

# Gate Burton Energy Park Environmental Statement

Volume 3, Appendix 15-F: Desk Study - Grid Connection Corridor  
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## Table of Contents

1.	Introduction .....	4
1.1	Background.....	4
2.	Site Setting .....	5
3.	Ground Model .....	7
3.2	Soil Chemistry.....	11
3.3	Ground Stability Records .....	11
3.4	Hydrology .....	12
3.5	Flooding.....	13
4.	Historical & Planned Development .....	14
5.	Regulated Activities .....	16
6.	Preliminary Risk Assessment .....	19
6.2	Risks to Human Health.....	21
6.3	Risks to Surface Water.....	21
6.4	Risks to Groundwater.....	22
6.5	Risks to Infrastructure .....	22
7.	Conclusions .....	23
8.	References .....	24
Annex A.	Risk Assessment Principles .....	25
8.1	Assessment Framework.....	25
8.2	Risk Assessment Principles.....	25
8.3	LCRM Assessment of Risk.....	27

## Tables

Table 1	Site Surroundings.....	6
Table 2	Preliminary Ground Model .....	8
Table 3	Estimated Soil Chemistry based on BGS background and UK Soil Observatory background concentrations .....	11
Table 4	Ground Stability records .....	11
Table 5	Surface Water Quality.....	12
Table 6	Regulated Activities within the Grid Connection Corridor. ....	16
Table 7	Regulated Activities associated with the power station, within the power station footprint, or in its close proximity. ....	16
Table 8	Potential Sources of Contamination .....	19
Table 9	Potential Receptors .....	20
Table 10	Potential Pathways .....	20
Table A-1	Description of Severity of Risk.....	26
Table A-2	Likelihood of Risk Occurrence .....	26
Table A-3	Risk based on Comparison of Likelihood and Severity.....	26
Table A-4	Conversion to LCRM Risk Categories .....	27

# 1. Introduction

## 1.1 Background

- 1.1.1 Gate Burton Energy Park Limited (hereafter referred to as ‘the Applicant’) has commissioned this Report for the Gate Burton Energy Park Grid Connection Corridor.
- 1.1.2 The Gate Burton Energy Park comprises the installation of solar photovoltaic (PV) generating panels and on-site energy storage facilities across a proposed site in Lincolnshire (hereafter referred to as the ‘Solar and Energy Storage Park’) and grid connection infrastructure (hereafter referred to as the ‘Grid Connection Corridor’). The entire scheme, including both the Solar and Energy Storage Park and Grid Connection Corridor is referred to as the ‘Order limits’. Further information on the Scheme is provided in **Environmental Statement (ES) Volume 1, Chapter 2: The Scheme [EN010131/APP/3.1]**. The Order Limits are shown on **ES Volume 2: Figure 1-2 [EN010131/APP/3.2]**.
- 1.1.3 This Grid Connection Corridor Report is an addendum to **ES Volume 3: Appendix 15-C: Phase 1 Preliminary Risk Assessment Report [EN010131/APP/3.3]**, and relates to the portion of land within the Order limits known as the Grid Connection Corridor, shown in orange on **ES Volume 2: Figure 1-2 [EN010131/APP/3.2]**.
- 1.1.4 This Report is intended to provide a high-level overview of the Grid Connection Corridor with regards to its geological, hydrological and hydrogeological setting, and public domain geo-environmental information to build up a general understanding of the Grid Connection Corridor and surrounding environmental setting/sensitivity.
- 1.1.5 In keeping with the requirement to provide a high level overview only, this Report does not include any assessment of agricultural land or soils and it is also not equivalent to a Stage 1, Tier 1 level of assessment (preliminary assessment) as defined by the Environment Agency’s Land Contamination Risk Management (Ref 1) guidance. to support planning applications. Mineral designations and current/historical mineral extraction activities have also not been reviewed.
- 1.1.6 This report also includes an overview of:
- Historical land uses for the Grid Connection Corridor and immediate surrounds with a particular emphasis on identifying potential on-site and off-site contamination sources;
  - A site conceptual model with a view to identifying any significant source-pathway-receptor linkages followed by a qualitative preliminary risk assessment; and
  - Conclusions and recommendations based on the findings.

- 1.1.7 This Report has been prepared using a combination of published records, information provided by the Client, statutory records, historical mapping supplied within a Landmark Envirocheck Report, published geological and hydrogeological mapping, and historical borehole records. However, a detailed review of these has not been undertaken given only a general overview is required by the scope of this Report. Unless otherwise stated, only features located within the Grid Connection Corridor boundaries have been considered for the purposes of this Report.
- 1.1.8 There are no previous investigation reports available for the Grid Connection Corridor. The information sources used are:
- Historical maps as part of a standard Envirocheck Report provided by the Landmark Information Group (Ref. 286968913\_1\_1, dated 28 October 2021);
  - Standard Envirocheck data sheets and site sensitivity maps provided by the Landmark Information Group (Ref. 286968913\_1\_1, dated 28 October 2021);
  - 1:100,000 scale Groundwater Vulnerability Map;
  - British Geological Survey (BGS) Geological Map and Memoir (Ref 2, Ref 3);
  - Environment Agency website;
  - BGS website;
  - DEFRA Magic website (Ref 4); and
  - Zetica website for information on unexploded ordnance (Ref 5).
- 1.1.9 Specific information sources are referenced throughout the document and a bibliography is included in Section 8 of the Report.

