Geosyntec consultants

engineers | scientists | innovators

ISO 9001
ISO 14001
ISO 45001

Certificate Number 14638

Phase 1 Desk Study

Singleton Birch, Lincolnshire

Prepared for

Centrica Energy Assets
Woodland House
Woodland Park
Hessle
HU13 0FA

Prepared by

Geosyntec Consultants Ltd
1st Floor Gatehead Business Park
Delph New Road
Delph
Oldham
OL3 5DE

Project Number: GCU0127073

2nd September 2025

[FINAL]

Geosyntec consultants

Project Title:	Singleton Birch Phase 1 Desk Study
Project No:	GCU0127073
Report Ref:	GCU0127073/P1
Status:	Final
Client:	Centrica Energy Assets
Client Address:	Woodland House Woodland Park Hessle HU13 0FA
Issued By:	Geosyntec Consultants Ltd1st Floor Gatehead Business Park Delph New Road Delph Oldham OL3 5DE

Document Production / Approval Record (final documents only)

	Name	Signature	Date	Position
Prepared by	Rhian Lynes	[redacted]	02/09/2025	Project Professional Environmental Consultant
Reviewed by	Dan Maher	[redacted]	02/09/2025	Senior Environmental Scientist
Approved by	Tim Strowbridge	[redacted]	02/09/2025	Principal Consultant

EXECUTIVE SUMMARY

Geosyntec Consultants Limited (Geosyntec) were instructed by Centrica Energy Storage Ltd (Centrica, the "Client") to perform a Phase 1 Desk Study for the property located at Melton Ross Quarries, Melton Ross, DN38 6AE (the "Site") to support a future planning application for a hydrogen production facility.

The Site forms part of the Singleton Birch quarry, comprising a triangular parcel of land south of the main quarry and lime works located between the A18 road and railway line. It is understood this segment of land formed the original quarry at the Site (formerly known as Melton Ross Quarries) and was later used as a landfill. Recent restorative backfilling has taken place, ahead of a proposed redevelopment of the land into a business park. Outline planning permission for the industrial park has been granted by North Lincolnshire Council under reference number PA/2017/463.

A review of available historical mapping showed the Site as part of the *Chalk Hill* quarry and lime works in the earliest available map from 1886. Over time, the quarry expanded within the triangular plot of land, resulting in two excavations in the east and west of the Site. The main quarry, later renamed Melton Ross Quarry and then Singleton Birch, has generally expanded towards the north and northwest, away from the Site. A former RAF base to the southeast of Site was also present (though not shown on historical mapping) and later was redeveloped into Humberside Airport, which is still operational today. Limited development of the surrounding area has been undertaken beyond the quarry and airport.

The Site held an environmental permit for a landfill from 1981, and is understood to have been operating as a landfill prior to then. The Site was shown as a *Refuse Tip* on the 1994 historical map. It is understood landfilling operations ceased in 2006, and ongoing monitoring of groundwater and ground gas has been conducted by SLR Consultants. Reports available on the North Lincolnshire planning portal and Environment Agency (EA) inspection reports of the Site (supplied by the Client) showed the Site has exceeded compliance monitoring requirements of the permit for mecoprop and ammoniacal nitrogen. The 2024 permit compliance assessment report by the Environment Agency stated that if exceedances of ammoniacal nitrogen continued then further action would be required. The report did not give the level recorded.

Elevated methane and carbon dioxide have also been detected in landfill gas monitoring wells. The highest recorded methane was 10.9 % and carbon dioxide was 6.6 % in a dedicated landfill gas risk assessment report, both taken from monitoring location "2". Flow rates at the Site were found to be low, ranging from -0.1 to -0.3 l/h in a 2017 monitoring round.

The Site has recently undergone a land raising exercise, ahead of the proposed development. Engineering specifications for the land raising have not been supplied, but a copy of the environmental permit for a waste recovery operation at the Site was supplied.

The Geosyntec Conceptual Site Model has shown that there is a risk to future site users from five Potentially Complete Pollutant Linkages (PCLP) including:

1. **PCPL 1:** Contamination from Made Ground within the landfill migrating through groundwater and impacting upon the Principal Aquifer and SPZ III drinking water source.
2. **PCPL 2:** Landfill gas generation at the Site migrating into building spaces and impacting upon future site users.
3. **PCPL 3:** Future site users coming into direct contact with Made Ground at the Site.
4. **PCPL 4:** Future site users inhaling asbestos fibres within Made Ground at the Site.
5. **PCPL 5:** Potential PFAS and hydrocarbon contamination migrating through groundwater from Humberside Airport.

Further investigation is recommended at the Site, including;

- Additional ground gas monitoring which would be representative of post-land raising ground conditions. Proposed new monitoring wells should target building footprints of the proposed development;
- Groundwater monitoring, focussing on a broader spectrum of analytical testing in relation to human health and risk to controlled waters. Proposed new monitoring wells should target the development area, and if appropriate monitoring location down-gradient of the waste body;
- Soil sample analysis, focussing on a broader spectrum of analytical testing in relation to human health, including asbestos screening samples to further characterise potential asbestos contamination of the waste;
- Waste classification testing for waste soil arisings during construction;
- Geotechnical testing to confirm suitability of the backfilled materials for the end development.

LIMITATION

Geosyntec Consultants Ltd (Geosyntec) has prepared this report for the sole use of Centrica in accordance with the Agreement under which our services were performed. No other warranty, express or implied, is made as to the professional advice included in this report or any other services provided by us. This report may not be relied upon by any other party without the prior and express written agreement of Geosyntec, which will not be unreasonably withheld.

Unless otherwise stated in this report, the assessments made assume that the site and facilities will continue to be used for their current purpose without significant change. The conclusions and recommendations contained in this report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested. Information obtained from third parties has not been independently verified by Geosyntec, unless otherwise stated in the report.

Where assessments of works or costs required to reduce or mitigate any environmental liability identified in this report are made, such assessments are based upon the information available at the time and may be subject to further investigations or information which may become available. It is therefore possible that cost estimates, where provided, may vary outside stated ranges. Where assessments of works or costs necessary to achieve compliance have been made these are based upon measures which, in Geosyntec's experience could normally be negotiated with the relevant authorities under present legislation and enforcement practice, assuming a pro-active and reasonable approach by site management.

COPYRIGHT

TABLE OF CONTENTS

FIGURES

APPENDICES

1 INTRODUCTION

Geosyntec Consultants Limited (Geosyntec) were instructed by Centrica Energy Storage Ltd (Centrica, the "Client") to perform a Phase 1 Desk Study for the property located at Melton Ross Quarries, Melton Ross, DN38 6AE (the "Site").

The Site forms part of the Singleton Birch quarry, comprising a triangular parcel of land south of the main quarry and lime works located between the A18 road and railway line. It is understood this segment of land formed the original quarry at the Site (formerly known as Melton Ross Quarries) and was later used as a landfill. Recent restorative land raising has taken place, ahead of a proposed redevelopment of the land into a business park. Outline planning permission for the industrial park has been granted by North Lincolnshire Council under reference number PA/2017/463.

This Phase 1 is to support the planning application for a proposed hydrogen plant. The land ownership and development boundaries are shown in **Figure 1**.

