Meridian Solar Farm

EN010169

Volume 6

Environmental Statement

6.3 ES Appendix 5-4: Contaminated Land Assessment

APFP Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

March 2026

1. Errata Notice

1.1.1. This report was prepared for the Preliminary Environmental Information Report in April 2025. Since the preparation of this report, there have been updates to the Order Limits of the Scheme, however, these do not impact on the conclusions of this report.

1.1.2. Errors were noted within Table 3-1 of this report, as part of the statutory consultation feedback received from the Environment Agency. Therefore, an updated table is provided below. These updates do not change the conclusions of the preliminary risk assessment.

Updated Table 3-1: Summary of environmental data – Solar Development Area and Inter-Array Connections

Data Source	Details
BGS Recorded Mineral Sites	Sand and gravel mineral assessment area within Land Parcel A.
Landfill sites.	No recorded historical landfill sites situated within the Solar Development Area and Inter-Arrays. 6 historical landfill sites situated within 500m from the Solar Development Area and Inter-Arrays: • New River Drove; Deposited household waste; Last input 1970; NGR 525900 315900; • Queens Bank; Deposited household waste; Last input 1975; NGR 529100 314300; • West Drove; Deposited household waste; Last input 1970; NGR 534300 312700; • Leeds Gate Bridge; Deposited commercial waste; First input 1973; NGR 536500 317200; • Drain adjacent to Lutton Gate Road; Deposited inert waste; First input 1987; Last input 1990, NGR 536500 316300; • Parsons Lane landfill site; Deposited household waste; NGR 532200, 313400. 4 recorded historical landfill sites situated between 501-1000m from the Solar Development Area and Inter-Arrays: • Holbeach Drove Gate; Deposited household waste; Last input 1970; NGR 532800 312500 • Mole Drove Farm; Deposited household waste; Last input 1970; NGR 535200 313700

Data Source	Details
	• Peacock House; Deposited household waste; NGR 533600 311600, • Land off Little Dog Grove; Deposited household waste; NGR 533900 317000.
Discharge consents	No discharge consents located within the Solar Development Area and Inter-Arrays. 6 discharge consents between 250-500m, and 5 discharge consents between 500-1000m from the Solar Development Area and Inter-Arrays.
Recorded pollution incidents to controlled waters	7 recorded pollution incidents located within 1km of the Solar Development Area and Inter-Arrays.

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1 Introduction

1.1 Background

Jeremy Benn Associates Ltd (JBA) have been commissioned by the Temple Group Ltd on behalf of Meridian Solar Farm Ltd to undertake a desk based contaminated land assessment to provide information as part of a Development Consent Order (DCO) application, under the Planning Act 2008, for the Meridian Solar Farm Nationally Significant Infrastructure Project (NSIP). The NSIP concerns the construction, operation (including maintenance) and decommissioning of a solar photovoltaic (PV) electricity generating facility with associated infrastructure including co-located Battery Energy Storage System (BESS) and a Grid Connection up to approximately 13km (referred to collectively as the 'Scheme'). The Scheme consists of three elements, the 'PV Area', the 'Grid Connection', and the 'Inter-Array Connection'. The PV Area is the land proposed to contain the solar PV infrastructure, solar PV supporting infrastructure and BESS and On-Site Substation Compounds. The Grid Connection Corridor and Inter-Array Areas are the indicative areas from which routing for the Grid Connection and Inter-Array Connection will be identified. The 'Site' consists of the PV Area, Inter-Array Areas and Grid Connection Corridor.

The Site is located within South Holland in southeast Lincolnshire, east of Spalding and north east of Crowland. This desk-based assessment is required to assess potential geo-environmental (land contamination) related risks associated with the Scheme.

1.2 Aim and scope

The purpose of this desk study report is to determine the likely presence and extent of any potential environmental (contamination related) risks associated with the Scheme. This is achieved through:

- review of the current environmental setting, establishing any potential environmental pathways and receptors;
- assessment of potential contamination sources through analysis of environmental regulatory data and historical land uses;
- a qualitative Preliminary Risk Assessment (PRA) based upon current UK guidance: Land Contamination Risk Management (Environment Agency (EA) 2020[1]) for any potential sources that have been identified, following the production of a conceptual site model, using the source-pathway-receptor methodology. This corresponds to a Stage 1 Risk Assessment under the above EA guidance framework.

Any conclusions and recommendations are then be given based on the results of this assessment. It should be noted that ecological and geotechnical assessments (ground stability) are excluded from this report and no specific geoenvironmental site walkover visit has been undertaken at this stage. Also, this assessment excludes assessment of above

[1] https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks/stage-1-risk-assessment

ground infrastructure at the Site for the potential presence of Asbestos Containing Materials, or assessment of the presence of potential invasive plant species.

1.3 Data sources

The data used in the desk study were obtained from the following sources:

- Topography and general mapping:
  - OS Open Data, Terrain 50 DTM, LiDAR 1/2m DTM (EA Open Data), and
  - Aerial photography (Google Earth and Bing Maps).
- Geology and Soils:
  - British Geological Survey (BGS) 1:50,000 Geology Mapping
  - BGS digital geology mapping,
  - BGS online borehole database (BGS website),
  - BGS online Lexicon (BGS website),
  - 1:250,000 soils mapping (Soil Survey of England and Wales, 1983),
  - Soil Landscapes Online Viewer (DEFRA, 2022),
  - DEFRA's Magic Map, The National Soil Resources Institute (NSRI), and
  - Mining Remediation Authority online viewer.
- Hydrogeology:
  - Aquifer classification (DEFRA's Magic Map),
  - Groundwater vulnerability (DEFRA's Magic Map),
  - Source Protection Zones (DEFRA's Magic Map),
  - Flood Risk Online Viewer (https://check-long-term-flood-risk.service.gov.uk/).
- Contaminated Land:
  - National Library of Scotland Historic Maps,
  - Category 1 & 2 Environmental Pollution Incidents (CaBA Identity),
  - Historic Landfill Sites.

1.4 Limitations

This report has been prepared based on use of the desk-based sources of information highlighted above. The report does not preclude other potential contaminants being present at the Site beyond those which are highlighted in the following sections.

2 Environmental setting

2.1 Introduction

The section presents a summary of JBA's understanding of the environmental setting of the Site and local area, including aspects such as the hydrology, geology and ecology. This analysis will enable the identification of vulnerable receptors (such as productive aquifers, sites of ecological importance etc.) and potential pathways (such as migration through surface and sub-surface water flow).

2.2 Site location

The Site is located within South Holland in southeast Lincolnshire, east of Spalding and north east of Crowland. The Site encompasses the PV Area, Inter-Arrays Areas and Grid Connection Corridor. The Site comprises relatively low lying, predominantly arable agricultural land with isolated pockets of plantation woodland, hedgerow, and scrub. Steep, man-made agricultural drainage ditches border many of the arable field boundaries.

The Grid Connection Corridor runs up to approximately 13km from the PV Area towards the north to connect the PV Area to the national electricity transmission system (NETS) point of connection. The Site location is provided in Figure 2-1.