## 2. Site Setting

- 2.1.1 The Grid Connection Corridor is located approximately 4 kilometres (km) south of Gainsborough between the railway line connecting Lincoln and Doncaster and the village of Rampton.
- 2.1.2 The Grid Connection Corridor covers an area of approximately 172 hectares and is defined by the red line boundary shown in shown in orange on **ES Volume 2: Figure 1-2 [EN010131/APP/3.2]**.
- 2.1.3 A site walkover has not been undertaken.
- 2.1.4 The land use within the Grid Connection Corridor is predominantly agricultural, comprising large arable fields delineated by hedgerows and drainage ditches. No buildings are located within the Grid Connection Corridor boundary, except the substation at Cottam Power Station, located in the southwestern portion of the Grid Connection Corridor.

- 2.1.5 The Grid Connection Corridor is crossed northwest-southeast by a railway line which previously served Cottam Power Station, and by the River Trent, which flows regionally south to north.
- 2.1.6 The topography of the Grid Connection Corridor is generally flat, ranging from approximately 2m above ordnance datum (AOD) to >20m AOD.
- 2.1.7 Relevant features immediately surrounding the Grid Connection Corridor are summarised in Table 1.

**Table 1 Site Surroundings**

<b>Direction</b>	<b>Summary</b>
North	Mostly agricultural land. The Solar and Energy Storage Park bounds the north easternmost portion of the Grid Connection Corridor. The villages of Marton and Coates are located to the north, east and west of the River Trent, respectively. The area of Trent Port, and south of Marton, which includes a pumping station (east bank of the River Trent).
South	Mostly agricultural land. Cottam Power Station and its associated infrastructure are located south, partially overlapping the Grid Connection Corridor. The villages of Torksey and Brampton, and the dismantled Sheffield-Manchester railway line are also located south.
East	Mostly agricultural land and farms. A railway line, connecting Lincoln and Doncaster, runs southeast to northwest.
West	Mostly agricultural land and farms. The village of Rampton is also located west of the Grid Connection Corridor.

## 3. Ground Model

- 3.1.1 Based on a review of published geological and hydrogeological information and a selection of historical borehole records<sup>1</sup>, a general overview of the anticipated ground conditions within the Grid Connection Corridor is presented in Table 2.
- 3.1.2 There are no known licensed groundwater abstractions identified within the Grid Connection Corridor. Information on private abstractions and any further details relating to groundwater abstractions surrounding the Grid Connection Corridor will be included within **ES Volume 1: Chapter 9 Water Environment** of the Environmental Statement [EN010131/APP/3.1].
- 3.1.3 The Grid Connection Corridor does not lie within a Source Protection Zone (SPZ).

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<sup>1</sup> BGS ref. SK88SW41, SK88SW44, SK87NW139, SK88SW26, SK88SW27, SK87NW43, SK87NW44, SK87NW86, SK88SW8

**Table 2 Preliminary Ground Model**

Geology	Typical Description and anticipated thickness based on BGS mapping (BGS logs where specified <sup>(2)</sup> )	Location and extent	Soilscapes (Ref 6) Soil Description	Aquifer <sup>(1)</sup>	Depth to Groundwater	Ground Gas Potential
Made Ground /Topsoil	Made Ground – thickness unknown, potentially locally recorded up to 0.80 m within the Power Station footprint, described as ash and gravel fill, or tarmac, hardcore and red marl. Topsoil.	Limited potential for Made Ground. Key areas it is anticipated includes railways, farm building areas, power station Topsoil recorded in the central and western portion of the Grid Connection Corridor.	Loamy and clayey floodplain soils with naturally high groundwater in the central portion of the Grid Connection Corridor,	-	Limited information is available from the selected BGS borehole records regarding groundwater levels within the area.	Low (potential infilled pits – unknown fill material)
Alluvium	Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. Recorded in the central portion of the Grid Connection Corridor in BGS hole SK88SW8, described as ‘clay, pale brown, sandy patches’. Occasionally reported as ‘River Terrace Deposits’ in the power station footprint.	Central portion of the Grid Connection Corridor, locally in the western portion of the Grid Connection Corridor.	generally along the course of River Trent and in localised areas in the western portion of the Grid Connection Corridor, northwest and west of Cottam Power Station.	Secondary A No SPZ	Generally, water was recorded within 3 mbgl. However, occasionally water was observed within 2 mbgl or at more than 8 m bgl.	Low. Possible if organic material present.
Holme Pierrepont Sand And Gravel Member	Sand and gravel. Generally pinkish, poorly sorted, sandy, gravels. Gravel dominated by rounded pebbles of "Bunter" quartz/quartzite (typically c.80%), plus flint, sandstone, cherts, etc, and other "exotic" lithologies.	Most of the eastern portion of the Grid Connection Corridor; south of Marton	Naturally wet very acid sandy and loamy soils, in the eastern portion of the Grid	Secondary A No SPZ	Water is likely to be present within the superficial glaciofluvial, alluvium, Holme Pierrepont Member deposits, where these are	Low
Glaciofluvial deposits -	Sand and gravel. locally with lenses of silt, clay or organic material.	Locally, in the eastern portion of the Grid Connection Corridor between Marton and Grange Farm.		Secondary A No SPZ		Very Low