1.1 Scope of Works

The aim of the Phase 1 Desk Study review has been to provide the Client with an understanding of potential environmental risks and liabilities associated with the subject Site, in particular:

- Environmental issues such as potential presence of contamination of soil, groundwater and buildings caused by historic or current activities or any off-site exposure. Structural, planning issues, cultural history or heritage issues were not considered;
- Areas relating to compliance with applicable environmental regulations;
- The need for further investigation of potential contamination and discharges;
- Immediate surrounding land use.

The work has included a review of publicly available maps, environmental databases, historical aerial photos, environmental documentation provided by the Site and a Site inspection conducted on the 9th January 2025. It was agreed that the purpose of the Site visit conducted as part of this project was visual inspection only, therefore no sampling or testing was carried out.

Geosyntec has produced a Conceptual Site Model (CSM) and conducted a preliminary risk assessment which are collated in this report.

The scope of this report did not include assessments relating to Occupational Health and Safety, Environmental Health and Safety, Noise or Nuisance.

2 SITE DESCRIPTION

2.1 General Characteristics

The Site comprises an approximately 7.7 hectare property located near Melton Ross, Lincolnshire. The Site location is shown in **Figure 1.** The Site is currently a disused piece of land, south of the main Singleton Birch quarry and lime works. It is understood restorative land raising was recently completed at the Site in preparation for the upcoming redevelopment.

The property is owned by Singleton Birch.

The general Site layout is shown in **Figure 2**. The Site is currently vacant, but a weighbridge and welfare cabin were present from the recent land raising exercise. The Site is bounded by a railway line to the north and a road to the south, with mature trees around the boundary. The Site is divided into two former excavation halves in the east and west, with different ground levels in each half. The topography lowers in the north, southwest and west where filling has not yet been completed. There are several soil embankments along the north of the Site where previous quarrying was completed.

Photographs from the Site visit on 9th January 2025 are provided in **Appendix A**.

2.2 Surrounding Area

The area surrounding the Site is currently a mix of residential, commercial and agricultural properties.

Current adjoining land uses are summarised below:

Direction	Adjacent Land Use	Beyond Neighbouring Properties
North	Railway line immediately north. Singleton Birch quarry and lime works beyond.	Agricultural fields. A180 road (dual carriageway, 1.2 km)
East	Agricultural field.	Further agricultural fields. Village of Kirmington (1.5 km)
South	A18 road (single carriageway) immediately south, with 1 no. residential property beyond, agricultural fields to the south and southwest, and Humberside Airport to the southeast.	Agricultural fields.
West	Railway line immediately north. Singleton Birch quarry and lime works beyond.	Agricultural fields. Melton Ross village (1.2 km)

2.3 Physical Setting

2.3.1 Geology

The Site is depicted on the Ordnance Survey (OS) 1:10,000 scale map at National Grid Reference TA086111. The Site was observed to be generally flat, with some steep embankments and depressions along the northern and southern edges and at the western end.

The British Geological Survey 1:50,000 geological map series, Sheet 89 (Brigg), was consulted for the geology underlying the Site.

The Site is shown as comprising Made Ground and Infilled Ground. There are no Superficial deposits mapped within 1 km of the Site.

Bedrock geology was identified as the Welton Chalk Formation comprising thickly bedded chalk with flint nodules. It is understood the quarry was progressed to the "Black Band" at the base of the Welton Chalk Formation, described as a marl horizon approximately 1.00 m thick, beyond which is the underlying Ferriby Chalk.

2.3.2 Borehole Records

There are 5 no. borehole records within 200 m of the Site, some of which are publicly available through the British Geological Survey GeoIndex[1] viewer. These dated to the early 20th Century.

The nearest available borehole to the Site (ref. TA01SE130) is located approximately 100 m northwest of the Site, within the Singleton Birch quarry . The encountered geology in this borehole comprises:

Depth From (m)	Depth To Base (m)	Formation	Geological Description
0.00	4.26 (14ft)	"Well"	"Well" – log is record of groundwater well installed in 1913.
4.26	11.58 (38ft)	Welton Chalk	Chalk
11.58	12.49 (41ft)	Black Band	"Blue Clay"
12.49	17.06 (56ft)	Ferriby Chalk	Chalk

In addition to the publicly available borehole records, logs from the Site were included in the Client supplied *Closure Plan: Hydrological Risk Assessment* (SLR Consulting, June 2015, reference: 404.00075.00084). This included two locations (referenced IT4 and IT5 in the report text, but numbered S3A and S2 respectively in the borehole logs) located within the landfill material.

IT5/S2 was located on the eastern side of the landfill and encountered 9.50 m thickness of Made Ground comprising concrete, brick, tarmac and slag. IT4/S3A was located on the western side of the landfill and encountered a gravelly clay with "abundant fabric fragments", concrete, brick, chalk and mudstone gravel. The base of the landfill material was encountered at 3.45 m depth.

[1] GeoIndex, British Geological Survey. Accessed on 07 January 2025; https://mapapps2.bgs.ac.uk/geoindex/home.html

2.3.3 Hydrology and Groundwater

The nearest surface water feature is a pond located approximately 550 m west of Site.

According to the previous SLR ground investigation, groundwater was encountered at 8.0 m depth within the landfill material in IT4/S3A. Leachate was also recorded in IT4/S3A and IT5/S2, approximately 4.00 m above nearby groundwater levels. Due to the age of the landfill, the material is uncapped, unlined and not subject to leachate or ground gas control measures.

Wider groundwater within the chalk bedrock was found to flow to the northeast, though localised mounding of groundwater was observed, which may be a function of dewatering from quarrying activities.

The Welton Chalk bedrock is classified as a Principal Aquifer. Principal aquifers are classified by the Environment Agency as strategically important rock units with high permeability and water storage capacity. It is understood the Ferriby Chalk, underlying the Welton Chalk, is also classified as a Principal Aquifer.

The nearest groundwater abstraction point is located 72 m north within the Singleton Birch Quarry. A second groundwater abstraction is also present 144 m northwest within the quarry. It is understood that the abstractions are used for process water at the quarry.

The Site does fall within a Source Protection Zone (SPZ) Zone III area for a groundwater abstraction located approximately 1.7 km northeast of the Site.

There are no surface water abstraction points within 1.5 km of the Site.

2.3.4 Flooding

According to the Envirocheck report, the Site is not at risk of extreme flooding from rivers or the sea.

The Environment Agency data suggests the Site would be susceptible to a 1 in 30-year flood event. The flooding contours centre around three topographically low areas in the east and west of the Site, and may be based on previous topographic information.

The British Geological Survey data suggests there is potential for groundwater flooding at the Site.

2.4 Geological Hazards

2.4.1 Mining and Extraction

According to the Envirocheck report, there are 17 individual recorded mineral sites within 500 m the Site. Of these, 4 are recorded at the Site itself. All the entries relate to different areas of the wider Singleton Birch and Melton Ross quarries.

The Site is not in a Coal Mining Affected area.

2.4.2 *Radon*

The Site does not fall within a Radon Affected area. Less than 1 % of homes are above the action level. Radon protection measures are not required.

