations of some PFA derived contaminants in surface water and groundwater during recent monitoring events. Laboratory soil leachate testing of the PFA to be relocated has confirmed generally low concentrations with occasional minor exceedances of Generic Assessment Criteria. The mechanically agitated nature of the laboratory leaching tests overestimates leachate concentrations and demonstrates there is a very limited potential for leaching to occur during future earthworks activities and even less potential once the PFA is emplaced.

As such, the CSM and hydrogeological risk assessment (HRA) indicates that the movement of PFA and the creation of a thin layer of PFA within the new landfill cell on top of in-situ PFA will not create a new source of contamination. The lack of a contamination source and the existing elevated baseline conditions indicates that the new landfill cell will have a negligible impact on background groundwater and surface water conditions over the cell's lifetime. Therefore, the collection of leachate is not required and there is no requirement for installation of a top liner (landfill cap). Although the new landfill cell will not have an engineered cap, the compacted PFA will act as a low permeability layer ( $10^{-7}$  m/s) which will inhibit infiltration and provide improvement compared to the current free draining situation ( $10^{-5}$  m/s recorded in PFA groundwater monitoring wells).

The CSM and HRA also indicate that the current conditions provide effective protection of soil and groundwater over the whole lifespan of the landfill and that a geological barrier and bottom / sidewall liners are not required. The new landfill cell will contain PFA only. PFA is not biodegradable and so cannot produce ground gas, therefore the updated ground gas risk assessment indicates that ground gas does not need to be managed or collected.

PFA will be deposited in 250 mm thick layers and compacted to reduce future settlement. Stability and settlement risk assessments indicate that the design of the landfill is sufficient to form the development platform for the BESS and PFA slopes will be stable. Final landfill elevations will vary between approximately 7.0 metres above Ordnance Datum (m aOD) and 15.1 m aOD, with the development platform having a general sloping surface towards the south-west to aid surface water run-off.

The required BESS foundations (likely pre-cast concrete or composite strip foundations), cable ducts and surface water drainage systems will be constructed within the landfill cell, as part of the engineered landfill design. Surface water run-off will be collected and discharged via the existing discharge consent into the toe drain and then pumped to Thorpe Marsh Drain.

Landfill restoration is not included as part of this variation, but is likely to include placement of gravel on the landfill surface (BESS development platform), with seeded topsoil on PFA slopes to allow for landfill restoration activities to occur in future (detail not included in this application, but that will form part of a wider scheme include meeting the Client's ambitious biodiversity net gain targets).

The proposed final layout of the BESS will include provision for access to complete long-term monitoring during the aftercare phase prior to permit surrender.

## 2. SUPPORTING INFORMATION

### 2.0 Scope

Ramboll UK Limited has been requested by Thorpe Marsh Green Energy Hub Limited to prepare an application to vary Environmental Permit EPR/CP3091SC/V002 that is held for a raised dilute and disperse non-hazardous waste that is located at the former Thorpe Marsh Power Station, near Barnby Dunn, Doncaster, UK.

The application has been prepared following pre-application consultation with the Environment Agency and is to allow the excavation and re-deposition of the accepted waste type, Pulverised Fuel Ash (PFA), within the existing landfill. This is required to create a development platform for a proposed renewable energy Battery Energy Storage System (BESS), referred to as the Thorpe Marsh Green Energy Hub (TMGEH).

TMGEH is proposed for development under planning application that is currently in the process of being granted:

23/00537/FULM | Reclamation through construction and operation of Energy Hub incorporating Battery Energy Storage, Substation and associated Infrastructure, including earthworks to existing material and to provide development platform and construction of railhead. | Thorpe Marsh Ash Fields Marsh Lane Barnby Dun Doncaster DN3 1ET

### 2.1 Site Description and Surrounding Area

The site is located to the west of the former Thorpe Marsh Power Station (which was active between 1963 and 1994), approximately 6 km north of Doncaster town centre. The approximate centre of the site is at National Grid Reference 459480, 409490. A site location plan is presented as Figure 1, Appendix 1.