Geology	Typical Description and anticipated thickness based on BGS mapping (BGS logs where specified <sup>(2)</sup> )	Location and extent	Soilscapes (Ref 6) Soil Description	Aquifer <sup>(1)</sup>	Depth to Groundwater	Ground Gas Potential
Mercia Mudstone Group	<p>Dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas. Thin beds of gypsum/anhydrite widespread; sandstones are also present.</p> <p>Recorded in the central and western portions of the Grid Connection Corridor in BGS holes SK87NW43 and SK87NW44 and described as mudstone, red, finely laminated, grey-green; mudstone, red; red-brown Keuper.</p> <p>Underlain by Sherwood Sandstone Group (Bunter) in several BGS boreholes in the northeastern and central portion of the Grid Connection Corridor and within the power station footprint (from &gt;200 m bgl depth).</p>	Majority of the Grid Connection Corridor	<p>Connection Corridor and south of Marton.</p> <p>Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils in the eastern portion of the Grid Connection Corridor, southeast and east of Marton.</p>	Secondary B No SPZ	located on the Grid Connection Corridor.	Very Low
Scunthorpe mudstone formation	<p>Mudstone and limestone, interbedded: grey, variably calcareous and silty, blocky or fissile mudstone with thin beds of argillaceous limestone (bioclastic or micritic) and calcareous siltstone, particularly near base and in upper part, which is ferruginous in the area.</p> <p>To c.128m.</p>	Area of limited extent southeast of Marton.		Secondary B No SPZ		Very Low
Penarth Group	<p>Mudstone. Grey to black mudstones with subordinate limestones and sandstones; predominantly marine in origin.</p> <p>0 - &gt;12m.</p>	Eastern portion of the Grid Connection Corridor		Secondary undifferentiated No SPZ		Very Low

<sup>(1)</sup> The Environment Agency's Combined Groundwater Vulnerability Map of the area shows that groundwater vulnerability on Grid Connection Corridor varies from medium to high.

Geology	Typical Description and anticipated thickness based on BGS mapping (BGS logs where specified <sup>(2)</sup> )	Location and extent	Soilscapes (Ref 6) Soil Description	Aquifer <sup>(1)</sup>	Depth to Groundwater	Ground Gas Potential
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<sup>(2)</sup> BGS ref. SK88SW41, SK88SW44, SK87NW139, SK88SW26, SK88SW27, SK87NW43, SK87NW44, SK87NW86, SK88SW8

## 3.2 Soil Chemistry

- 3.2.1 The BGS Soil Chemistry datasets provide indicative information on regional concentrations of five potentially harmful elements: arsenic, cadmium, chromium, nickel and lead in soil. Elevated concentrations can exist due to natural geological conditions or possible anthropogenic contamination.
- 3.2.2 Soil samples were also collected for the National Soil Inventory (NSI) by the Soil Survey of England and Wales (now the National Soil Resources Institute, Cranfield University) as part of the Advanced Soil Geochemical Atlas of England and Wales (Ref 7). The maps are based on 5700 surface soil samples (0–15 cm), collected across England and Wales, that have been analysed for 50 major and trace elements.
- 3.2.3 The following BGS and NSI determinands (those considered applicable to the Grid Connection Corridor) estimated soil chemistry levels are presented in Table 3.

**Table 3 Estimated Soil Chemistry based on BGS background and UK Soil Observatory background concentrations**

Determinand	Estimated geometric mean concentration (mg/kg) BGS background concentrations	Estimated Soil Chemistry UK Soil Observatory background concentrations (mg/kg)
Arsenic	6.78 to 14.1	0 – 11.82
Cadmium	<0.33 to 0.85	0.25 – 0.45
Chromium	-	5 – 67
Copper	12.5 to 97.6	8.84 – 20.85
Iron	-	1.08 – 2.45 (%)
Lead	33.2 to 242	37 – 55
Nickel	16.7 to 40.1	6.92 – 21.04
Selenium	-	0.21 – 0.41
Vanadium	-	5 - 75
Zinc	-	49 - 67

## 3.3 Ground Stability Records

- 3.3.1 Table 4 provides a summary of the variable risk of ground stability hazards across the Grid Connection Corridor and the wider area as provided within the Envirocheck report:

**Table 4 Ground Stability records**

Hazard Type	Hazard Potential
Collapsible Ground Stability	No hazard to very low
Compressible Ground Stability	No hazard to moderate
Ground Dissolution Stability	No hazard

Hazard Type	Hazard Potential
Landslide Ground Stability	Very low to moderate
Running Sand Ground Stability	No hazard to low
Shrinking or Swelling Clay Ground Stability	No hazard to low

### 3.4 Hydrology

3.4.1 The River Trent crosses the Grid Connection Corridor west of Marton from north to south. Other relevant surface water courses are:

- Seymour Drain, which is a tributary of River Trent and flows regionally south to north, crossing the Power Station and flowing east of Cottam village;
- Marton Drain, which is a tributary of River Trent and flows regionally south to north, discharging into River Trent southwest of Marton in proximity of Trent Port (Ref 8).

3.4.2 Several other drains and ditches are present on the Grid Connection Corridor, mostly along existing boundaries between agricultural parcels. The drain network is particularly dense in the southwestern portion of the Grid Connection Corridor, in proximity of the power station.

3.4.3 A small pond is located on-site, south of Marton. Other ponds, potentially marshlands associated with the River Trent, can be observed in the proximity of the Grid Connection Corridor boundary, west of Marton.

3.4.4 Table 5 summarises the pertinent surface water quality information available associated with the Grid Connection Corridor.

**Table 5 Surface Water Quality**

Surface Water Feature	General Quality Assessment (GQA) – 2019	Distance (m)	Flow Direction	Upstream / Downstream of Site
Trent from Carlton-on-Trent to Laughton Drain Water Body	Chemical: Fail Ecological: Moderate	on-site	South-North	N/A
Seymour Drain Catchment	Chemical: Fail Ecological: Moderate	on-site	South-North	N/A
Seymour Drain Catchment	Chemical: Fail Ecological: Moderate	on-site	South-North	N/A

3.4.5 The entire Grid Connection Corridor is located within Nitrate Vulnerable Zones for Surface water.

- 3.4.6 No Licensed Surface Water Abstractions have been identified within the Grid Connection Corridor. Information on private abstractions will be included **within Chapter 9 Water Environment** of the Environmental Statement [EN010131/APP/3.1].