2.4.3 *Other Geological Hazards*

Feature	On Site	Within 250 m
Potential for Collapsible Ground Stability Hazards	Very Low	Very Low
Potential for Compressible Ground Stability Hazards	Moderate	Very Low
Potential for Ground Dissolution Stability Hazards	No Hazard	No Hazard
Potential for Landslide Ground Stability Hazards	No Hazard	No Hazard
Potential for Running Sand Ground Stability Hazards	No Hazard	Very Low
Potential for Shrinking or Swelling Clay Ground Stability Hazards	Very Low	Very Low

3 SITE HISTORY

3.1 Historical Mapping

Geosyntec review the historical maps and aerial photographs as part of the Envirocheck report. The full maps are provided in **Appendix B** and are summarised below:

Date	Source	On Site	Off Site
1886 - 1887	OS 1:2,500 & 1:10,560	The main triangle of land comprises a cutting in the southwestern corner, with a railway siding coming off the main railway line into the cutting. The eastern side appears to be undisturbed, with the parish boundary marked across a field boundary intersecting the Site. The area of the current kilns to the north is shown as part of a field north of the railway line.	*Manchester, Sheffield & Lincolnshire Railway* [0 m N] runs southeast to northwest along the Site boundary. *Chalk Hill* quarry [0 m NW] is present immediately north of the railway line, showing some buildings, railway sidings and *Limekilns*. Quarry excavation is approximately 330 m in length. *Camp Covert* woodland and *Yarborough Camp* Roman camp [500 – 900 km N]. Residential property [20m SE]. *Quarry* [75 m S] Melton Ross village [1.15 km W] and Croxton village [1 km NE]. Largely farmland with occasional farm houses.
1907-1908	OS 1:2,500 & 1:10,560	No recorded changes.	*Chalk Hill* quarry expanded with additional buildings, railway sidings, *Limekilns* and expansion of excavation. Additionally marked as *Whiting and Lime Works*.
1950 – 1951	OS 1:10,560	Railway siding showing a shorter route. Addition of a track in the centre of the Site, with excavations shown on the western and eastern sections.	Expansion of the main quarry towards the north. No changes marked for the wider area.
1956	OS 1:10,000	Site is shown with a water body in the western section, a ridge in the southern central section, the railway siding, and excavation with water body in the eastern section. The area of the current lime kilns to the north is shown as part of the main quarry excavation.	Further expansion of the main quarry towards the north. *Airfield* [1 km SE] marked in the field to the southeast – no structures or runways marked.
1969 – 1970	OS 1:2,500	The railway siding is no longer marked. *Water* is labelled in two areas in the western and eastern excavations. Two buildings are present along a track in the central ridge of the Site. Buildings added in the area of the current lime kilns to the north, but not matching the current building layout.	Some changes to the buildings layout in the southwest of the main quarry. Further expansion of the quarry to the north and northeast. Addition of buildings around the area of the current limekilns, but not to the current building layout. *Lime kilns* and *Tank* labelled. *Limestone Quarry* and *Spoil Heap* labelled north of the A160 road, immediately north of the main quarry. Road bordering the Site to the south labelled as *A18*. *Airfield (Disused)* [500 m SE] showing "X" shaped runways and taxiways – expands outside of the map boundaries. *Filling Station* [2 no., 800 m E] on the *A18* road.

Date	Source	On Site	Off Site
1972	OS 1:10,000	No marked changes at this scale.	Continued expansion of the quarry to the northeast. *Limestone Quarry* and *Active Workings* marked on excavations northwest of the *A160* road.
1991	OS 1:10,000	Possible backfilling of the eastern side of Site – water body shown in the southwestern corner of Site with rough ground marked surrounding it and in the eastern excavation.	Quarry workings to the northeast of the main quarry marked as *Quarry (Disused)* [135 m N]. *Chalk Pit* [675 m E] with conveyor extending the workings northeast. Former marked *Limestone Pit* marked as *Disused Workings* [250 m E]. *Humberside International Airport* [630 m SE] with car park, buildings and runways matching the previous airfield layout. *Filling Stations* [800 m E] no longer marked. *A180* dual carriageway [1 km N] bordering the Camp Covert woodland.
1994	OS 1:2,500 (partial)	Site marked as *Refuse Tip* with *Pond* in the southwestern corner. Current *Limekilns* and other structures shown in the northern section of the development area.	Additional building, structures, tanks and conveyors within the main quarry site, mostly matching the current site layout. Partial map only extends 200 m beyond Site and other areas not shown.
2000	OS 1:10,000	Site no longer marked as *Refuse Tip* but shown as rough ground.	Continued expansion of *Quarry (Limestone)*, extending up to 1.25 km north of Site with *Conveyor* crossing the disused workings. *Workings (Disused)* [400 m W]. *Quarry (Disused)* [400 m N]. Expansion of Humberside International Airport [55 m SE].
2006	OS 1:10,000	*Pond* no longer marked in the southwest. Site covered by rough ground surrounded by cuttings. Structure shown in the centre of Site.	*Quarry* extended into *Camp Covert* woodland [1 km N]. Minor expansion of *Humberside International Airport* [220 m SE].
2009	OS 1:10,000	No changes at this scale.	No changes at this scale.
2013	OS 1:10,000	No changes at this scale.	Additional buildings within the main quarry [300 m N and 700 m NW].
2016	OS 1:10,000	No changes at this scale.	Minor changes to main quarry processing area north of the railway. Possible expansion of the quarry further west outside of the mapped area.
2024	OS 1:10,000	Site marked as scrub ground in the western section. Small buildings present in the centre of Site off the track. Rough ground or spoil heap marked in the eastern excavation.	Addition of tanks, buildings and *Flare Stack* north of the limekilns. Marked as *Workings* [380 m N]. *Reservoir (covered)* [500 m N] within the quarry. Continued expansion of quarrying area to the northeast, outside of mapping area. Expansion of *Humberside International Airport* with the addition of hotels, car parks and other buildings.

It is understood the quarry first opened in the 1840's and appears on the earliest available map from 1887 as *Chalk Hill* quarry. The main quarry and buildings are located north of the railway line, outside of the Site and development area boundary. Over time, the quarry expands within the development Site and is shown as two excavation areas in the west and east. These excavations are shown to contain water in the 1969-1970 mapping, before being marked as a *Refuse Tip* in the 1994 map. The Site is shown as backfilled by the 2006 map and remains unchanged up until the latest 2024 map.

Whilst a railway siding was marked on the earlier available maps, the area it stood on was later shown as part of the quarry excavation, and so any related potential contamination will have been removed during excavation.

The historical maps show how the wider quarry north of the railway line has expanded over time, generally expanding towards the north and northwest. The only other notable change in the surrounding area is the development of Humberside Airport to the southeast. There are limited changes and development to the wider area around the quarry, which maintains a rural and agricultural use.

3.2 Local Authority Records

Geosyntec searched the North Lincolnshire planning portal on 14th January 2025 and found 1 no. planning applications linked to the Site. The applications have been reviewed and applications which provide information on the Site history or environmentally pertinent information are discussed below.

3.2.1 On Site

Record Reference	Date and Status	Description
PA/2017/463	28 February 2018 Split Decision	*Hybrid application for full planning permission for land raising; and outline planning permission with all matters reserved for an industrial park.* Application for outline planning permission for an industrial park at the Site, including a full granted application for land raising at the Site. The application included a number of geo-environmental reports including a site investigation, hydrogeological risk assessment and landfill gas risk assessment. These are discussed in more detail in Section 3.3 below. The outline permission for an industrial park included 25 no. planning conditions in total, of which Condition 15 related to contaminated land. Condition 15 states that a Phase 1 desk study and remediation scheme should be submitted to the local authority, the remediation scheme should be implemented as approved and any unexpected contamination should be reported.