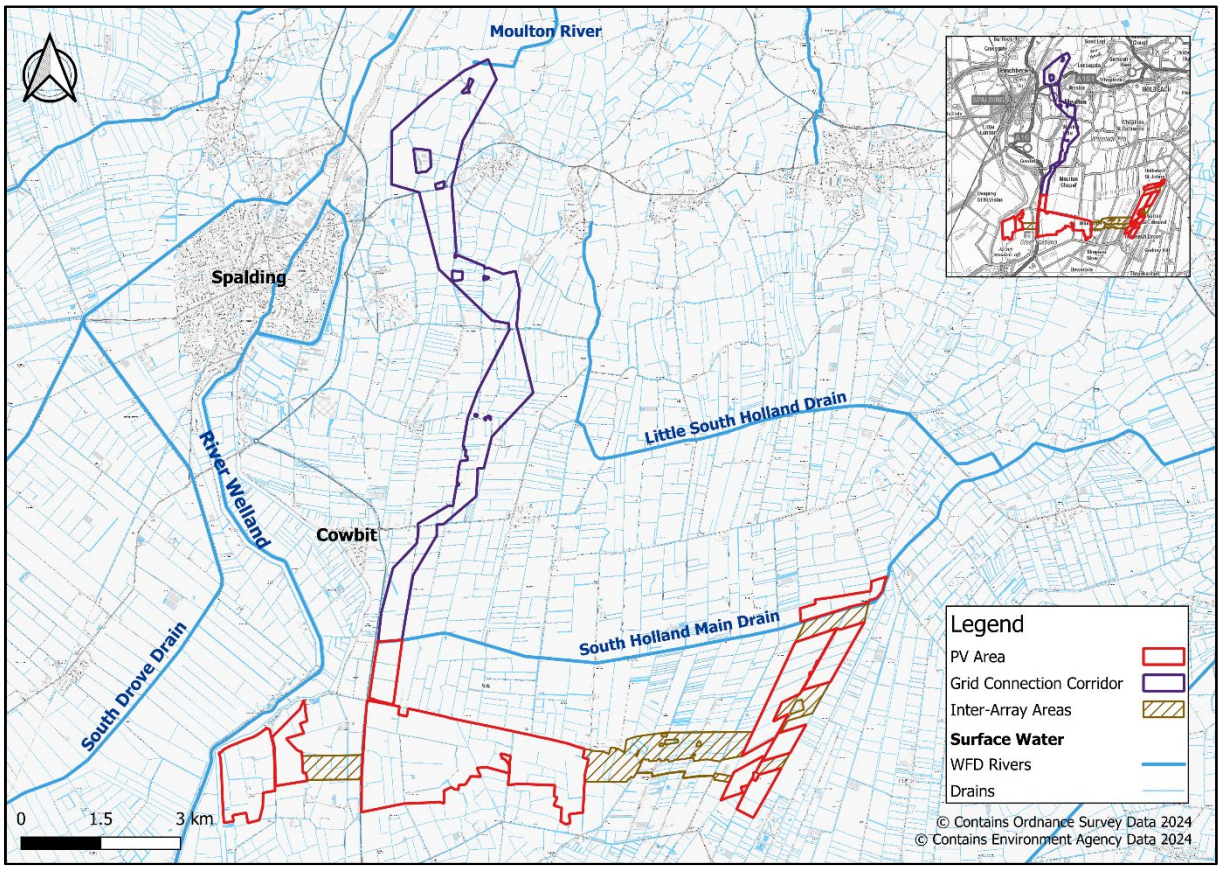


Figure 2-1: Site Location

2.3 Topography

The topography of the Site is shown in Figure 2-2. The PV Area and Inter-Array Areas are relatively flat with an elevation varying between approximately 0.1 to 2.64mAOD. The elevation within the Grid Connection Corridor varies between approximately 0.8 to 3.6mAOD.

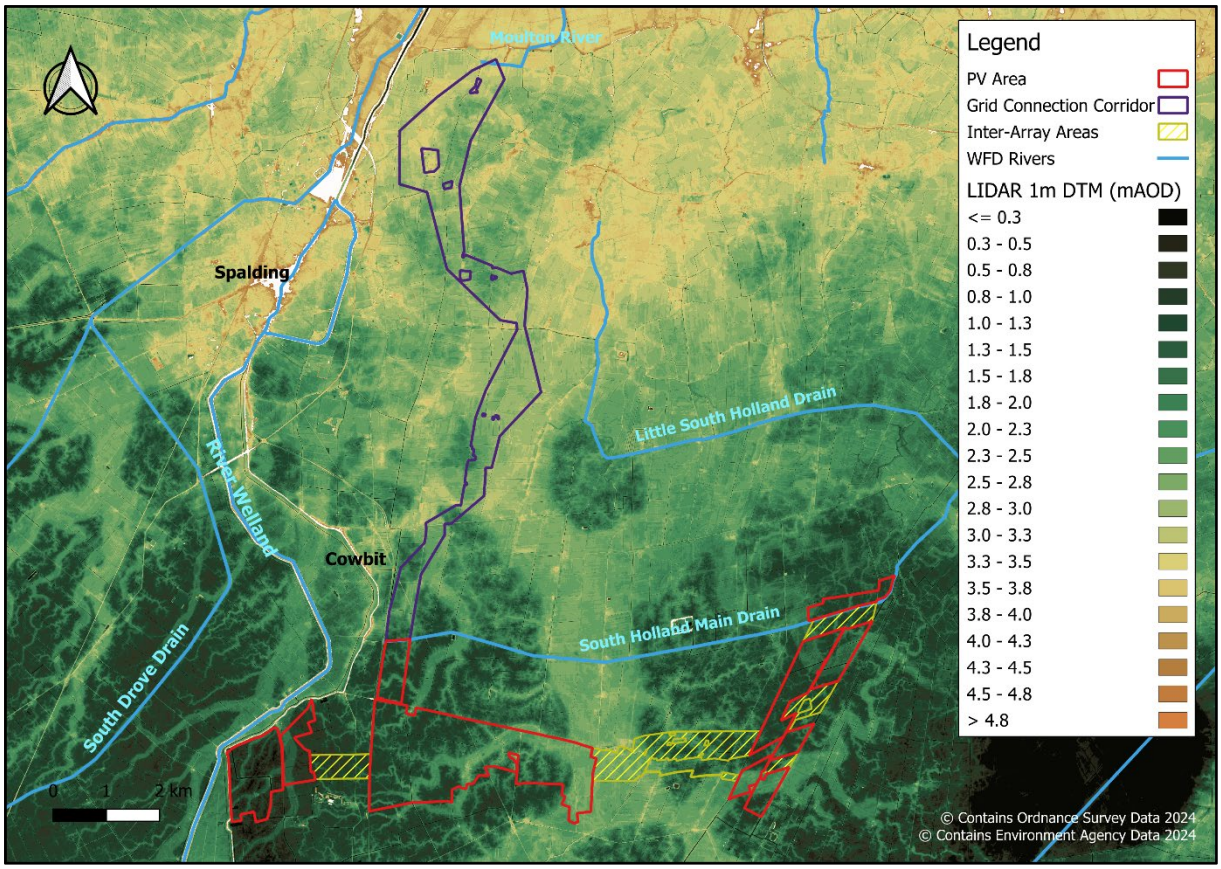


Figure 2-2: Topography

2.4 Surface water hydrology

The main watercourses in the area surrounding the Site are River Welland and South Holland Main Drain (Figure 2-3). An assessment of surface waterbodies for ecological and chemical quality is maintained by the EA under the Water Framework Directive and is viewable through their online Catchment Data Explorer. The Site lies within two Water Framework Directive (WFD) catchments. All except the eastern land parcel of the PV Area (land parcel D), lies within the "Welland - conf Greatford Cut to tidal Waterbody" catchment while the eastern land parcel (land parcel D) lies within the 'South Holland Main Drain Waterbody' catchment.

The River Welland is 33.2km in length and flows northwards approximately 450m from the western edge of the Site. The section of River Welland within the surrounding area of the Site belongs to the "Welland - conf Greatford Cut to tidal Waterbody" catchment and has 'moderate' ecological status under the WFD's 2022 classification. It has a hydromorphological designation of 'heavily modified' and a catchment area of 71 km².

The South Holland Main Drain is 36km in length and flows eastwards in close proximity to the Scheme. The river belongs to the 'South Holland Main Drain Waterbody' catchment and has 'moderate' ecological status under the WFD's 2022 classification. It has a hydromorphological designation of 'artificial' and a catchment area of 169 km².

The closest EA HiFlows-UK flow gauging station on the River Welland is located approximately 15km upstream of the Site, at 'Welland at Tallington Total' (NRFA No. 31004). This gauging station reports a QMED flow of 35m³/s and a mean flow of 4.043m³/s. The Q95 flow is 0.894m³/s.

The Moulton River is an artificial river having moderate ecological status with a length of 5.6km and a catchment area of 24.3km² which crosses the northern edge of the Grid Connection Corridor.

2.5 Surface water abstractions

There are no surface water abstraction licences recorded by the EA within the Site. However, there are eight surface water abstraction licences within 1km of the Site. Six of the surface water abstractions are used for general agricultural purposes and two of the abstractions are used for drainage operations - industrial, commercial and public service. The nearest surface water abstraction is located adjacent to the northern edge of PV Area (land parcel B). There are no abstraction licences recorded by the EA within the Grid Connection Corridor or Inter-Array Areas.