## 3.5 Flooding

- 3.5.1 The BGS Groundwater Flooding Susceptibility map included in the Envirocheck Report indicates that the vast majority of the Grid Connection Corridor has a potential for groundwater flooding to occur at surface. The exception is for some areas in proximity of the power station and of Marton village where there is limited potential for groundwater flooding to occur or there is only potential of flooding of property situated below ground level.
- 3.5.2 Flood maps included in the Envirocheck report indicate that the vast majority of the Grid Connection Corridor is subject to flooding without defences. However, the westernmost portion of the Grid Connection Corridor is not shown to be subject to flooding. Areas south of Marton show some limited extent to flooding as are subject to extreme flooding without defences. Linear flood defences are located west and east of River Trent, east of Marton.

## 4. Historical & Planned Development

- 4.1.1 The historical Ordnance Survey (OS) maps obtained with the Landmark Envirocheck report date between 1885 and 2021 (scales 1:2,500, 1:10,560 and 1:10,000). Given the high-level overview scope of this assessment, only historical maps scales 1:10,560 and 1:10,000 were reviewed. For the purposes of this Section, the study area has been extended to approximately 500 m from the Grid Connection Corridor boundary to include potentially contaminative off-site features. The main findings are summarised as follows.
- The Grid Connection Corridor has been predominantly agricultural from the earliest available maps (1885) to present day, with the vast majority of the area occupied by fields and drains and with farms located in close proximity to Grid Connection Corridor boundary
  - The villages of Coates, Marton and Cottam were already present by 1885.
  - The Manchester – Sheffield Lincolnshire Railway was already present by 1885. This crossed the site northwest of the Power Station. The rail route was modified by 1980 and redirected south of Cottam towards the Station.
  - A sand pit was also noted in 1885, southwest of Marton and in immediate proximity of the boundary of the Grid Connection Corridor.
  - Trent Port, located west of Marton is also present in 1885, with a malthouse and a windmill in close proximity.
  - No significant changes are noted to have occurred in the first half of the 20th century, except for the presence of Marton pumping station (visible from 1900) with associate chimney (visible from 1922) located south of the Trent Port, and a cemetery, first appearing east of Marton and north of the Grid Connection Corridor in 1922. The area immediately south of the pumping station is mapped as marshland from 1956, and then as ponds from 1980-1981.
  - The power station is visible on the maps around 1974; a sewage farm within the Grid Connection Corridor boundary, south of Marton is present from 1980-1981 to 2000.
  - No significant changes within the Grid Connection Corridor or immediate surrounding area are visible after 2000.
- 4.1.2 Information available online indicates that Cottam Power Station ceased operations in September 2019 and was due to begin decommissioning in 2021; a smaller portion of the wider industrial site is currently used as natural gas power plant (Cottam Development Centre) (Ref 9, Ref 10).
- 4.1.3 Based on a review of historical maps dated 1907-1947, the Grid Connection Corridor was not located near any wartime sites of interest such as military bases, ports or industrial centres.
- 4.1.4 An analysis of the post war historical map (1947-1956) does not show significant redevelopment within the area. Due to the rural area and the low level of

redevelopment throughout the years, there is the possibility that Unexploded Ordnance (UXO) could have gone unnoticed.

- 4.1.5 The regional UXO mapping published by Zetica (Ref 5) shows the Grid Connection Corridor lies within a zone of low bomb risk.
- 4.1.6 No further action is required with regard to potential unexploded ordnance at the Grid Connection Corridor.

## 5. Regulated Activities

5.1.1 A high-level summary of the key relevant features that characterise the Grid Connection Corridor included in the Envirocheck report is reported below. These include Contemporary Trade Entries, Sensitive Land Uses, Waste Facilities, Hazardous Substances and Pollution records mapped within the Grid Connection Corridor boundary.

5.1.2 Table 6 shows the regulated activities within the Grid Connection Corridor.

**Table 6 Regulated Activities within the Grid Connection Corridor.**

Entry Type	Details
Discharge Consents	<p>South of Cottam Power Station: registered to Powergen UK Plc, Trade Effluent Discharge – Site Drainage.</p> <p>South of Marton Village, along the A166: Registered to Severn Trent Water Limited, Sewage Discharges – Final/Treated Effluent and Storm Overflow/Storm Tank – Water Company; receiving waters: tributary of Marton Drain.</p> <p>South of Marton Village: Registered to Severn Trent Water Limited, Sewage Discharges –Storm Overflow/Storm Tank – Water Company; receiving waters: tributary of Marton Drain.</p>
Licensed waste management facility	South of Cottam Power Station, in proximity of the Grid Connection Corridor boundary: Operator: EDF Energy (Cottam Power) Limited; Category: lagoons; consent surrendered.
Underground Electrical Cable	Southwestern portion of the Grid Connection Corridor, within the power station footprint; Alternating Current, Commissioned

5.1.3 The following entries (Table 7) are specifically associated with the power station, within the power station footprint, or in its close proximity. Although located outside of the Grid Connection Corridor’s boundary, these entries have been considered relevant for the purposes of this study, given the potentially contaminative nature of the power station infrastructure.