3.2.2 Off Site

A total of 23 no. planning applications were listed on the North Lincolnshire planning portal for the DN38 6AE postcode, all of which relate to operations at the main quarry dating back to 2000. Key applications in relation to contaminated land and environmental issues are discussed below.

Record Reference	Date and Status	Description
PA/2024/1350	9 January 2025 Approved	*Prior approval under Schedule 2, Part 17, Class B of the Town & Country Planning (General permitted Development) (England) Order 2015 for an extension to Hydrate Plant at Melton Ross Lime Works, Single Birch Ltd, Melton Ross Quarries, Barnetby, DN38 6AE* This application related to Prior Approval for an extension at the hydrate plant at the main quarry. The decision was that Prior Approval was not required.

Record Reference	Date and Status	Description
PA/2023/1045	26 April 2024 Approved with conditions	*Planning permission to construct and operate an anaerobic digestion facility and associated ancillary infrastructure for the production of biomethane and carbon dioxide.* This application is for a second anaerobic digestion facility within the main quarry to the north. The application conditions included Condition 3 which stated: "*If, during development, any odorous, discoloured or otherwise visually contaminated material is found to be present at the site then no further development shall be carried out until a written method statement detailing how this contamination shall be dealt with has been submitted to and approved in writing by the local planning authority.*"
PA/2022/1865	25 May 2023 Approved with conditions	*Planning permission to vary condition 5 of PA/2021/1665 to operate the approved calciner plant 24 hours a day, 7 days a week*
PA/2021/1665	28 February 2022 Approved with conditions	*Planning permission to erect a feed and storage silo, flash calciner plant, oxygen plant, motor control centre and tanker parking area.* This application included a desk study and Preliminary Risk Assessment in relation to contaminated land (Swan Environmental, no report reference, dated July 2021). The desk study concluded that a site investigation would be of greater risk to the Principal Aquifer, by potentially creating a pathway for potential contamination to enter the groundwater. The final approved conditions included a similar condition to application PA/2023/1045 that any contamination encountered during construction must be reported to the local authority.
PA/2019/159	22 March 2019 Approved with conditions.	*Planning permission to erect new changing room / welfare facility including the demolition of existing garages.* Application to erect new welfare facility in the main quarry. No contamination reports supplied. Condition to report any contamination encountered during construction.
PA/2018/2471	3 May 2019 Approved with conditions.	*Planning permission to construct a new anaerobic digestion facility and associated ancillary infrastructure.* Application for an anaerobic digestion facility in the main quarry site. Included a condition to report any contamination encountered during construction, and a condition to make information on the site geology available to geologists and the public. Application did not include a desk study or investigation in relation to contaminated land.
MIN/2000/0242	3 November 2000 Approved with conditions	*Planning permission to extend existing quarry and for its subsequent restoration by landfilling* No documentation available on the online portal. Unclear if this location relates to the Campwood Landfill to the north or the Site.

3.3 Previous Reports and Supplied Documentation

The following reports and documentation were provided to Geosyntec for review:

- Closure Plan: Hydrogeological Risk Assessment, SLR Consulting, ref. 404.00075.00084, dated June 2015
- Environmental Permit EPR/GB3405CL for waste recovery operation, dated 1st August 2018, Permit Holder: Singleton Birch Ltd.
- Environmental Permit EPR/DP3195NA/V009 for the landfill, dated 10th May 2019, Permit holder: Singleton Birch Ltd, plus 4 no. EPR compliance assessment reports from 2020, 2023 and 2024.

In addition, the following documentation was identified on the planning portal:

- Melton Ross Closed Landfill, Updated Landfill Gas Risk Assessment (July 2008 – July 2010), SLR Consulting, ref. 406-00075-00049, dated July 2010.
- Site Investigation, Melton Ross Landfill, DJM Waste Management Consultancy and Training Ltd, 2016, no report reference.
- Proposed Business Park Development, Melton Ross, Geo-Environmental Report, SLR Consulting, ref. 403.00075.00092, dated March 2017.

3.3.1 Updated Landfill Gas Risk Assessment, SLR Consulting, July 2010

This report was commissioned by Singleton Birch Ltd, in response to Environment Agency concerns that the previously submitted Landfill Closure Plan and Landfill Gas Risk Assessment reports did not fully address the issue of landfill gas risk at the Site. The report covers 2 years of monthly gas monitoring. The previously submitted reports have not been made available for Geosyntec's review.

The report references that records of landfilling were not kept at the time, but an estimated 135,000 m^3 of material has been deposited at the Site. The landfill was licenced to receive inert waste, but the report references that photographic evidence of fishing waste from Grimsby (not inert) was deposited at the Site. These photographs were not available for review.

The report states that waste was not placed in operating phases (i.e. in a sequence or cells), with no groundwater management system, no basal lining, no leachate management, no landfill gas management and no engineered capping layer.

At the time of this report, there were 3 no. boreholes present at the Site, drilled in 2006 into the eastern excavation. The report references 9 no. gas monitoring wells that were used for this monitoring period, and the locations are concentrated in the east of the Site.

The gas monitoring did identify exceedances of the Environment Agency trigger levels (>1 % methane and >1.5 % carbon dioxide) over the 2 year period, however gas flows recorded were low, suggesting small levels of gas generation. The highest recorded methane was 10.9 % and carbon dioxide was 6.6%, both recorded in location "2".

The report concludes that there is a low risk from landfill gas at the Site.

3.3.2 Hydrogeological Risk Assessment, SLR Consulting, June 2015

This report was produced by SLR for Singleton Birch Ltd, in order to comply with Environment Agency requirements in relation to the closure of the landfill.

The report states inert waste was deposited at the Site, and estimates the base of the landfill to be at 15 - 17 m AOD (above Ordnance Datum), with a typical waste thickness of 18 m. It also states no engineered capping system, leachate management system or gas management system is present at the Site, as this was not required at the time the landfill was opened.

The report utilises monitoring wells installed in 2006 and additional new wells installed in 2015. Two of the older wells (IT4 and IT5) were located within the waste mass. The other monitoring wells were positioned down-gradient to the east and northeast, outside of the waste body, and the locations agreed with the EA. Subsequent monitoring of the new boreholes (IT6 – IT9) found that only IT6 was positioned down-gradient of the landfill. The report suggests local groundwater level are impacted by the quarrying activities.

Leachate was encountered in both IT4 and IT5, at approximately 4 m above the local groundwater levels.

Groundwater samples taken over the monitoring period were screened for "priority pollutants" ammoniacal nitrogen, mecoprop (a pesticide), nickel, sulphate and TPH. Concentrations of ammoniacal nitrogen, mecoprop, nickel and sulphate were found to exceed the Drinking Water Standards (DWS) during the monitoring period. Evidence was presented that mecoprop and ammoniacal nitrogen are declining over time.

In conclusion, the risk assessment found the landfill continued to pose a potential hazard to groundwater and therefore still fell under the requirements of the permitting regime. It recommended further monitoring of groundwater and leachate in order to comply with the Site environmental permit.