The original permit installation boundary drawing associated with WML number WD20D53 is not available for review; however, the assumed permit installation boundary is shown on Figure 2, Appendix 1. The total permit site area extends to approximately 61 Ha (hectares). This includes c.17 Ha of land to the west which is currently occupied by the Thorpe Marsh Nature Reserve and the eastern 44 Ha comprises the former Thorpe Marsh Power Station pulverised fuel ash (PFA) landfill. The landfill plot is unsurfaced and is mostly covered by naturally regenerating grassland and some small areas of scrub / woodland.

The site topography is dominated by the deposited waste and in particular a U-shaped bund covering much of the site area. The site levels vary between approximately 0m AOD in the south of the site to 24 m AOD at the top of the bund. A topographical survey was undertaken in February 2024 and is presented as Figure 3, Appendix 1.

The surrounding land use comprises predominantly agricultural land including the following:

- To the north, the existing Network Rail freight rail line with agricultural fields and minor roads beyond. Approximately 0.9 km from the northern boundary is the village of Thorpe-in-Balne.
- To the east, the former Thorpe Marsh (coal-fired) Power Station site (now demolished) and the existing National Grid 400 kV Thorpe Marsh Substation. Further to the east, Thorpe Bank (road), the River Don, agricultural fields, and the River Dun Navigation. Approximately 1 km from the eastern boundary is the village of Barnaby Dun.
- To the south, Thorpe Marsh Drain, agricultural fields and Fordstead Lane (road). Approximately 2 km from the southern boundary is the village of Arksey.

- To the west, the (Yorkshire Wildlife Trust managed) Thorpe Marsh Nature Reserve (with Thorpmere Pond present) followed by agricultural fields and another Network Rail line beyond. Approximately 4.75 km from the western boundary are the towns of Adwick-le-Street and Carcroft.

The raised Ea Beck / Thorpe Marsh Drain is present approximately 90 m south and it is flanked by levees. Beyond the EA Beck there are further drains in the wider surrounds.

## 2.2 Permit History and Background

Thorpe Marsh Landfill is a regulated waste disposal site covered by an Environmental Permit (formerly Waste Management Licence (WML) number WD20D53, originally granted in 1977, now EPR/CP3091SC/V002). The permit allowed the disposal of PFA as well as domestic, commercial, and industrial wastes from the adjacent Thorpe Marsh Power Station. The landfill was operated prior to the implementation of the 2001 Landfill Directive (LFD). Anecdotal evidence suggests that a 10m high horseshoe bund was created in the 1970s, although mapping from this time shows the area as fields. It should be noted that the original WML was granted in 1977, so it's likely that the bund was created after this was issued in the late 1970s. The height of the horseshoe bund was subsequently increased again to 20 metres in 1990 to allow additional storage, it is this PFA that is to be relocated (partially) as part of the proposed permit variation. The power station closed on 31st March 1994 and no subsequent material was deposited in the landfill.

In a discrete area at the southern end of the site PFA waste was co-disposed with other permitted waste types. Only PFA will be relocated as part of the proposed development earthworks and the commercial waste will remain untouched.

The proposed redevelopment of the landfill into a BESS will involve submission of a permit variation application for re-opening of the landfill to facilitate creation of a development platform using re-profiling of PFA from both the eastern and western arms of the 'U' shaped bund.

It is understood that PFA is not considered to be inert (email from Helen Culshaw of the Environment Agency dated 9th October 2023) and therefore the LFD standards for hazardous or non-hazardous wastes would apply. However, it was stated that some standards (including the specification of the lining and leachate collection system) could be reduced or removed based on a risk assessment.

In 2024 a separate application has been made to the Environment Agency to transfer the aforementioned Permit (EPR/CP3091SC/V002) from the current operator Banks Group to Thorpe Marsh Green Energy Hub Limited, following the acquisition of the development in 2023. The intent is to complete the name transfer and permit variation simultaneously to then allow the development to progress.

A site investigation was completed in 2024 to document the condition of the PFA and that has been used as the basis for developing a Conceptual Site Model and associated Hydrogeological Risk Assessment. This concludes that under laboratory conditions the PFA is only capable of leaching low concentrations of non-hazardous and hazardous substances that when subject to further Detailed Quantitative Risk Assessment does not result in an unacceptable pollution input or risk to the underlying groundwater or nearby surface waters.

The proposals involved the relocation and compaction of approximately 600,000m<sup>3</sup> of PFA. This will provide a low permeability cap to the existing deposits; a formal engineered cap, leachate or gas controls are not proposed based on the outcome of the risk assessment and that facilitates a sustainable design for the site.