**Table 7 Regulated Activities associated with the power station, within the power station footprint, or in its close proximity.**

Entry Type	Details
Licensed Waste Management Facility (Locations)	<p>Operator: EDF, Category: landfills taking non-biodegradable wastes (not construction); license status: surrendered. Located southeast of Cottam Power Station, approximately 800 m east of the Grid Connection Corridor.</p> <p>Operator: Cottam Power Limited, Category: lagoons; license status: surrendered. Located southeast of Cottam Power Station, approximately 600 m east of the Grid Connection Corridor.</p> <p>Operator: E D F Energy ( Cottam Power ) Limited, Category: lagoons; license status: surrendered. Located on the boundary of the Grid Connection Corridor, southeast of Cottam Power Station.</p> <p>Operator: Cottam Power Limited, Category: lagoons; license status: To PPC. Located approximately 300 m from the Grid Connection Corridor boundary, within the power station footprint.</p>



Entry Type	Details
Integrated Pollution Prevention Control	<p>Operator: Eon U K Plc, Category: lagoons; license status: surrendered. Located approximately 200 m from the Grid Connection Corridor boundary, within the power station footprint.</p> <hr/> <p>Multiple entries located within the power station footprint, with the two effective permits as follows:                      Registered to Edf Energy (Thermal Generation) Limited, for the following activities:                      - loading, unloading or storing pulverised fuel ash in bulk prior to further transportation in bulk.                      - inorganic chemicals; salts. e.g. ammonium chloride.                      - combustion; any fuel greater or equal to 50 Mw.                      - associated process.                      - a mix of recovery and disposal of &gt;50 t/d non-hazardous waste (&gt;100 t/d if only AD) involving treatment of slags and ashes.                      - disposal of &gt; 50 t/d non-hazardous waste (&gt; 100 t/d if only AD) involving physico-chemical treatment                      Effective date: 26th April 2019                      Registered to Edf Energy (Thermal Generation) Limited, for the following activities:                      - Recovery or a mix of recovery and disposal of &gt; 50 t/d non-hazardous waste (&gt; 100 t/d if only ad) involving treatment of slags and ashes.                      Effective date: 16th January 2018.</p>
Planning Hazardous Substance Consent	<p>Operator: Edf Energy Ltd, Hazardous substance: toxic; license status: New application granted unconditionally - Granted. Located within the power station footprint..</p>
Integrated pollution control	<p>Multiple entries within the Power Station footprint, related to 'Combustion processes within the Fuel &amp; Power Industry'; Operator: Edf Energy (Cottam Power) Ltd/E.On Uk Plc; license status: Authorisation superseded by a substantial or non substantial variation/ Revoked - Now IPPC.</p>
COMAH sites	<p>Operator: Edf Energy (Thermal Generation) Limited/ Edf Energy (Cottam Power) Limited, Lower Tier, Status: active.</p>
BGS Recorded mineral sites	<p>Rampton Quarry, Operator: Lafarge Aggregates Ltd., Commodity: Sand and Gravel, Status: ceased. Mapped approximately 80 m east, 400 m east and 300 m southeast of the Grid Connection Corridor, southeast of the Power Station.                      Multiple entries Cottam Power Station Ash Plant, with two entries still active:                      Operator: Cemex UK Cement, Commodity: Pulverised Fuel Ash/furnace bottom ash; mapped within the Power Station footprint.                      Operator: Edf Energy, Commodity: Gypsum From Desulphurisation Plant At Cottam Ps; mapped within the Power Station footprint.</p>
Water Abstractions	<p>Multiple entries. Operator: Edf Energy (Thermal Generation) Limited/ Edf Energy (West Burton Power) Ltd, Abstraction: Production of Energy: Boiler/ Production of Energy: Evaporative Cooling/ Production Of Energy: Non-Evaporative Cooling Feed/ Production of Energy: Process water; Source: Tidal. Mapped approximately 700 m east of the Grid Connection Corridor, southeast of the Power Station, along River Trent.                      Multiple entries. Operator: Lafarge Aggregates Limited; Abstraction: Extractive: Mineral Washing; Source: Tidal. Mapped approximately 700 m east of the Grid Connection Corridor, southeast of the Power Station, along River Trent.                      Multiple entries. Operator: Lafarge Aggregates Limited/Tarmac Aggregates Limited; Abstraction: Extractive: Mineral Washing; Source: Groundwater. Mapped approximately 500 m east of the Grid Connection Corridor, southeast of the Power Station, along River Trent.</p>

Entry Type	Details
	<p>Multiple entries. Operator Powergen/ Edf Energy (Cottam Power) Limited/ Cottam Power Limited; Abstraction: Industrial Processing (Miscellaneous), Production of Energy: Boiler Feed; Source: Groundwater. Mapped approximately 20 m from the Grid Connection Corridor boundaries, within the Power Station footprint.</p>
<p>Licensed waste management facility (area)</p>	<p>Cottam Ash Disposal Site, Licence holder: Edf Energy (Cottam Power) Ltd, Category: Waste Landfilling; &gt;10 T/D with Capacity &gt;25,000T Excluding Inert Waste; license status: Effective. Located east of Cottam Power Station, approximately 250 m east of the Grid Connection Corridor boundary</p> <p>Rampton R2 Lagoon, Licence holder: Edf Energy (Cottam Power) Ltd, Category: Waste Landfilling; &gt;10 T/D with Capacity &gt;25,000T Excluding Inert Waste; license status: Effective. Located southeast of Cottam Power Station, approximately 80 m east of the Grid Connection Corridor boundary</p> <p>Cottam Power Station, Licence holder: Cottam Power Limited, Category: Landfills Taking Non-biodegradable Wastes (Not Construction); license status: Inactive. Located east of Cottam Power Station, approximately 250 m east of the Grid Connection Corridor boundary.</p> <p>Cottam Power Station, Licence holder: Cottam Power Limited, Category: Lagoons; license status: IPPC. Located east of Cottam Power Station, approximately 250 m east of the Grid Connection Corridor boundary</p>
<p>Historical Landfill Sites</p>	<p>Licence holder: Powergen Plc, Category: Deposited Waste included Industrial Waste. Located east of Cottam Power Station, approximately 1 km m northeast of the Grid Connection Corridor boundary.</p> <p>Licence holder: Powergen Plc, Category: not supplied. Located southeast of Cottam Power Station, approximately 600 m east of the Grid Connection Corridor boundary</p> <p>Licence holder: Powergen Plc, Category: not supplied. Located southeast of Cottam Power Station, approximately 400 m south east of the Grid Connection Corridor boundary.</p>
<p>Pollution incident to controlled waters</p>	<p>Multiple entries. Incident occurred in 1996 at Powergen Flyash Outfall, Near Redland Quarry, RAMPTON, Pollutant: Miscellaneous - Inert Suspended Solids Note: Other Adverse Effects; Flyash Disch To Watercourse; category 3 – Minor Incident. Located 700 m east of the Grid Connection Corridor boundary, southeast of the power station</p>
<p>Discharge consents</p>	<p>Operator: Lafarge Aggregates Limited, Trade Discharge - Mineral Workings. Receiving water: River Trent. Mapped approximately 700 m east of the Grid Connection Corridor, southeast of the power station, along River Trent.</p> <p>Operator: Lafarge Aggregates Limited, Sewage Discharges - Final/Treated Effluent - Not Water Company. Discharge environment: Land/soakaway. Mapped approximately 700 m east of the Grid Connection Corridor, southeast of the power station, along River Trent.</p> <p>Operator: Powergen Uk Plc, Unknown type. Discharge environment not supplied. Mapped approximately 200 m northeast of the Grid Connection Corridor, east of the power station.</p>