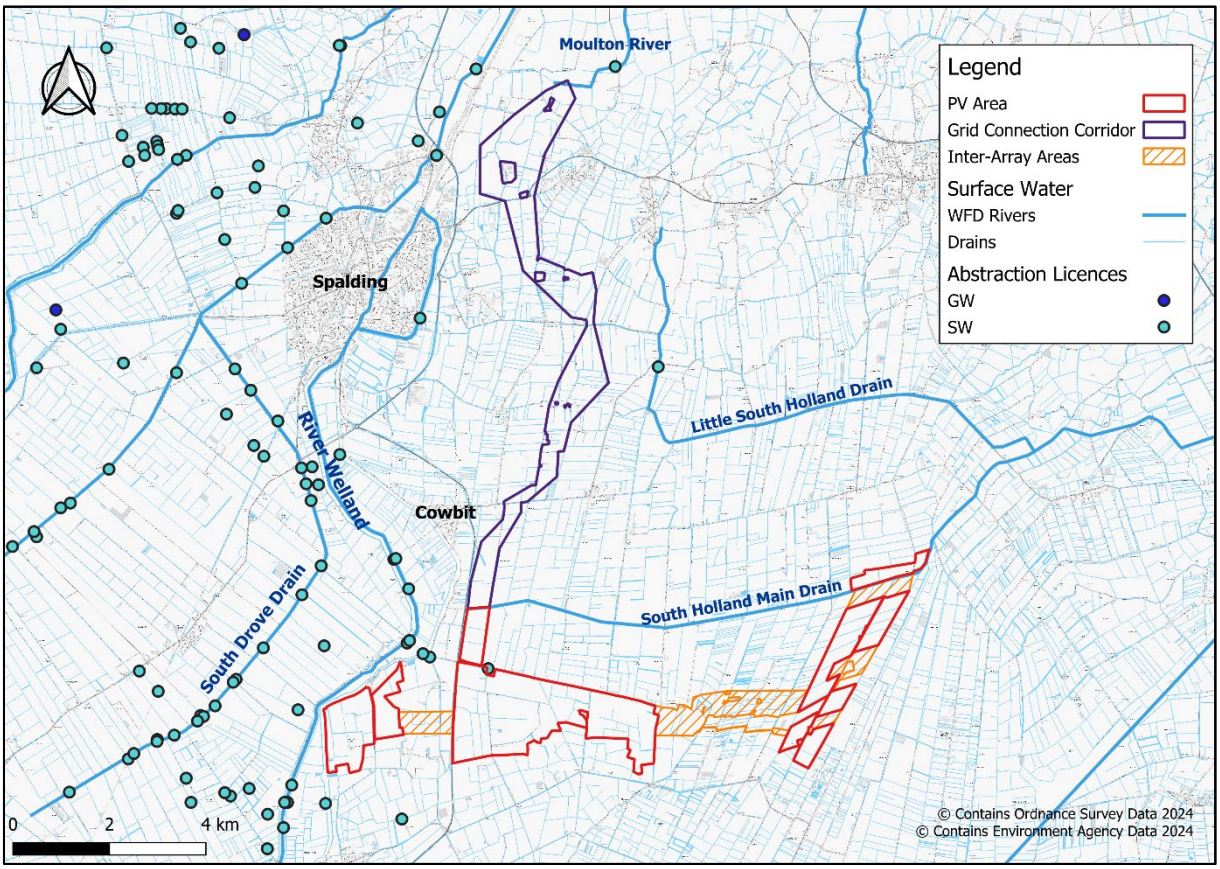


Figure 2-3: Surface water features

2.6 Geology

2.6.1 Summary

Information on the soils and geology of the Site and surrounding area has been derived from the Soil Survey of England and Wales (1970), 1:50,000 BGS geology mapping (BGS online map viewer), 1:50,000 BGS geology mapping (Sheet 144 Spalding and Sheet 158 Peterborough) and the BGS online borehole archive (GeoIndex).

A summary of geological stratigraphy beneath the Site is given in Table 2-1.

Table 2-1: Geological stratigraphy on Site

Age	Formation/Group		Description	Thickness (m)
Quaternary Period	Topsoil		Loamy and clayey soils of coastal flats	0.2 – 0.5*
	Superficial Deposit	Tidal Flat Deposits – Clay, Silt and Sand	Yellow to grey-brown peaty silty clay	4.0 – 6.7*
		Peat	Decomposed mass of semi-carbonized vegetation which has grown under waterlogged, anaerobic conditions, usually in bogs or swamps.	0 – 1.0*
		River Terrace – Sand and Gravel	Very clayey sandy gravel with traces of indigenous shell fragments	0 – 6.0*
Jurassic Period	Bedrock Geology	West Walton Formation	Calcareous mudstone, silty mudstone and siltstone, with subordinate fine-grained sandstones and argillaceous limestone (cementstone) or siltstone nodules	15 – 17**

Age	Formation/Group		Description	Thickness (m)
		Oxford Clay Formation	Grey, generally smooth to slightly silty silicate-mudstone, with sporadic beds of argillaceous limestone nodules	Up to 76m**
Sources: * BGS Borehole Records ** BGS Online Lexicon of Named Rock Units				

2.6.2 Soils

The Soil Landscapes Online Viewer (DEFRA, 2024) indicates that the Site is exclusively covered by medium-carbon, loamy and clayey soils of coastal flats with naturally high groundwater. The soils are mostly drained. Shallow groundwater and marginal ditches to most fields mean that the water resource is vulnerable to pollution from nutrients, pesticides and wastes applied to land. The Soil Landscape Online Viewer also indicates that the soils covering the Site and surrounding area are classified as Grade 1 and Grade 2 soils. This means that the soils are Excellent and Very Good quality for agricultural purposes.

The BGS borehole records indicate that the Site is underlain by approximately 0.2-0.5m thick dark brown loamy topsoil.

2.6.3 Superficial deposits

The BGS GeoIndex indicates that the Site is exclusively underlain by superficial Tidal Flat deposits (Figure 2-4) comprising soft to firm light brown/grey/red-brown silty sandy clay and peat formed up to two million years ago in the Quaternary Period.

Also, the BGS borehole records indicate that the Site is underlain by approximately 4.0 - 6.7m of thick silty sandy clay Tidal Flat deposits with traces of Peat, 0.0 - 1.0m thick Peat and 0.0 - 6.0m thick River Terrace silty sandy gravels. Groundwater was not encountered in the majority of the boreholes which were viewed. Perched groundwater was only encountered on isolated areas of the Site in permeable horizons.