The submitted documents provided with this application include:

- A Conceptual Site Model – report ref. 1620016237-012-RAM-RP-SS-00001.

- A Hydrogeological Risk Assessment – report ref. 1620016237-012-RAM-RP-SS-00003.
- An Environmental Setting and Installation Design report - ref. 1620016237-012-RAM-RP-SS-00004
- A Stability Risk Assessment – report ref 1620016237-012-RAM-RP-SS-00005
- A Non-Technical Summary - ref. 1620016237-012-RAM-RP-SS-00002 (provided in this document)
- Supporting Information required by the Environment Agency Permit Application Forms (provided in this document, ref. 1620016237-012-RAM-RP-SS-00002)

## **2.3 Application for an Environmental Permit Forms and Supporting Information**

### 2.3.1 Form A

No supporting information required.

### 2.3.2 Form Part C2

Section 2b Changes or additions to existing activities

Table 1 highlights the waste operation to comprise (i) the disposal of waste in a landfill receiving more than 10 tonnes of waste in any day, or (ii) with a total capacity of more than 25,000 tonnes. As noted earlier in this document the proposal comprises the relocation and de-deposition of ~600,00m<sup>3</sup> of PFA to form a development platform, this would exceed both criteria (i) and (ii).

### 2.3.3 Section 3c - Finances

The proposed cost profile and expenditure spreadsheet is provided with this application under separate cover.

### 2.3.4 Section 3b Your ability as an operator

Please refer to the transfer application ref for the future operators technical competency.

### 2.3.5 Section 3d - Management systems

A project specific Environmental Management System (EMS) will be produced for the project to meet the requirements of the Environment Agency's guidance for EMS for Permitted Activities. The EMS will complement the sites Construction Environmental Management Plan, future contractors method statements and risk assessments and the documentation and risk assessments submitted with this application.

### 2.3.6 Section 5a - Plans

See appendix for drawings that show the site boundary, permit boundary, discharge point, earthworks drawings and proposed drainage plans.

### 2.3.7 Section 5c - Provide a non-technical summary of your application

See non-technical summary provided at the start of this document.

### 2.3.8 Section Part C4

Section 1 What waste operations are you applying to vary?

Types of Waste Accepted

The landfill will accept PFA only, as waste code 10-01-02, coal fly ash, and potentially some component of 10-01-01, furnace bottom ash, if encountered locally or as inclusions. Unsuitable waste types, if encountered, will be removed and disposed to an appropriate licensed facility off-site.