## 6. Preliminary Risk Assessment

- 6.1.1 This section identifies possible risks, if any, arising from substances used or deposited on-site, or from other sources of land contamination. Both past and current potentially contaminative land uses have been considered. The principles and assumptions on the basis of this assessment are reported in Annex A.
- 6.1.2 Table 8 lists the potential sources of contamination that may be found at the Grid Connection Corridor and associated potential contaminants with reference to the DoE Industry Profiles (Ref 11) and R&D Publication 66: 2008 (Ref 12).

**Table 8 Potential Sources of Contamination**

Source Reference	Location	Potential Sources	Typical Associated Contaminants of Potential Concern (CoPC)
S1	On-site	Cottam Power Station	Low potential for ground gas. Potential for: metals; Polycyclic Aromatic Hydrocarbons (PAH); Polychlorinated Biphenyls (PCB), fuel oil, oils; solvents; wood preservatives; inorganic compounds; acids, alkalis; asbestos; ash.
S2	On-site	On-site agricultural land and associated facilities.	Potential for: metals; inorganics, nitrites, nitrates, ammonium pesticides and herbicides; hydrocarbons.
S3	On-site	Onsite Railway and sidings (current and historical).	Potential for hydrocarbons; PCB; PAH and creosote; Solvents; Benzene, toluene, ethylbenzene; xylene (BTEX) herbicides; metals; asbestos, ash and fill, sulphates.
S4	On-site	On-site Potential Made Ground associated with utilities infrastructure (drainage, roadways, utilities).	Low potential for ground gas. Potential for a range of inorganic and organic contaminants including but not limited to metals, metalloids, organic compounds, inorganic compounds, asbestos, hydrocarbons, methane, hydrogen sulphide and carbon dioxide.
S5	On-site	Sewage Works	Moderate potential for ground gas (potential for methane (CH <sub>4</sub> ), carbon dioxide (CO <sub>2</sub> ), hydrogen sulphide (H <sub>2</sub> S)). Potential for a range of inorganic and organic contaminants including but not limited to metals, metalloids and their compounds; inorganic ions; organics (depending on source of influent); fuel oils, PCBs, micro-organisms; treatment chemicals.
S6	Off-site	Off-site dredging lagoons, and landfill sites and pits associated with and in proximity of the power station.	High potential for landfill gas (potential for CH <sub>4</sub> , CO <sub>2</sub> , H <sub>2</sub> S). Potential for: metals; inorganics; organics including PAH and petroleum hydrocarbons; organotin compounds.
S7	Off-site	Other off-site sources: Cottam Power Station, agricultural land	Low/moderate potential for ground gas.

Source Reference	Location	Potential Sources	Typical Associated Contaminants of Potential Concern (CoPC)
		and associated facilities, railway and sidings (current and historical, potential Made Ground, cemetery.	Potential for: metals; inorganics, nitrites, nitrates, ammonium pesticides and herbicides; hydrocarbons PCBs, TPH, PAH and VOC, SVOC; BTEX asbestos, ash and fill, sulphates.

Sources: Department of Environment Industry Profiles (Ref 11) and R&D Publication 66: 2008 (Ref 12).

6.1.3 Potential receptors associated with the Grid Connection Corridor are shown on Table 9.

**Table 9 Potential Receptors**

Receptor Reference	Receptor	Description
R1	Human Health (Future users)	Future commercial receptors on-site (infrequent workers/maintenance workers at the Grid Connection Corridor (e.g. for repair work). Public users (including farmers, walkers etc).
R2	Human Health (off site – commercial/residential properties)	Commercial and residential receptors off-site (adjacent houses, farms and commercial properties, including Cottam Development Centre).
R3	Water Environment: Superficial Aquifers	Groundwater within the Secondary A aquifers.
R4	Water Environment: Bedrock Aquifers	Groundwater within the Secondary B and Secondary undifferentiated aquifers.
R5	Water Environment: Surface waters	River Trent, Seymour Drain, Marton Drain, other drains and ditches. Small pond on-site; ponds off-site.
R6	Buildings & Infrastructure: Concrete foundations associated with buildings, cables, utilities services.	Infrastructure at risk from ignition of accumulated ground gas in confined space. Below ground infrastructure at risk from aggressive ground conditions.