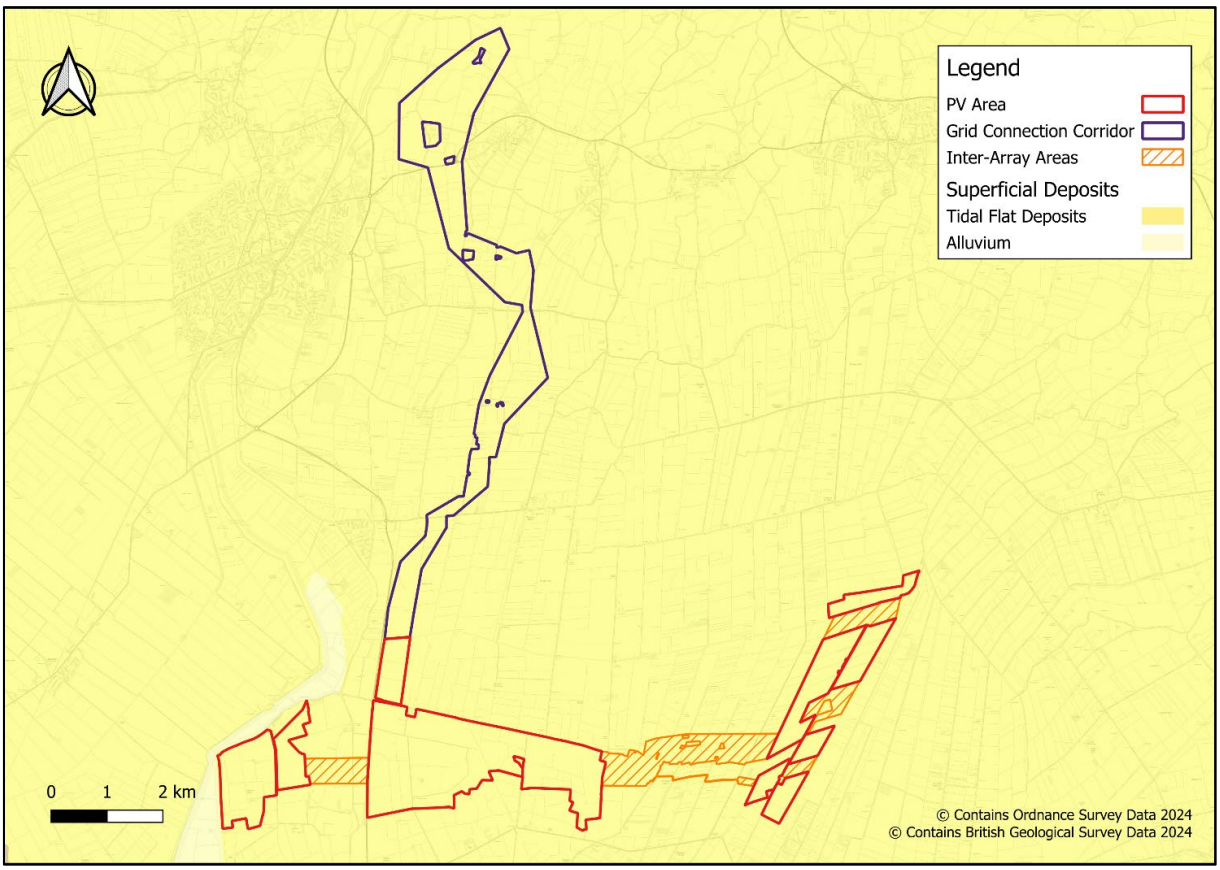


Figure 2-4: Superficial deposits

2.6.4 Bedrock geology

The bedrock geology underlying the Site is shown in Figure 2-5. The BGS GeoIndex indicates that:

- the majority of the Site is underlain by two lithologies of Upper Jurassic West Walston Formation and Middle to Upper Jurassic Oxford Clay Formation.
- the south-eastern part of the PV Area (southern part of land parcel D) is underlain by the undifferentiated West Walton and Ampthill Clay Formations.

The Oxford Clay Formation comprises up to 76m thick pale grey, generally smooth to slightly silty silicate-mudstone with sporadic beds of argillaceous limestone nodules formed between 166.1 and 157.3 million years ago during the Jurassic period.

The younger West Walton Formation comprises 15 to 17m thick calcareous mudstone and silty mudstone and siltstone with subordinate fine-grained sandstones and argillaceous limestone (cementstone) or siltstone nodules formed between 163.5 and 157.3 million years ago during the Jurassic period.

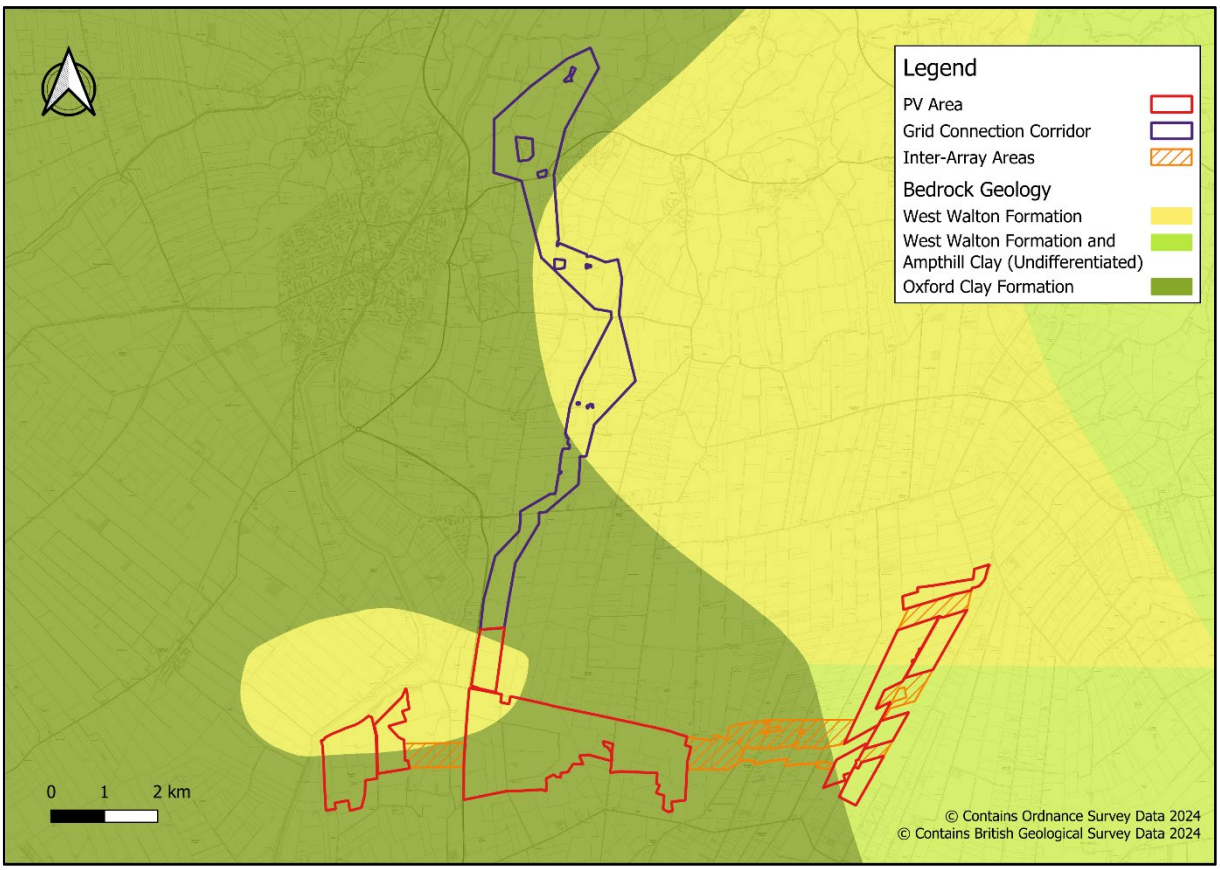


Figure 2-5: Bedrock geology

2.7 Coal and non-coal mining

The Mining Remediation Authority's online interactive viewer has been reviewed for the area. The Site is not located within any Coal Mining Reporting Area. There is no identified coal mining activity within the Site and the surrounding area.

2.8 BGS GeoIndex

There are 14 historical boreholes present within the Site including 10 boreholes in the PV Area, 3 in the Inter-Array Area and 1 in the Grid Connection Corridor. Borehole records are available on the BGS GeoIndex. The borehole records are broadly consistent with the information presented within BGS maps of the area. The geological information within the boreholes has been evaluated and compared with the geological maps. Based on the information provided in records from the boreholes presented in Figure 2-6, a preliminary geological model for the Site has been developed and is presented in Table 2-1.