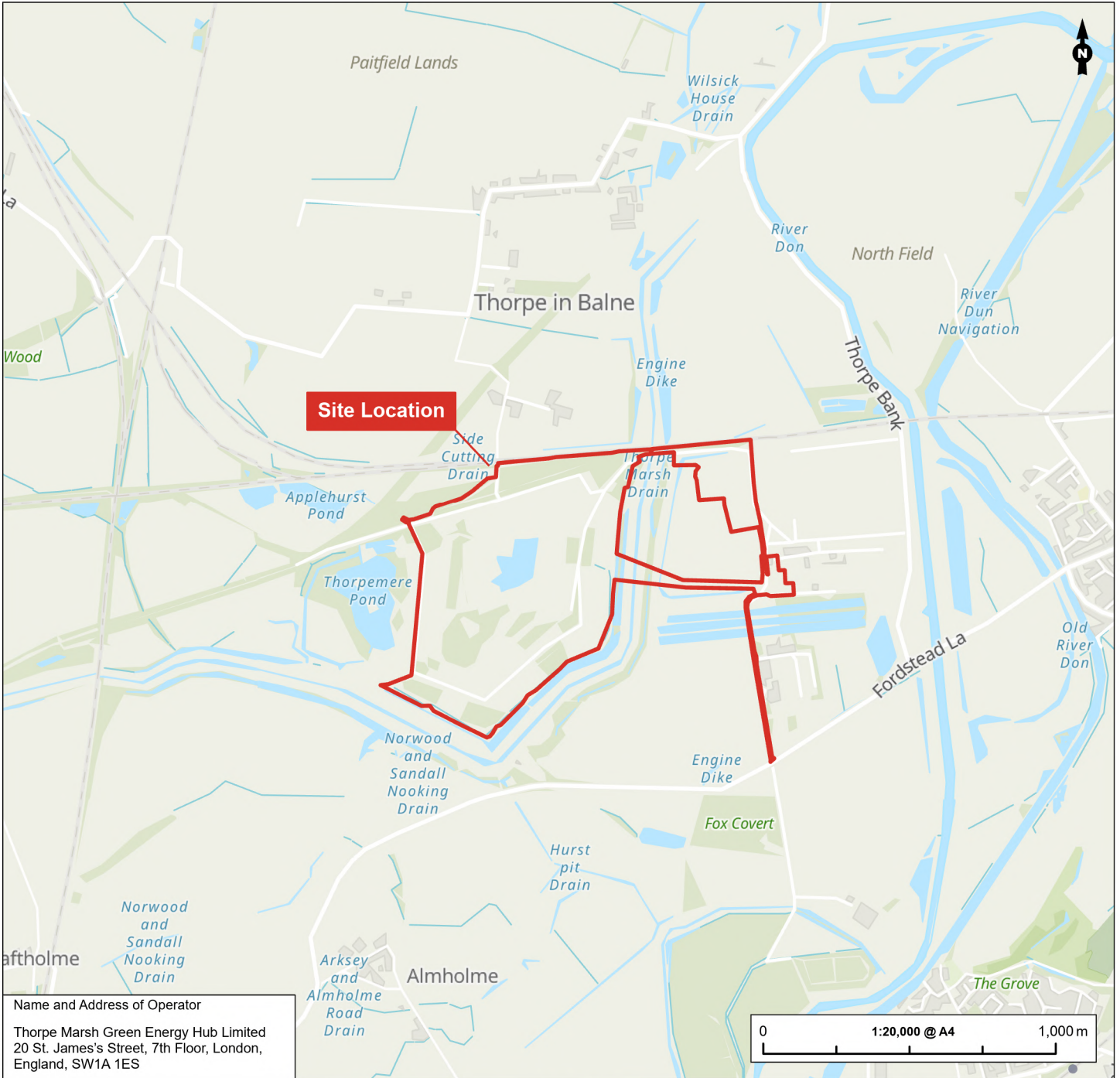
As a further comment to the content of Table 1a the landfill cell will only accept landfill waste that is necessary to form the development platform at a calculated volume of 600,000m<sup>3</sup>. No new waste will be accepted.