6.1.4 Potential pathways associated with the Grid Connection Corridor are shown in Table 10.

**Table 10 Potential Pathways**

Pathway Reference	Receptor	Description
P1	Human Health	Direct contact, dermal absorption or ingestion of soil/ water.
P2	Human Health	Inhalation of soil particulates or soil vapour derived from soils.
P3	Human Health	Inhalation of asbestos fibres
P4	Human Health	Migration of hazardous gases/vapours via permeable strata into confined spaces (asphyxiation/explosion).
P5	Water Environment: Surface water	Spillage/loss/run off from surface direct to receiving water.

Pathway Reference	Receptor	Description
P6	Water Environment: Surface water	Lateral migration of impacted shallow groundwater towards surface water receptors.
P7	Water Environment: Groundwater	Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow and/ or deep groundwater.
P8	Water Environment: Groundwater	Vertical migration of impacted shallow groundwater to the deeper aquifer.
P9	Buildings & Infrastructure: Concrete	Direct contact of buried concrete with contaminated soils (i.e. hydrocarbons) and aggressive ground conditions (pH and sulphate).
P10	Infrastructure: Supply pipes	Direct contact of services and supply pipes with contaminated soils.
P11	Buildings & Infrastructure: Structures	Migration of hazardous gases/vapours via permeable strata into enclosed spaces (off site) and service/utility trenches.

6.1.5 A qualitative preliminary risk assessment of the possible linkages of the above sources (S1 to S7), transport pathways (P1 to P11) and receptors (R1 to R6) has been undertaken using the methodology presented in Annex A.

6.1.6 The risks posed to human health, groundwater, surface water and infrastructure as summarised below.

6.1.7 The level of risk is determined based on the current condition of the Grid Connection Corridor (i.e. the effects of mitigation measures are not included).

6.1.8 The preliminary risk assessment undertaken within this section does not consider acute linkages for construction, maintenance workers, and off-site receptors during construction. It is anticipated that these acute linkages will be managed by appropriate health and safety measures.

## 6.2 Risks to Human Health

6.2.1 Given the limited likely presence of human health receptors the risk to human health is considered to be low.

6.2.2 No receptors were identified within the Grid Connection Corridor boundaries, with the exception of public users, farm workers and or maintenance workers including infrequent workers at the Cottam substation.

6.2.3 While the possibility for human receptors to come into contact directly, or indirectly, with contaminants exists, the exposure is generally considered transient and unlikely to pose an unacceptable risk to human health. The likely presence of concentrations of contaminants which may be present are also unlikely to be at concentrations which may cause harm.

## 6.3 Risks to Surface Water

6.3.1 Risks to surface watercourses on-site are considered to be generally low to moderate/low.

- 6.3.2 Surface watercourses (River Trent, Seymour Drain and Marton Drain) cross the Grid Connection Corridor for a limited extent. While the dense drainage network and shallow groundwater may facilitate runoff, the likelihood of surface water being impacted by sources within the Grid Connection Corridor is generally considered low due to the low impact surface earthworks works taking place in the vicinity of these receptors. The crossing of the River Trent will be via trenchless techniques (horizontal directional drill).
- 6.3.3 For further information about mitigation measures protective of surface water, refer to **ES Volume 1, Chapter 9: Water Environment [EN010131/APP/3.1]**.

## 6.4 Risks to Groundwater

- 6.4.1 Risks to groundwater were generally considered to be low to moderate/low.
- 6.4.2 Groundwater was recorded at relatively shallow depth (as shallow as <2 m bgl). It is therefore considered likely that the identified sources could impact the Secondary A aquifer underlying the Grid Connection Corridor with mild severity effects.
- 6.4.3 Risks to the Secondary B and Secondary (Undifferentiated) bedrock aquifers are considered to be low.
- 6.4.4 Construction works for the installation of the cables could temporarily mobilise contaminants within soil and potentially impact groundwater. However, this effect is considered to be temporary and overall risk to groundwater is expected to be acceptable.

## 6.5 Risks to Infrastructure

- 6.5.1 Risks to existing and future infrastructure is generally considered to be very low to low.
- 6.5.2 Except for Cottam substation area, no significant infrastructure or buildings are present on-site and future infrastructure (i.e. proposed cables) may be impacted on by localised aggressive ground conditions in proximity of the identified sources (railway, dredging lagoons) but the impact is unlikely to pose a risk to the infrastructure itself given the nature of the sources.
- 6.5.3 Current and future infrastructure in proximity of Cottam Power Station might be impacted by existing ground conditions associated with Made Ground and/or potential contaminants presence; this risk is considered to be low to moderate/low and overall acceptable.

## 7. Conclusions

- 7.1.1 The following is a summary of the review of the information sources listed in Section 1.3.
- 7.1.2 The anticipated geology comprises localised Glaciofluvial Deposits, Alluvium, and Holme Pierrepont Sand superficial deposits across most of the Grid Connection Corridor. The bedrock formations, expected to be underlying the Grid Connection Corridor, are the Scunthorpe Mudstone Formation, Penarth and Mercia Mudstone Group.
- 7.1.3 The Glaciofluvial Deposits, Alluvium, Holme Pierrepont Member deposits, where present at the Grid Connection Corridor, are classified as a Secondary A aquifer.
- 7.1.4 The bedrock deposits of the Scunthorpe and Mercia Mudstone groups are classified as Secondary B aquifers; the Penarth group is classified as a Secondary undifferentiated aquifer.
- 7.1.5 Based on the review of historical maps, the Grid Connection Corridor has had a predominantly agricultural use with the exception of the railway line running through the western portion of the Grid Connection Corridor, and the infrastructure associated with Cottam Power Station. Other potential sources of contamination were identified within the Grid Connection Corridor boundaries and off-site, including a sand pit, potentially infilled land, potential Made Ground, landfills and dredging lagoons, and former sewage works.
- 7.1.6 Given the nature of the scheme, the sources identified and the nature of the likely exposure to existing human health receptors and that of the future users of the Grid Connection Corridor, the risk to human health is considered to be low. Risks to controlled waters has been identified to be low to moderate/low.
- 7.1.7 Overall, the potential risks that have been identified have been assessed by the Preliminary Risk Assessment as being acceptable.
- 7.1.8 Therefore, the potential risks identified are not considered to pose a significant risk to the Grid Connection Corridor.