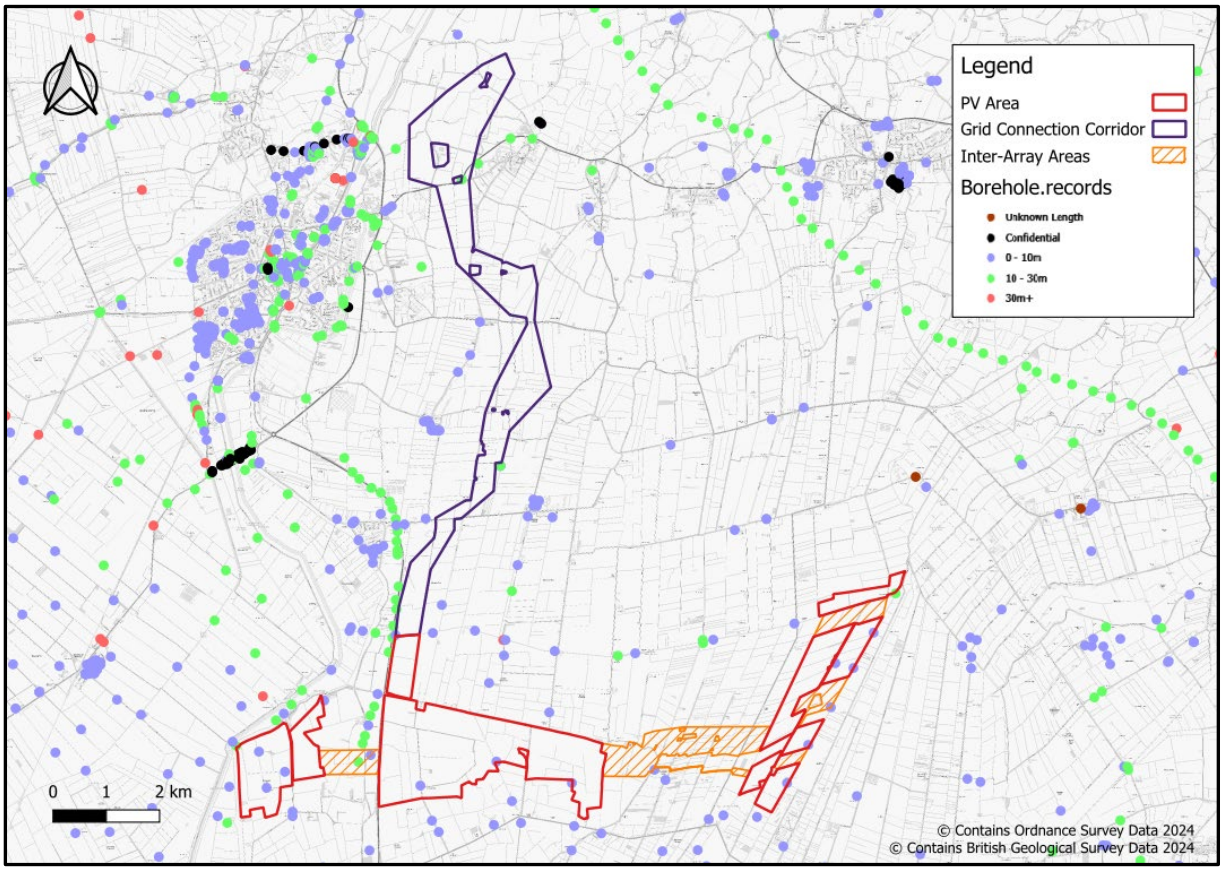


Figure 2-6: BGS borehole locations

2.9 Hydrogeology

2.9.1 Aquifer designation

The geological strata summarised in the Geology and Soils section have been assessed for their hydrogeological properties using the BGS aquifer designation mapping. The superficial deposits and bedrock units underlying the whole Site and surrounding area are classified as unproductive strata.

2.9.2 Aquifer vulnerability and water quality

Defra aquifer vulnerability mapping indicates underlying superficial deposits and bedrock lithologies as unproductive strata.

2.9.3 Groundwater abstraction

There are no groundwater abstraction licences recorded by the EA or the Local Authorities within 1km of the Site.

2.9.4 Discharge consents

There are no discharge consents located within the Site, however, there are 23 discharge consents provided by the EA within 1km of the Site.

2.9.5 Aquifer properties and groundwater flow

The underlying superficial deposits and bedrock lithologies are marked as unproductive strata.

2.9.6 Groundwater source protection zones

Source Protection Zones (SPZs) are used to protect areas of vulnerable groundwater that is used for abstraction and where water quality is of high importance (such as drinking water abstractions). SPZs are categorised into three zones, 1-3, with 1 being of highest risk of contamination, and 3 representing the lowest risk but still within the groundwater catchment. There are no SPZs recorded within 1km of the Site. The nearest SPZ is located approximately 10km to the south-west of the western edge of the Site.

2.9.7 Ecological designations

Ecological designations are sites that contain water-dependant features that could be affected by the development.

Sites of Special Scientific Interest (SSSI) are the finest sites for wildlife and natural features, supporting many characteristics, rare and endangered species, habitats and natural features. There are no SSSI within 1km of the Site. The nearest SSSI is Cowbit Wash SSSI located approximately 4.5 km northwest of the PV Area, 4 km west of the Grid Connection Corridor.

There are no Special Protection Area (SPA), Special Areas of Conservation (SAC) or RAMSAR sites within 5km of the Site.

2.10 Summary of potential environmental receptors

A summary of environmental receptors that may be present in or near to the Site is given in Table 2-2. This shows receptor types and their associated sensitivity.

Table 2-2: Environmental receptors

Receptor Type	Receptor	Sensitivity	Reasoning
Human receptors	Future site users and workers involved in the Scheme development	High	At this stage JBA understand that the proposed works may potentially involve limited excavation and other ancillary groundworks.
Groundwater	Unproductive strata	Negligible	Unproductive strata.
Surface water	River Welland	Medium	Flows approximately 250m west of the PV Area (land parcel A). Potential for contaminants to reach this receptor via surface water flow. Ecological status: moderate; Chemical status: does not

Receptor Type	Receptor	Sensitivity	Reasoning
			require assessment.
	South Holland Main Drain	Medium	Flows adjacent to the northern edge of the PV Area and southern edge of Grid Connection Corridor. Potential for contaminants to reach this receptor via surface water flow. Ecological status: moderate; Chemical status: does not require assessment.
	Moulton River	Medium	Intersects the northernmost point of the Grid Connection Corridor. Potential for contaminants to reach this receptor via surface water flow. Ecological status: moderate; Chemical status: does not require assessment.
	Little South Holland Drain	Medium	A small tributary of the South Holland Main Drain, flows eastwards approximately 1km from the Grid Connection Corridor to the east. Potential for contaminants to reach receptor via surface water flow.
	Abstractions	Medium	Eight surface water abstractions within 1km of the Site. Six out of eight abstractions are used for general agricultural purposes and two are used for drainage operations.

3 Potential contamination sources

3.1 Introduction

Analysis of potential contamination sources has been completed through review of various data sources. This includes regulatory data, historical mapping and the National Hazard Directory. Historical maps show the development of the Site from 1840.

3.2 PV Area and Inter-Array Areas

3.2.1 Regulatory and environmental data

A summary of regulatory environmental data within 1km from the PV Area and Inter-Array Areas is presented in Table 3-1.

Table 3-1: Summary of environmental data - PV Area and Inter-Array Areas

Data source	Details
BGS Recorded Mineral Sites	None within 1km.
Landfill sites	No recorded historical landfill sites situated within the PV Area and Inter-Array Areas. 5 historical landfill sites situated within 250m from the PV Area and Inter-Array Areas: • New River Drove; Deposited household waste; Last input 1970; NGR 525900 315900 • Queens Bank; Deposited household waste; Last input 1975; NGR 529100 314300 • West Drove; Deposited household waste; Last input 1970; NGR 534300 312700 • Leeds Gate Bridge; Deposited commercial waste; First input 1973; NGR 536500 317200 • Drain adjacent to Lutton Gate Road; Deposited inert waste; First input 1987; Last input 1990, NGR 536500 316300 2 recorded historical landfill sites situated between 501-1000m from the PV Area and Inter-Array Areas: • Holbeach Drove Gate; Deposited household waste; Last input 1970; NGR 532800 312500 • Mole Drove Farm; Deposited household waste; Last input 1970; NGR 535200 313700
Discharge consents	No discharge consents located within the PV Area and Inter-Array Areas, 6 discharge consents between 250-500m, and 5 discharge consents between 500-1000m from the PV

Data source	Details
	Area and Inter-Array Areas.
Recorded pollution incidents to controlled waters	2 recorded pollution incidents (1 significant, 1 no impact) situated within 250m, and 1 incident (major) situated between 501-1000m of the PV Area and Inter-Array Areas.

3.2.2 Historical land use

The historical land uses on and adjacent to the PV Area and Inter-Array Areas have been determined from a review of historical mapping of National Library of Scotland, Mineral Resource Maps in England (Lincolnshire), Category 1 & 2 Environmental Pollution Incidents (CaBA Identity) and Historic Landfill Sites. It should be noted that some potential sources of contamination e.g. electrical substations are only shown in 1:2,500 historical maps which are not accessible in National Library of Scotland's website.

The most pertinent historical developments relating to potential contamination sources are shown in Table 3-2.