The report did not consider landfill gas.

3.3.3 Site Investigation, DJM Waste Management Consultancy and Training, 2016

This report was commissioned by Sandstop Quarries Ltd to assess the shallow waste content within the landfill. DJM completed 6 no. trial pits at the Site and took a composite sample from each location for laboratory analysis. The trial pit locations were exclusively within the western side of the landfill.

Materials encountered included asphalt, concrete, clay, wood, glass, plastic, rubber, bricks, chain link fencing, copper pipe, ash and fragment of cement-bound asbestos (in TP4, no depth given).

The soil samples results were not screened against any criteria, but elevated levels of polycyclic aromatic hydrocarbons (PAHs) and Total Petroleum Hydrocarbons (TPH) were noted. The samples were classified as non-hazardous under the waste classification regime at the time.

3.3.4 Geo-Environmental Report, SLR Consulting, March 2017

This report was commissioned by Singleton Birch Ltd to review existing site investigation data in the context of a proposed business park redevelopment of the Site. The report summarises the findings of the Landfill Closure report and DJM Site Investigation.

The findings of the previous report was supported with some further ground gas monitoring up to January 2017, which found similar levels of gases to the previous reports. Positive flow rates were not recorded during the additional monitoring. A CS2 scenario is concluded for gas risk.

Additional sampling of groundwater and leachate is not directly referenced, and the report uses previous laboratory results.

The report Conceptual Model concludes there are potentially complete linkages between leachate impacting on controlled waters and ground gases impacting on proposed buildings.

The report recommends gas protection measures for proposed buildings, and suggests three possible design scenarios. The report states that Monitored Natural Attenuation may be suitable for the Site and recommends ongoing monitoring of the landfill leachate. The new development should decrease infiltration into the landfill body

3.3.5 Environmental Permit EPR/DP3195NA/V009, dated 10th May 2019

This environmental permit covers the original landfilling operations at the Site and originally dates to 1981. The supplied copy is the 9th variation to the permit, which includes requirements of the permit in order to close the landfill. This states no waste is to be accepted at the Site. A condition is included that a landfill gas risk assessment, groundwater and ground gas monitoring plan and infrastructure inspection plan are submitted to the Environment Agency within 6 months of the date of the permit.

Annual monitoring values are outlined for ammoniacal nitrogen, Mecoprop and sulphate in monitoring points IT2, IT3 and IT6. Requirements for monthly landfill gas monitoring are given but marked as "TBC". Quarterly monitoring of leachate in IT4 and IT5 are specified also.

A search of the Environment Agency Public Register lists the status of the permit as "Closure". It is understood that ongoing quarterly monitoring is still required as part of this permit. Clarification should be sought to confirm whether any of the responsibilities of the permit will fall upon the Client post-construction of the proposed development, if the permit is not surrendered.

3.3.6 Environmental Permit EPR/GB4305CL dated 1st August 2019

This environmental permit relates to the acceptance of waste and waste recovery operations during the recent land raising exercise. The permit includes groundwater, leachate, and landfill gas monitoring requirements, a list of waste categories that can be accepted at the Site and the requirement to report waste accepted quarterly.

Acceptable waste include waste from mineral excavation, waste gravel and crushed rocks, construction and demolition waste, and soil and stones.

Also supplied were 4 no. EPR Compliance Assessment Reports completed by the Environment Agency in association with this permit:

- Report ID 404973/0373729, Dated 05/10/2020: Virtual inspection report. No permit breaches recorded.
- Report ID: 70811/0451925, Dated 24/02/2023: Elevated ammoniacal nitrogen in IT6 groundwater is reported, but stated thought to be related to nearby agricultural activity. No other permit breaches recorded.
- Report ID: 70811/0490815, Dated 01/02/2024: Elevated sulphate is reported in location IT3 at 506 mg/l, exceeding the permit limit of 360 mg/l. Highest methane result is reported at 12.6

% but does not state the location. No further action is required as the Environment Agency officer deems this is caused by a period of rain predating the testing.

- Report ID: 70811/0503152, Dated 12/06/2024: Elevated ammoniacal nitrogen was reported to the EA by the operator. It was deemed nearby use of fertiliser had caused this elevated level as other monitoring parameters associated with the landfill were decreasing. The EA conclude no further action is required.

The exact monitoring results that these reports reference have not been supplied to Geosyntec for review.

A search of the Environment Agency Public Register lists the status of the permit as "Issued".

4 ENVIRONMENTAL DATABASE REVIEW

Geosyntec procured an Envirocheck report (ref. 366363277) which provides a database of environmental information held by various statutory bodies including, but not limited to, the Environment Agency, Local Authority, British Geological Survey, Coal Authority, Natural England and Health & Safety Executive.

A copy of the Envirocheck Report is provided in **Appendix B**. A summary of the findings are given below.

4.1 Permitting and Licencing

Feature	On Site	Within 250 m
Contaminated Land Register Entries	None recorded.	None recorded.
Discharge Consents	None recorded.	Mr Michael Bird (162 m N) dated 19 August 1971 (Soakaway)
Integrated Pollution Controls	None recorded.	Singleton Birch Ltd (31 m W), 13th November 2017, Cement/Lime Manufacture and Camp Wood Waste Acid Treatment Plant and Campwood Landfill. (Multiple entries and historic entries relating to processes at the quarry. Total 27 entries.)
Local Authority Pollution Prevention and Controls	None recorded.	Singleton Birch Ltd (41 m W), No date supplied, Quarry processes including roadstone plants and the size reduction of bricks, tiles and concrete.
Registered Radioactive Substances	None recorded.	None recorded.
Pollution Incidents to Controlled Waters	None recorded.	None recorded.
Prosecutions Relating to Authorised Processes	None recorded.	None recorded.
Substantiated Pollution Incident Register	None recorded.	None recorded.

The majority of permitting entries relate to processes at the main Singleton Birch quarry site.

The nearest discharge consent relates to a soakaway on a farm, and is unlikely to impact upon the Site.

4.2 Waste

Feature	On Site	Within 500 m
Historical Landfill Sites	None recorded (under this category within the Envirocheck report).	Melton Ross Quarry (West) [546 m W] - dates and waste types not supplied.
Potentially Infilled Land	Yes – covering infilled pit/ground.	Unknown filled ground [97 m SE]
Registered Landfill Sites	Yes –Melton Ross Quarry, Singleton Birch Limited, Category: landfills taking non-biodegradable waste (not construction), Licence issued 2nd September 1981, Licence status: Closure. No permit number supplied.	Campwood Landfill [240 m N], Singleton Birch Limited, Category: Waste landfilling with capacity >25,000 T excluding inert waste, Licence issued 1st March 2018, Licence status: Effective. Permit number: EPR/BS9989IJ.

Feature	On Site	Within 500 m
		Includes two other entries from 1999 and 2003 for previous versions of the permit for the same landfill.
Licenced Waste Management Facilities	Yes – 4 entries. 2 no. entries from 1981 and 2004 cover landfill activities and are listed as closed and expired respectively. Both are registered to Singleton Birch Limited. 1 no. entry form 2015 covers "Inert & Excavation Waste TS + Treatment" and is listed as Surrendered and registered to Sandstop Quarries Ltd. 1 no. entry from 2019 is given for "Use of waste in a deposit for recovery op(eration)". The status is given as issued and is registered to Singleton Birch Ltd.	1 no. entry within 500 m, registered to Singleton Birch Ltd for Mining Watse Operations, issued 22nd March 2022. 2 no. entries over 500 m registered to Singleton Birch Ltd for landfilling in the north of the main quarry.