#### 2.3.9 4 - Monitoring

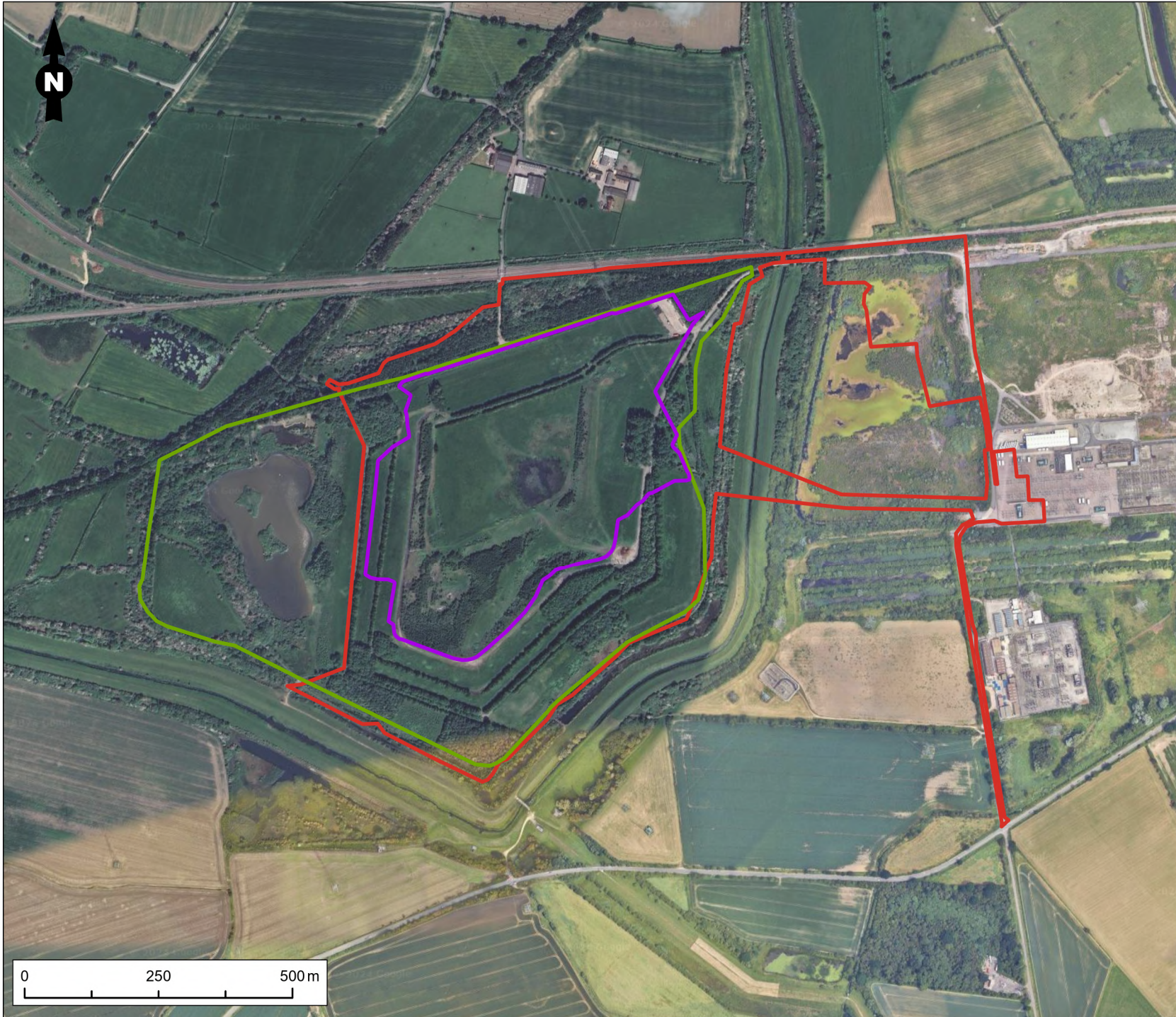
Surface water monitoring proposals are detailed in the environmental monitoring plan, report reference 1620016237-012-RAM-RP-SS-00006.

**APPENDIX 1**  
**FIGURES**



Name and Address of Operator  
 Thorpe Marsh Green Energy Hub Limited  
 20 St. James's Street, 7th Floor, London,  
 England, SW1A 1ES

	Figure Title <b>Site Location</b>	Project Name <b>Thorpe Marsh Landfill (EPR/CP3091SC/V002)</b>	Date <b>May 2024</b>	
	Client <b>Thorpe Marsh Green Energy Hub Limited</b>	Project No./Filey ID <b>1620016237 / REH2023N03018</b>	Prepared By <b>PJH</b>	Figure No. <b>1</b>
			Scale <b>As Shown</b>	Revision <b>1.0</b>



### Legend

- Planning Boundary
- Environmental Permit Boundary
- New PFA Cell Boundary

#### Name and Address of Operator

Thorpe Marsh Green Energy Hub Limited  
 20 St. James's Street, 7th Floor, London,  
 England, SW1A 1ES

#### Figure Title

Site Layout

Project Name  
**Thorpe Marsh Landfill**  
 (EPR/CP3091SC/V002)

Project No./Filey ID  
 1620016237 / REH2023N03018

Date	Figure No.	Revision
May 2024	2	1.0

Prepared By PJH	Scale 1:10,000 @A4
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Client  
**Thorpe Marsh Green  
 Energy Hub Limited**






**Legend**

- Environmental Permit Boundary
- Surveyed Contour (m AOD)

**Surface Elevation (m AOD)**

26

-2

Name and Address of Operator		
Thorpe Marsh Green Energy Hub Limited 20 St. James's Street, 7th Floor, London, England, SW1A 1ES		
Figure Title		
Ground Elevation		
Project Name		
Thorpe Marsh Landfill (EPR/CP3091SC/V002)		
Project No./Filey ID		
1620016237 / REH2023N03018		
Date	Figure No.	Revision
May 2024	3	1.0
Prepared By	Scale	
PH	1:5,000 @A3	
Client	Thorpe Marsh Green Energy Hub Limited	
		

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