Table 3-2: Potential contamination sources based upon historical land use within 1km from the PV Area and Inter-Array Areas

Map year	Land use on-site PV Area and Inter-Array Areas	Land use off-site PV Area and Inter-Array Areas (within 1km)	Potential contamination sources
1840 – 1880 (OS Six Inch)	Predominantly agricultural land, cottages, farms; drains and sluices; sheepfolds; footpaths, tracks, roads and bridges; Great Northern and Great Eastern Joint Railway.	Predominantly agricultural land, cottages, farms; drains and sluices; sheepfolds; footpaths, roads and bridges; boat house; St James's brick works; Postland train stations; smithy; Shepeau Stow mill (corn); Pumping station.	Made Ground associated with residential and commercial properties, roads, bridges and footpaths, railways, stations and road embankments; Smithy; Mill; Pumping station.
1892 - 1914 (OS 25 Inch)	Pumping station.	No significant changes.	Pumping station.
1930 - 1942 (OS Half-inch); 1937 - 1961	No significant changes.	Slight urban development; Mills no longer in place.	Made Ground associated with urban development.

Map year	Land use on-site PV Area and Inter-Array Areas	Land use off-site PV Area and Inter-Array Areas (within 1km)	Potential contamination sources
(OS 1:25,000)			
1949 - 1972 (OS 1:10,000 / 1:10,560)	No significant changes.	No significant changes.	Made Ground.
2000 (10k Raster Mapping)	Peterborough and Spalding gliding club (Crowland airfield- not been a WW2 RAF or USAAF operational station); Disused pit; railway dismantled.	Continuing urban development including playing fields, caravan parks in Crowland and Cowbit; Postland pumping station; Disused pits; Gas valve compound; Sewage works.	Made Ground associated with residential and commercial properties, airfield (potential for storage of fuel, aircraft maintenance, use of retardants etc), gas valve compound, disused pits and dismantled railway; Sewage works.
2022	No significant changes.	No significant changes.	Made Ground.

3.3 Grid Connection Corridor

3.3.1 Regulatory and environmental data

A summary of regulatory environmental data within the Grid Connection Corridor is presented in Table 3-4.

Table 3-3: Summary of environmental data - Grid Connection Corridor

Data source	Details
BGS Recorded Mineral Sites	None within 1km.
Landfill sites	No historical landfill sites situated within the Grid Connection Corridor. 1 historical landfill site situated within 1000m from the Grid Connection Corridor: • New River Drove; Deposited household waste; Last input 1970; NGR 525900 315900

Data source	Details
Discharge consents	No discharge consents located within the Grid Connection Corridor, 4 discharge consents within 250m, and 6 discharge consents between 500-1000m from the Grid Connection Corridor.
Recorded pollution incidents to controlled waters	None within 1km.

3.3.2 Historical land use

The most pertinent historical developments relating to potential contamination sources within the Grid Connection Corridor are shown in Table 3-5.

Table 3-4: Potential contamination sources based upon historical land use within 1km from the Grid Connection Corridor

Map year	Land use on-site Grid Connection Corridor	Land use off-site Grid Connection Corridor (within 1km)	Potential contamination sources
1840 – 1880 (OS Six Inch)	Predominantly agricultural land, cottages, farms; drains and sluices; sheepfolds; footpaths, tracks, roads and bridges; Great Northern & Great Eastern Joint Railway; Bourne & Lynn Joint Railway; Weston rail stations.	Predominantly agricultural land, cottages, farms; drains and sluices; sheepfolds; footpaths, roads and bridges; Slight urbanisation in Cowbit, Moulton Chapel, Weston Hills, Spalding and Weston; Great Northern & Great Eastern Joint Railway; Bourne & Lynn Joint Railway; Cowbit rail stations; Hunley mill (corn); Cowbit windmill (corn); Shepeau Stow mill (corn); Smithy; pumping station.	Made Ground associated with residential and commercial properties, roads, bridges and footpaths, multiple railways, stations and road embankments; Smithy; Mill; Pumping station.
1892 - 1914 (OS 25 Inch)	Pumping station.	Slight urban development in Weston, Weston Hills, Moulton Chapel, Cowbit and Spalding;	Made Ground associated with urban development; Pumping station.
1937 - 1961 (OS 1:25,000)	Pumps in almost all of the farms and cottages within the Grid Connection Corridor (not all	Urban development; Pumps in almost all of the farms and cottages within 1km of the Grid Connection Corridor (not all shown on the map); Mills no longer in place.	Made Ground associated with urban development and disused mills; Pumps.

Map year	Land use on-site Grid Connection Corridor	Land use off-site Grid Connection Corridor (within 1km)	Potential contamination sources
	shown on the map).		
1949 - 1972 (OS 1:10,000 / 1:10,560)	No significant changes.	No Significant Change.	N/A.
2000 (10k Raster Mapping)	Reservoirs; Sewage works; railways dismantled and stations closed.	Sewage works; Railways dismantled and stations closed.	Made Ground associated dismantled railways and stations; Reservoirs; sewage works.
2022	No significant change.	Slight urban development in villages and towns within the surrounding area.	Made Ground associated with urban development.

4 Preliminary Environmental Assessment

4.1 Introduction

This preliminary environmental risk assessment is based on a source-pathway-receptor methodology, which is described in Appendix A. This section summarises the findings for each component of this analysis, which then culminates in the development of a conceptual site model. This model is then used to develop a risk rating for any given potential contamination source that has been identified.

4.2 Identified sources within the PV Area, Inter-Array Areas and the surrounding area

The potential sources of contamination have been identified from regulatory data and historical and current land uses on the PV Area, Inter-Array Areas and surrounding area. The primary potential sources are shown in Table 4-1.

Table 4-1: Identified potential contamination sources within the PV Area, Inter-Array Areas and the surrounding area

Source	Potential contaminants of concern	Location and Likely / Anticipated Distribution
On-site PV Area and Inter-Array Areas		
Historical Pit (infilled with Made Ground)	A range of potential metallic, inorganic and organic (hydrocarbon-based) contaminants may be present. Potential fugitive ground gases (e.g. carbon dioxide, methane).	1 disused pit within the PV Area located at the south western edge.
Made Ground	General contamination that may be present from historical land uses: Heavy metals. Total petroleum hydrocarbons (TPH). Polycyclic aromatic hydrocarbons (PAH). Volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Asbestos containing materials (ACMs) in non-natural soils.	Potentially contaminated Made Ground underlying mapped areas of: • residential and commercial properties, roads, bridges and footpaths; • railways and road embankments.
Industrial Works (historical and current)		The historical pumping station and railway.
Off-site, up to 1km from the PV Area and Inter-Array Areas.		

Source	Potential contaminants of concern	Location and Likely / Anticipated Distribution
Historical landfills	A range of potential metallic, inorganic and organic (hydrocarbon-based) contaminants may be present. Potential fugitive ground gases (e.g. carbon dioxide, methane).	5 historical landfills within 250m from the PV Area, Inter-Array Areas; 2 historical landfills between 501-1000m from the PV Area, Inter-Array Areas.
Historical Pits (infilled with Made Ground)		2 disused pits adjacent to the western edge of the PV Area.
Industrial Works (historical and current)	General contamination that may be present from historical land uses: Heavy metals. Total petroleum hydrocarbons (TPH). Polycyclic aromatic hydrocarbons (PAH). Volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Asbestos containing materials (ACMs) in non-natural soils. PFAS compounds and fuels (airfield). PCBs (electrical substation).	The historical pumping stations, mills, smithies, sewage works, gas valve compound, brick works and railways.
Made Ground		Potentially contaminated Made Ground underlying mapped areas of: • residential and commercial properties, roads, bridges, boat house and footpaths; • railways, stations and road embankments; • airfield.

The locations of potential contamination sources within PV Area and Inter-Array Areas are shown in Figure 4-1.