The Envirocheck report includes information on the known landfill within the Site. The available permitting data shows the earliest permit for the landfill dates to 1981, with a permit in 2019 covering the backfilling operations.

Permits are also shown for the Campwood Landfill within the main quarry, with the earliest permit record given dating to 1999. The Singleton Birch website[2] lists that the landfill can accept non-hazardous wastes including industrial wastes containing sulphur, calcium-based wastes from titanium dioxide production, sludges and wastes from on-site effluent treatment, sludges and solid wastes from gas treatment, waste concrete and concrete sludge, and gypsum-based construction materials.

4.3 Hazardous Substances

Feature	On Site	Within 250 m
Control of Major Accident Hazard Sites (COMAH)	None recorded.	Singleton Birch Ltd [41 m W], Lower Tier, recorded as "Record ceased to be supplied under COMAH Regulations".
Explosive Sites	None recorded.	None recorded.
Notification of installations Handling Hazardous Substances (NIHHS)	None recorded.	Singleton Birch Ltd [115 m N], listed as not active.
Planning Hazardous Substance Consents	None recorded.	Singleton Birch Ltd [112 n N], dated 4th November 1992, Part C – Flammable substance – Liquified petroleum gas held at >1.4 bar where amount held is greater than or equal to 25 tonnes. Consent granted.
Planning Hazardous Substance Enforcements	None recorded.	None recorded.

[2] Singleton Birch Waste Management, https://www.singletonbirch.co.uk/waste-management/ Accessed 16th January 2025

There are no hazardous substance related consents registered at the Site. Older records are listed for the main Singleton Birch quarry to the north and west.

4.4 Industrial Land Use

Feature	On Site	Within 250 m
Contemporary Trade Directory Entries	None recorded.	3 no. entries within 250 m, including Singleton Birch Ltd (Quarry – 41 m W), Agrimin Ltd (Pet foods and animal feeds – 71 m SE) and Birch Chemicals (Chemical manufacturers – 127 m W).
Fuel Station Entries	None recorded.	None recorded.
Gas Pipelines	None recorded.	None recorded.
Underground Electrical Cables	None recorded.	None recorded.

The environmental database includes trade directory entries for the Singleton Birch quarry and some businesses within the Humberside Airport to the southeast. There are no fuel stations, pipelines or cables within 250 m of the Site.

4.5 Sensitive Land Use

Feature	On Site	Within 500 m
Ancient Woodland	None recorded.	None recorded.
Areas of Outstanding Natural Beauty or National Parks	None recorded.	None recorded.
Nature Reserves	None recorded.	None recorded.
Ramsar Sites	None recorded.	None recorded.
Sites of Special Scientific Interest (SSSI)	None recorded.	None recorded.
Listed Buildings	None recorded.	None recorded.
Scheduled Monuments	None recorded.	None recorded within 500 m, but scheduled monuments for a Roman settlement [550 m E] and Iron Age/Roman fort [880 m N].

There are no sensitive land uses within 500 m of the Site.

There are two scheduled monuments relating to a Roman settlement and iron Age/Roman fort, which the Site is located between the two locations. Any potential archaeological evidence at the Site will have been removed during quarrying activities, so is not a consideration for the Site.

4.6 Unexploded Ordnance

The Zetica Unexploded Ordnance (UXO) risk maps[3] were consulted for the local area.

Humberside Airport is located to the southeast of the Site. Whilst it does not appear on the historical maps, an internet search suggests it opened as an RAF base in 1941, and therefore is a potential historical target. The historical maps indicate the quarry was being excavated during this period.

The risk maps shows five other former RAF sites within 10 km of the Site, including airfields and decoy sites.

The wider area is assigned a low-risk rating. Further advice on UXO risk for the Site should be sought as required, particularly in relation to piled foundations.

[3] Zetica Risk Maps https://zeticauxo.com/guidance/risk-maps/ Accessed 16th January 2025

5 SITE WALKOVER

5.1 Methodology

A site walkover was completed by Geosyntec representative Dan Maher on the 9th of January, escorted. A photographic log of the site walkover is provided in **Appendix A**.

As part of the site walkover, Geosyntec looked for evidence of hazardous substances used, stored or discarded, and inspected the Site for areas of disturbed or discoloured soil, equipment and/or building materials which may contain hazardous substances, areas of distressed vegetation, wastewater discharge areas, storage tanks, waste management areas, lagoons, pits, sumps, surface water management areas, and stained surfaces.

5.2 Overview of Site Operations

The site is currently largely vacant, featuring broken, unpaved ground across the entire extent. This is due to recent backfill operations on the former quarry. This activity was not ongoing at the time of operation, but evidence of this activity was present in the presence of a site cabin (Plate 2) and a weigh bridge (Plate 3). There are areas of lower topography to the north (Plate 4), southwest (Plate 5) and west (Plate 6) of the site where filling operations have not yet been completed. There is also a slight change drop in site level between the eastern and western halves of the site. There are several steep, soil embankments along the norther edge of the site, leading to a railway line. These appear to have been the product of excavations rather than depositions, given the evidence of excavator marks on the face of the embankment (Plate 7). The boundaries of the site are vegetated, with mature trees along the southern boundary of the site, which is adjacent to a road.

5.3 Materials Storage and Handling

It is not apparent from the site visit what is the source of the material deposited on site. There are no stockpiles of material present. There is evidence of anthropogenic wastes such as plastic in the material deposited on site (Plate 8). There is evidence of leachate collection on the site, with 2no leachate wells (Plate 9 & Plate 10) observed. There were also 10no monitoring wells present across the western portion of the site (Plate 11), though it was unclear whether these were for monitoring gas or groundwater. A groundwater monitoring installation was encountered on the southern boundary of the site (Plate 12). There was some ponding of water noted around the base of a number of the monitoring wells (Plate 13), though this was frozen at the time of the village so it was not possible to determine whether a sheen or any discolouration was present in the water.

5.4 Olfactory Contamination

There was no indication of olfactory contamination observed during the site visit.

5.5 Hazardous Substances

5.5.1 Asbestos

There are no permanent buildings present on Site. No evidence of asbestos containing materials was observed during the walkover.

5.5.2 Poly-Chlorinated Biphenols (PCBs)

There were no substations observed to be present on or near to the Site.

6 CONCEPTUAL SITE MODEL

The Conceptual Site Model (CSM) has been assessed using the Source-Pathway-Receptor model and considers potential exposure pathways to sensitive receptors under the proposed end use as a hydrogen power plant.

Details on the Site construction have not been supplied. Based on the presence of the waste body at the Site, a worst-case assumption that piled foundations would be used have been considered as part of this CSM.