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# Annex A. Risk Assessment Principles

## 8.1 Assessment Framework

Current best practice recommends that the determination of health hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Statutory Guidance to Part 2A (2012) and Land Contamination: Risk Management (LCRM) (2020).

The “suitable for use” approach is adopted for the assessment of contaminated land where remedial measures are undertaken where unacceptable risks to human health or the environment are realised taking into account the use (or proposed use) of the land in question and the environmental setting.

The risk assessment process for environmental contaminants is based on a source-pathway-receptor analysis. These terms can be defined as follows:

- **Source:** hazardous substance that has the potential to cause adverse impacts; and
- **Pathway:** route whereby a hazardous substance may come into contact with the receptor: examples include ingestion of contaminated soil and leaching of contaminants from soil into watercourses; and
- **Receptor: target that may be affected by contamination:** examples include human occupants/ users of site, water resources (surface waters or groundwater), or structures.

For a risk to be present, there must be a relevant/ viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

The following sections details the initial Conceptual Site Model (iCSM) which has been developed for the Grid Connection Corridor with a view to assessing the potential risks/liabilities and constraints associated with the Grid Connection Corridor in its current condition prior to any proposed redevelopment. Risks associated with the proposed redevelopment have also been assessed based on a commercial future land use scenario, including any potential sources of contamination, potential receptors and potential contaminant pathways identified during this desk-based assessment.

## 8.2 Risk Assessment Principles

Current best practice recommends that the determination of hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Environment Agency guidance on LCRM.

For a risk to be present, there must be a viable contaminant linkage i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

Assessments of risks associated with each of these contaminant linkages are discussed in the following sections.

Using criteria broadly based on those presented in the National House Building Council/Environment Agency/Chartered Institute of Environmental Health publication R&D 66 (NHBC/EA/CIEH, 2008), the magnitude of the risk associated with potential

contamination at the Grid Connection Corridor has been assessed. To do this an estimate is made of:

- The magnitude of the potential consequence (i.e. severity);
- The magnitude of probability (i.e. likelihood).

The severity of the risk is classified according to the criteria in Table A-1.

**Table A-1 Description of Severity of Risk**

Term	Description
Severe	Highly elevated concentrations likely to result in significant harm to human health. Catastrophic damage to crops, buildings or property (e.g. by explosion). Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects of water quality. Major damage to aquatic or other ecosystems.
Medium	Elevated concentrations which could result in significant harm to human health. Significant damage to crops, buildings or property (e.g. damage to building rendering it unsafe). Equivalent to EA Category 2 pollution incident including significant effect on water quality. Significant damage to aquatic or other ecosystems.
Mild	Exposure to human health unlikely to lead to significant harm. Minor damage to crops, buildings or property (e.g. surface spalling to concrete). Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality. Minor or short-lived damage to aquatic or other ecosystems.
Minor	No measurable effect on humans. Repairable effects of damage to buildings, structures and services. Equivalent to insubstantial pollution incident with no observed effect on water quality of ecosystems.

The probability of the risk occurring is classified according to the criteria in Table A-2.

**Table A-2 Likelihood of Risk Occurrence**

Likelihood	Explanation
High	Contaminant linkage may be present that appears very likely in the short-term and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	Contaminant linkage may be present, and it is probable that the risk will occur over the long term.
Low	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in Table A-3.

**Table A-3 Risk based on Comparison of Likelihood and Severity**

	Severity			
	SEVERE	MEDIUM	MILD	MINOR
High				
Likely				
Low				
Unlikely				

	Severity			
<b>HIGH</b>	Very High	High	Moderate	Low
<b>LIKELY</b>	High	Moderate	Moderate/Low	Low
<b>LOW</b>	Moderate	Moderate/Low	Low	Very Low
<b>UNLIKELY</b>	Moderate/Low	Low	Very Low	Very Low

### 8.3 LCRM Assessment of Risk

Current contaminated land guidance in LCRM (Ref 1) categorises risk at Stage 1 Tier 1 (i.e. PRA) as follows:

- Acceptable; and
- Unacceptable.

However, no framework for assessing the risk has been published to accompany the guidance, so the CIEH & NHBC R&D 66 assessment framework constitutes best practice in this regard. To align the risk rankings in Section 9.2 with the LCRM rankings and with the Part 2A definitions, the following matrix has been utilised. This conversion is demonstrated in Table A-4 below:

**Table A-4 Conversion to LCRM Risk Categories**

	Acceptable	Unacceptable
Very Low		
Low		
Moderate/Low		
Moderate*		
High		
Very High		

\* This risk category spans both acceptable and unacceptable. This is intentional as it is this risk band that tends to have the greatest level of uncertainty associated with it. Acceptability will dependent on site-specific circumstances and level of confidence in the available evidence.

For a risk to be unacceptable, the contaminant linkage should be associated with at least a “medium” severity as defined in Table A4.3 in Annex 4 of R&D66 and the probability should (in the majority of cases) be at least “likely” as defined in Table A4.4 of R&D66.

These risk categories represent the level of risk as it is currently understood from the information available at this time.