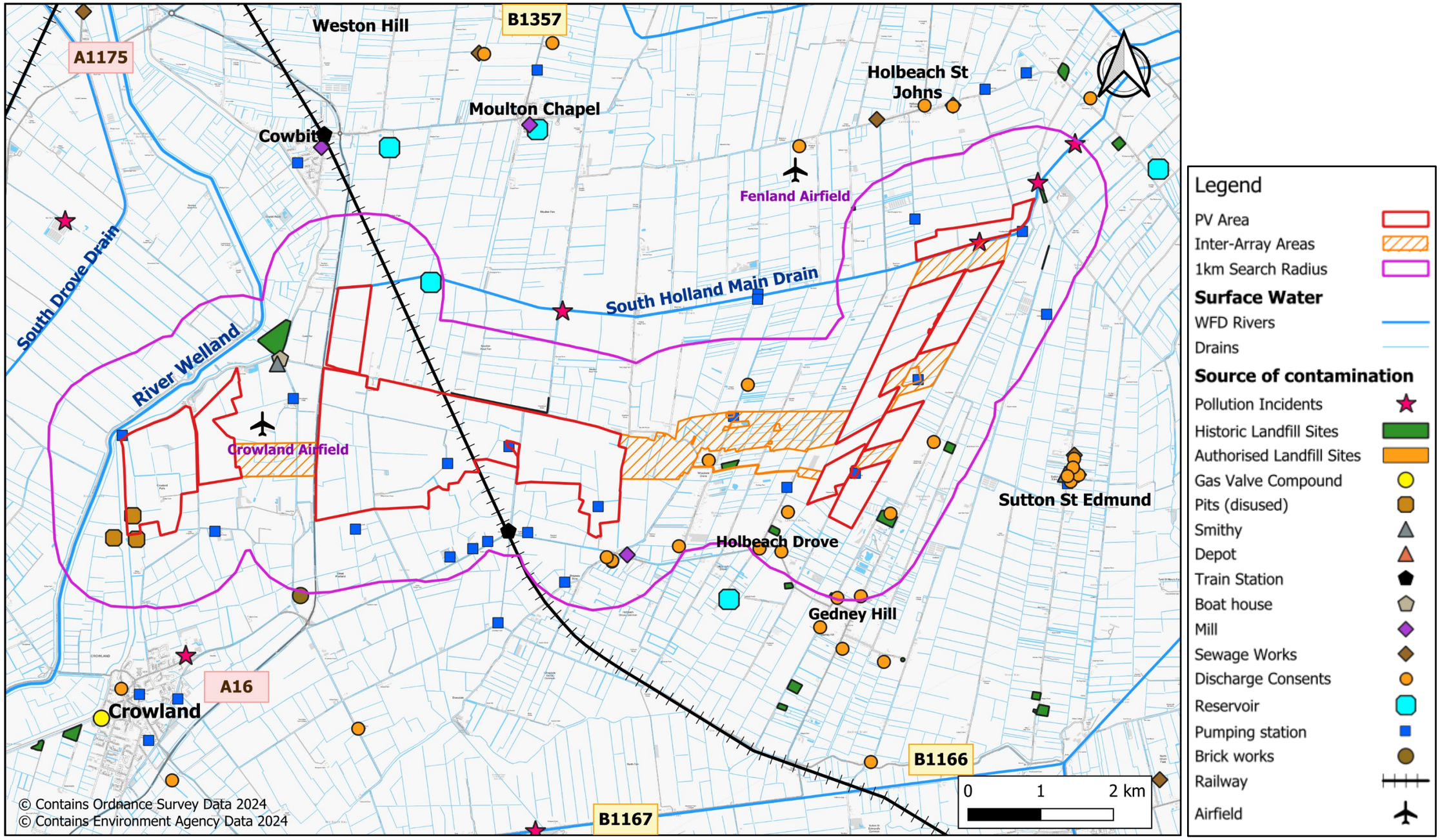


Figure 4-1: Potential sources of contamination within the PV Area, Inter-Array Areas and surrounding area

4.3 Identified sources within the Grid Connection Corridor

The potential sources of contamination have been identified from regulatory data and historical and current land uses on the Grid Connection Corridor and surrounding area. The primary potential sources are shown in Table 4-2.

Table 4-2: Identified potential contamination sources within the Grid Connection Corridor and the surrounding area

Source	Potential contaminants of concern	Location and Likely / Anticipated Distribution
On-site Grid Connection Corridor		
Made Ground	General contamination that may be present from historical land uses: Heavy metals. Total petroleum hydrocarbons. Polycyclic aromatic hydrocarbons. Volatile organic compounds and semi-volatile organic compounds. Asbestos containing materials in non-natural soils.	Potentially contaminated Made Ground underlying mapped areas of: • residential and commercial properties, roads, bridges and footpaths; • railways, railway station and road embankments.
Industrial Works (historical and current)		The historical pumping station.
Off-site, up to 1km from the Grid Connection Corridor.		
Historical Landfill	A range of potential metallic, inorganic and organic (hydrocarbon-based) contaminants may be present. Potential fugitive ground gases (e.g. carbon dioxide, methane).	1 historical landfill between 501-1000m from the Grid Connection Corridor.
Industrial Works (historical and current)	General contamination that may be present from historical land uses: Heavy metals. Total petroleum hydrocarbons (TPH). Polycyclic aromatic hydrocarbons (PAH). Volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Asbestos containing	The historical pumping stations and reservoirs, mill, smithy, sewage works, railways and railway station.
Made Ground		Potentially contaminated Made Ground underlying mapped areas of: • residential and commercial properties, roads, bridges, boat house and footpaths; • railways, stations and embankments.

Source	Potential contaminants of concern	Location and Likely / Anticipated Distribution
	materials (ACMs) in non-natural soils. PCBs (electrical substation).	

The locations of potential contamination sources within Grid Connection Corridor are shown in Figure 4-2.

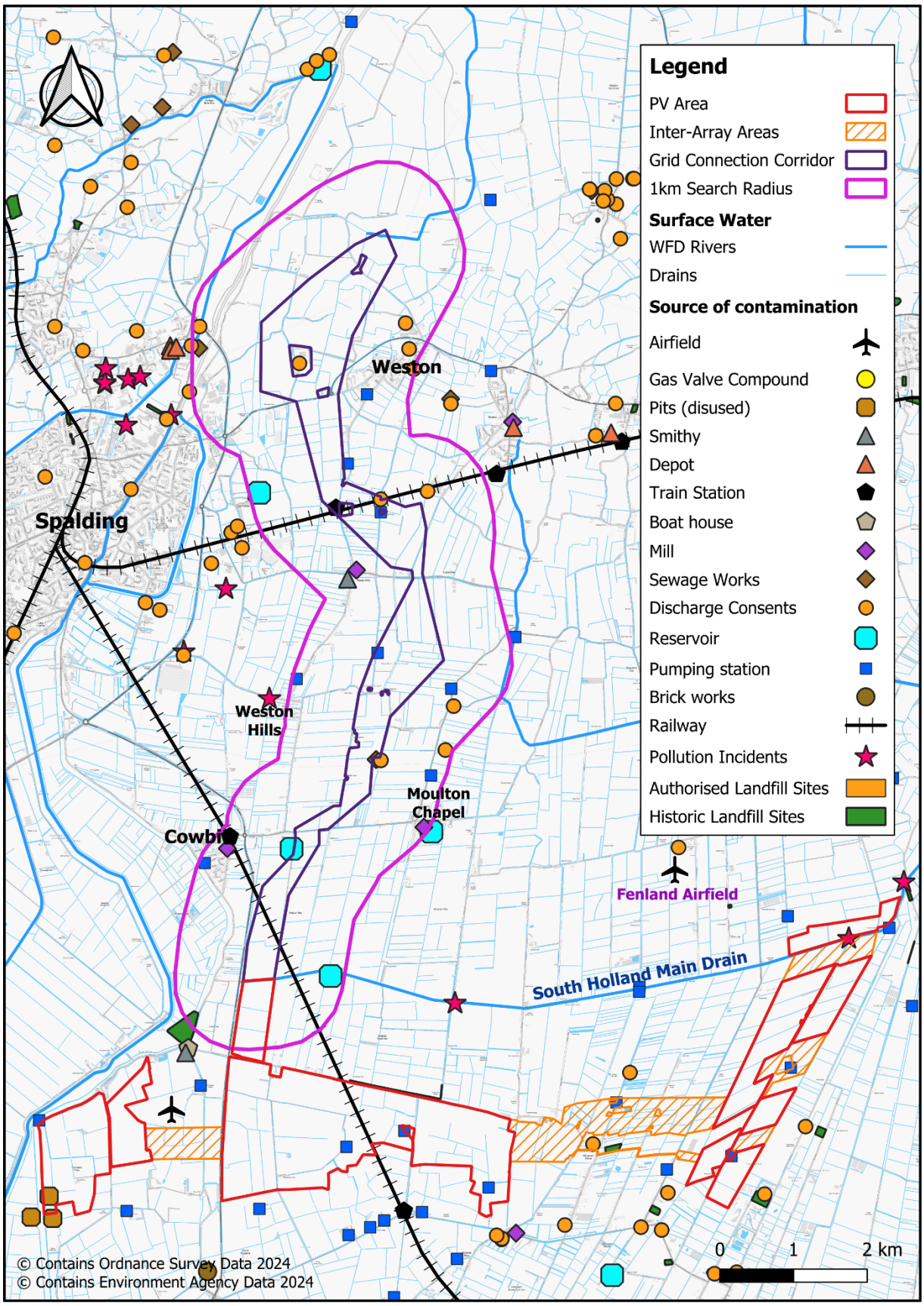


Figure 4-2: Potential sources of contamination within the Grid Connection Corridor and surrounding area

4.4 Pathways and receptors

Key potential receptors and possible pathways for contaminants to reach these receptors are summarised below:

- Current and future site users and construction workers involved in groundworks or site maintenance [direct contact, inhalation, accidental ingestion, migration of fugitive gases onto site];
- Surface water (River Welland; South Holland Main Drain; Little South Holland Drain; Moulton River; surface water abstractions) [overland flow, migration via drainage, groundwater baseflow].