6.1 Potential Sources

Following the review of available information, the following potential sources of contamination have been identified for the Site:

Potential Source	Location	Potential Contamination
Melton Ross Landfill	On-Site	Made Ground: heavy metals, hydrocarbons, PAHs, asbestos, sulphur, nitrogen and pesticides (mecoprop).
		Landfill gas: CH_4, CO_2, H_2S and CO.
Campwood Landfill	240 m N	Made Ground: heavy metals, hydrocarbons, PAHs, sulphur, titanium oxide.
Humberside Airport	80 m SE	Petroleum hydrocarbons, PFAS.

The landfill on Site is the primary potential source of contamination. Monitoring records and available reports have shown that the waste buried at the Site may not have conformed to the inert classification, and thus general made ground contamination could be present. A single fragment of asbestos was identified during previous investigation, which whilst low-level and sporadic, cannot be ruled out as being more widely distributed in other parts of the landfill body. Monitoring results have shown exceedances of permit monitoring criteria, such as mecoprop and ammoniacal nitrogen.

The landfill is also unlined, uncapped and does not have a landfill gas control system. Landfill gas monitoring has shown elevated levels of methane and carbon dioxide. Monitoring has typically been targeted towards permit closure and not risk to human health in proposed redevelopment of the Site.

The Campwood Landfill is located cross-gradient of the Site. It is understood this landfill is newer, but information on landfill lining and other control measures are not available. The landfill may impact upon the Site, in addition to the existing landfill at the Site. If information on the engineering design of the Campwood Landfill can be supplied, it may be possible to eliminate this as a potential source.

Humberside Airport is located to the southeast of Site, and previously operated as an RAF base. Airports are known to be potential sources of Per-and-polyfluoroalkyl substances (PFAS) from firefighting foams.

No assessment in regards to PFAS contamination has been made in the available information at the Site. As the airport is cross-gradient hydraulically, potential PFAS contamination, in addition to potential hydrocarbon contamination, may migrate in the direction of the Site.

6.2 Potential Pathways

The following potential pathways have been identified for the Site:

- Groundwater migration: From the SLR reports, groundwater at the Site is estimated to travel towards the northeast.
- Landfill gas migration: From the SLR reports, elevated methane and carbon dioxide have been detected at the Site. Flow rates were recorded as low (-0.1 to -0.3 l/h). The landfill has not been subjected to any capping or landfill gas, so landfill gas is expected to be able to migrate at the Site.
- Direct contact: Currently there is no cap at the landfill, and full details of the recent land raising exercise are not available to Geosyntec. Therefore, it must be assumed that Site users could come into direct contact with contaminated soils.
- Inhalation of asbestos fibres: Currently there is no cap at the landfill, and full details of the recent land raising exercise are not available to Geosyntec. Therefore, it must be assumed that Site users could be exposed to respirable asbestos fibres if disturbing soil at the Site.

6.3 Potential Receptors

The following potential receptors have been identified for the Site:

- Future Site Users.
- Groundwater in the Principal Aquifers below the Site (Welton Chalk and Ferriby Chalk).
- Drinking water source (Source Protection Zone III)

The above considers the end use of the proposed development and impact on surrounding land uses and underlying controlled waters.

6.4 Potentially Complete Pollutant Linkages

Of the above identified potential Sources, Pathways and Receptors, the following Potentially Complete Pollutant Linkages (PCPL) have been identified:

1. **PCPL 1:** Contamination from Made Ground within the landfill migrating through groundwater and impacting upon the Principal Aquifer and SPZ III drinking water source.
2. **PCPL 2:** Landfill gas generation at the Site migrating into building spaces and impacting upon future site users.
3. **PCPL 3:** Future site users coming into direct contact with Made Ground at the Site.
4. **PCPL 4:** Future site users inhaling asbestos fibres within Made Ground at the Site.
5. **PCPL 5:** Potential PFAS and hydrocarbon contamination migrating through groundwater from Humberside Airport.

7 QUALITATIVE RISK ASSESSMENT

A qualitative risk assessment or risk evaluation has been undertaken in line with UK Land Contamination Risk Guidance (LCRM) guidance. In this assessment, a consequence of the risk being realised and the probability of the risk occurring are assigned. These are then combined together to provide a risk classification for each potential pollutant linkage. This qualitative risk assessment process is detailed in **Appendix C** and the qualitative risk assessment for the Site is presented in the tables below. Risks from off-site sources to off-site receptors have not been assessed.

Pollutant Linkage Reference	Source	Pathway	Receptor	Consequence	Probability	Risk
PCPL 1	Made Ground	Groundwater	Principal Aquifer and SPZ III	Medium – The contaminants have potential to impact upon a nearby drinking water source, and caused damage to the Principal Aquifer.	Likely – The available monitoring information showed a decrease in levels over time, but exceedances of permit monitoring parameters.	Moderate
PCPL 2	Landfill Gas	Ground gas migration	Future Site Users	Medium - This could result in suffocation or explosion once buildings are constructed at the Site.	Likely - Elevated levels of landfill gases have already been detected at the Site.	Moderate
PCPL 3	Made Ground – general contamination	Direct Contact	Future Site Users	Medium – Potential exposure to contaminants within the landfill could cause "Significant harm" to human health.	Low – The final development is unlikely to include areas of soil exposing the landfill waste body.	Moderate / Low
PCPL 4	Made Ground - Asbestos	Inhalation	Future Site Users	Medium – Potential exposure to asbestos within the Made Ground could cause "Significant harm" to human health.	Low – The final development is unlikely to include areas of soil exposing the landfill waste body, but future disturbance of soil e.g. during future redevelopment, may result in exposure in future.	Moderate / Low
PCPL 5	Humberside Airport – PFAS and Hydrocarbons	Groundwater migration	Future Site Users and groundwater.	Medium – Exposure to PFAS or hydrocarbons could cause significant harm to human health or impact upon the water quality beneath the Site.	Low – The airport is located cross-gradient of Site so may result in migration of contaminants onto the Site, and has not been completely eliminated as a pathway.	Moderate / Low

8 CONCLUSIONS AND RECOMMENDATIONS

Geosyntec on behalf of Centrica Energy Storage conducted a Phase 1 Desk Study of the Site at Melton Ross Quarries, Lincolnshire. From the observations made during the Site inspection and document review, there are some potential issues relating to land contamination at the Site which would require further investigation.

8.1 Quarrying and Landfill

The Site operated as a chalk quarry as part of the neighbouring Chalk Hill (later Singleton Birch) quarry and lime works. Later the quarry was used as a landfill. The exact date of operation commencing is unknown, but the Site was shown in the 1994 map as *Refuse Tip* and supplied environmental permits for a landfill date to 1981. It is understood that the landfill operated prior to permitting and engineering requirements, and as a result has not been lined, does not contain leachate or landfill gas management systems and was not capped.

There are a number of data gaps identified based upon the review of available information about the Site. These include:

1. Data Gap 1: In the previous investigation completed by DJM, only one soil sample was collected per location in shallow material at the waste body. This gives limited information of the waste body and restricts detailed characterisation of the material.
2. Data Gap 2: Details of the land raising exercise completed have not been provided, other than a copy of the permit for the works. It is unknown whether contaminated materials were removed as part of this exercise or whether re-engineering of the existing waste body was completed. A copy of the specification for the works and any validation reports following completion would be requested for review, to ensure the works completed are suitable for the proposed end use and protection of human health and the environment.
3. Data Gap 3: Ongoing monitoring of groundwater and ground gas are required as part of the former landfill environmental permit. Partial records of the monitoring data up to 2017 are available within reports found on the planning portal and the supplied EA site audit reports. Confirmation of the ongoing monitoring requirements of the permit is required, including confirmation of responsible parties after redevelopment. Copies of recent monitoring data are also requested for independent review to further characterise groundwater conditions beneath the Site and confirm if natural attenuation is underway in the landfill.
4. Data Gap 4: Previous monitoring of landfill gas has been conducted at the Site. Of the reports reviewed by Geosyntec, the majority of these were targeted towards closure of the landfill permit and not risk assessing the impact of landfill gas on the proposed development. No monitoring data has been made available of the ground gas regime at the Site following the completion of the land raising exercise. The installation of new ground gas monitoring wells post-land raising is recommended to further assess the risk of landfill gas on the proposed development under the new ground conditions.

The Conceptual Site Model has shown that there is a risk to future site users from five potentially complete pollutant linkages including:

6. **PCPL 1:** Contamination from Made Ground within the landfill migrating through groundwater and impacting upon the Principal Aquifer and SPZ III drinking water source.
7. **PCPL 2:** Landfill gas generation at the Site migrating into building spaces and impacting upon future site users.
8. **PCPL 3:** Future site users coming into direct contact with Made Ground at the Site.
9. **PCPL 4:** Future site users inhaling asbestos fibres within Made Ground at the Site.
10. **PCPL 5:** Potential PFAS and hydrocarbon contamination migrating through groundwater from Humberside Airport.

Further investigation is recommended at the Site, including;

- Additional ground gas monitoring which would be representative of post-land raising ground conditions. Proposed new monitoring wells should target building footprints of the proposed development;
- Groundwater monitoring, focussing on a broader spectrum of analytical testing in relation to human health and risk to controlled waters. Proposed new monitoring wells should target the development area, and if appropriate monitoring location down-gradient of the waste body;
- Soil sample analysis, focussing on a broader spectrum of analytical testing in relation to human health, including asbestos screening samples to further characterise potential asbestos contamination of the waste;
- Waste classification testing for waste soil arisings during construction.

8.2 Other Considerations

The desk study has identified the following other considerations, which fall outside of the scope of contaminated land:

8.2.1 Geotechnical Suitability

Information on the engineering of the recent land raising exercise has not been supplied. It is assumed the original landfill waste body has not been compacted to an engineering standard at the time of backfill. Geotechnical information has not been supplied as part of this desk study review.

Due to the nature of the Site, it is assumed that piled foundations may be required as part of the proposed development.

As further site investigation is recommended, the investigation can also be utilised to collect information on the geotechnical properties of the material beneath the Site, such as Standard Penetration Tests (SPT) and the collection of samples for geotechnical laboratory testing. This information can then be used to aid civil engineering design of the proposed development.

8.2.2 Flooding

The Envirocheck report marks three areas within the Site (to the east, west and centre) as being susceptible to a 1 in 30-year flooding event. The flooding risk area appears to focus on a topographic low, and may be based on older topographic information for the Site. Further advice on flooding risk assessment should be sought as required.

8.2.3 UXO

The neighbouring Humberside Airport operated as a military base during World War II and may have been a target of historical bombing. Public records indicate the Site is classified as low risk, but further advice on UXO risk assessment should be sought as required, particularly for piled foundations.

8.2.4 Sulphate Attack on Concrete

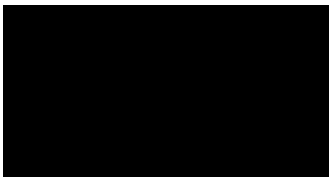
Elevated sulphur has been detected in groundwater at the Site. No information has been provided as to whether an assessment on sulphate attack on concrete has been completed. If further ground investigation is completed at the Site, soil samples can be collected to aid the design of sulphate resistant concrete as required.

o0o

Geosyntec Consultants trust the information and discussion contained in this report meets all your immediate requirements. Please do not hesitate to contact the undersigned if you have any further comments or questions about any aspect of the work.

Respectfully submitted

On behalf of Geosyntec Consultants



_____

Rhian Lynes

Project Professional Environmental Consultant

FIGURES

Site Location

Singleton Birch	GCU0127073
Geosyntec consultants / centrica energy storage+	Figure 1
Delph, UK	January 2025

Legend:

- Site boundary
- Additional land ownership
- Maintenance track
- Pipeline

Notes:

1. Not to scale.
2. Site layout plan supplied by Centrica.

Site Layout Plan

Geosyntec consultants

Centrica

Figure 2

Delph, UK

August 2025

APPENDIX A

GEOSYNTEC CONSULTANTS
Photographic Record

Client: Centrica	**Project Number:** GCU0127073
Site Name: Singleton Birch	**Site Location:** Melton Ross, North Lincolnshire

Photograph 1 **Date:** 9 January 2025 **Direction:** East **Comments:** Looking east across the site from the western end	

Photograph 2 **Date:** 09 January 2025 **Direction:** West **Comments:** Site cabin in the centre of the site, close to the main gate	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Centrica	**Project Number:** GCU0127073
Site Name: Singleton Birch	**Site Location:** Melton Ross, North Lincolnshire

Photograph 3

Date: 09 January 2025

Direction: North

Comments: Site weighbridge, in the centre of the site close to the main gate

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Centrica	**Project Number:** GCU0127073
Site Name: Singleton Birch	**Site Location:** Melton Ross, North Lincolnshire

Photograph 4 **Date:** 09 January 2025 **Direction:** North **Comments:** Topographically lower area at the northern end of the site	
Photograph 5 **Date:** 09 January 2025 **Direction:** Southwest **Comments:** Topographically lower area at the southwest end of the Site	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Centrica	**Project Number:** GCU0127073
Site Name: Singleton Birch	**Site Location:** Melton Ross, North Lincolnshire

Photograph 6 **Date:** 09 January 2025 **Direction:** South **Comments:** Topographic low point to the south of the site	

Photograph 7 **Date:** 09 January 2025 **Direction:** North **Comments:** Steep embankment showing evidence of excavation.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Centrica	**Project Number:** GCU0127073
Site Name: Singleton Birch	**Site Location:** Melton Ross, North Lincolnshire

Photograph 8 **Date:** 09 January 2025 **Direction:** ??? **Comments:** Evidence of plastics and other anthropogenic wastes in deposited material.	

Photograph 9 **Date:** 09 January 2025 **Direction:** Southwest **Comments:** Assumed leachate collection well	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Centrica	**Project Number:** GCU0127073
Site Name: Singleton Birch	**Site Location:** Melton Ross, North Lincolnshire

Photograph 10 **Date:** 09 January 2025 **Direction:** West **Comments:** Assumed leachate Monitoring well	

Photograph 11 **Date:** 09 January 2025 **Direction:** ??? **Comments:** Gas or groundwater monitoring installations	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Centrica	**Project Number:** GCU0127073
Site Name: Singleton Birch	**Site Location:** Melton Ross, North Lincolnshire

Photograph 12 **Date:** 09 January 2025 **Direction:** South **Comments:** Site boundary groundwater monitoring installation, southern boundary of the site	

Photograph 13 **Date:** 09 January 2025 **Direction:** East **Comments:** Ponded water around monitoring well installation. The water was frozen at the time of the visit.