Groundwater (unproductive superficial and bedrock strata) and ecology (no ecological designations within 1km from the Site) are scoped out from this assessment.

4.5 Conceptual site model

A preliminary conceptual model for the Site and surrounding environment has been developed based on the information available and described in the section below. The conceptual site model is used to identify potential pollutant linkages by identifying the following:

- Potential contamination source(s) - a contaminant or pollutant that is in, on or under the land and that has the potential to cause harm or pollution;
- Environmental pathways - a route by which a receptor is or could be affected by a contaminant; and,
- Environmental receptors - that could be adversely affected by a contaminant, e.g. construction workers, future site users, controlled waters, ecological receptors etc.

A pollutant linkage must be present for there to be a Source-Pathway-Receptor linkage. Without a pollutant linkage, there is not a risk - even if a potential source of contamination is present.

The main features of the conceptual model are as follows:

- Land use across the Site and surrounding area is predominantly agricultural in nature, with limited evidence of widespread historic development. Within the Site (including PV Areas, Inter-Array Areas and Grid Connection Corridor) deposits of Made Ground (potentially containing contaminants) may potentially be found at the following locations:
  - residential properties, roads, bridges and footpaths;
  - railway line and embankments;
  - historical infilled pit;
  - pumping stations.

Construction workers involved in solar farm development, or future site users could be exposed to residual contamination from such sources, were they to be present.

- Within 1km of the PV Area and Inter-Array Areas, Made Ground may also be present at:
  - residential and commercial properties, caravan parks, playing fields, roads, bridges and footpaths;
  - historical boathouse;
  - historical mill;
  - historical landfills;
  - historical infilled pits;
  - airfield;
  - historical industry including: smithy, brick works, railway lines and stations, pumping stations, sewage works, gas valve compound.
- Within 1km of the Grid Connection Corridor deposits of Made Ground are likely to be found at:
  - residential properties, roads, bridges and footpaths;
  - historical mills;
  - historical landfill;
  - railway lines, stations and embankments;
  - historical industry including: smithy, reservoir, sewage works, railway lines and stations, pumping stations.

The range of historical land uses which could have led to the presence of contamination within the PV Area and Inter-Array Areas and within the Grid Connection Corridor are displayed in Figure 4-1 and Figure 4-2.

- Materials within the infilled pits within and upgradient of the PV Area may potentially contain non-natural Made Ground deposits. It is possible that there is a pollution pathway (e.g. for leachates or fugitive gases) to the PV Area and Inter-Array Areas.
- The hydrology in the area comprises the catchment areas of three main watercourses which are likely to capture most overland flows: River Welland in the west and South Holland Main Drain in the north of the Site and Moulton River in the flowing past in the north of the Grid Connection Corridor.

4.6 Potential pollutant linkages

Based on the conceptual model presented above the following potential contamination sources have potential pollutant linkages and are identified to be considered with the qualitative risk assessment:

- On-site (PV Area and Inter-Array Areas):
  - potentially contaminated Made Ground due to minor development including residential properties, roads, bridges and footpaths;
  - historical pumping stations;
  - historical infilled pit;
  - historical and current railway line and embankment.

- Off-site (within 1km from the PV Area and Inter-Array Areas):
  - potentially contaminated Made Ground due to urbanisation;
  - historical landfills;
  - historical infilled pits;
  - historical boathouse;
  - historical smithy, brick works, mill, pumping stations, sewage works, gas valve compound;
  - historical and current railway lines and stations;
  - airfield.
- On-site (Grid Connection Corridor):
  - potentially contaminated Made Ground due to urbanisation;
  - historical reservoir, sewage works and pumping stations;
  - historical and current railway lines, stations and embankments.
- Off-site (within 1km from the Grid Connection Corridor):
  - potentially contaminated Made Ground due to urbanisation;
  - historical landfill;
  - historical smithy, mills, pumping stations, sewage works;
  - historical and current railway lines and stations.

4.7 Uncertainties

The conceptual site model has the following uncertainties:

- A detailed site walkover to identify potential visual evidence of contamination has not been undertaken.
- The presence of contamination within the underlying deposits of Made Ground which may or may not be present within the identified potential source areas has not been verified by a Phase 2 ground investigations. This includes on-site and off-site sources, such as nearby pumping station, infilled historical pits and landfills.
- Ground conditions within the area of proposed works, including geological profile and groundwater characteristics have been inferred from available mapping and local borehole records.
- Assessment of historical landfills is based on review of recorded sites. There is the potential for unrecorded or unlicenced landfills to be present within or near to the study area.

5 Qualitative Risk Assessment

A tabulated summary of the risk assessment process can be seen in Table 5-1. This firstly describes the sources, pathways and receptors derived from the baseline desk study and conceptual model. The assessment methodology for the Preliminary Risk Assessment described in Appendix A is then utilised to derive the potential severity of the given potential contamination source on any identified potential receptors. Finally, the likelihood of said contamination source reaching the receptor is given, which in conjunction with the potential severity is used to state a final risk value for each receptor. A full breakdown of potential contaminants associated with each source within the Site and surrounding area are shown in Table 4-1 and Table 4-2.

Table 5-1: Qualitative risk assessment summary

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
ON-SITE PV Area and Inter-Array Areas: Historical industry (pumping stations, railways);	A range of potential metallic, inorganic, and organic (hydrocarbon-based) contaminants and ACMs may be present. However, historic land use is predominantly agricultural in nature and therefore if contamination is present it is likely to be limited in extent.	Direct contact, inhalation, accidental ingestion of soil. Potential for exposure to contaminants during groundworks if areas of Made Ground were exposed.	Current and future site users and construction workers.	Low. Harm to designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Mild, Probability: Low) Desk based evidence indicated that the Site features historical and present day industry related to pumping stations and railway within the PV Area and Inter-Array Areas. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
		Overland flow, migration via drainage if areas of Made Ground were exposed during construction phase.	Surface Water – River Welland, South Holland Main Drain, Little South Holland Drain, Moulton River, Abstractions	Moderate / Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) Desk based evidence indicates a migration pathway is likely to exist between contaminants arising from historical and present day industry (pumping stations and railway) to the nearby watercourses. There is a pollution linkage, and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
ON-SITE PV Area and Inter-Array Areas: Made Ground from a range of sources (historic infilled pit, railway, roads, footpaths and residential properties)	A range of potential metallic, inorganic, and organic (hydrocarbon-based) contaminants and ACMs may be present. However, historic land use is predominantly agricultural in nature and therefore if contamination is present it is likely to be limited in extent.	Direct contact, inhalation, accidental ingestion of soil. Potential for exposure to contaminants during groundworks if areas of Made Ground were exposed.	Current and future site users and construction workers.	Moderate/Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) There are deposits of Made Ground from a range of sources potentially containing a range of contaminants. The sensitivity of the Scheme for human health is considered low, being largely open space. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
		Overland flow, migration via drainage if areas of Made Ground were exposed during construction phase.	Surface Water – River Welland, South Holland Main Drain, Little South Holland Drain, Moulton River, Abstractions	Moderate/Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) Desk based evidence indicates a migration pathway may exist between contaminants arising from Made Ground to the nearby watercourses. However it is considered unlikely that development would lead to the creation of pollutant linkages (for example through extensive below ground works, excavations etc.). There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
OFF-SITE PV Area and Inter-Array Areas (within 1km): Historical landfills (5 within 250m, 2 between 501-1000m)	A range of potential metallic, inorganic, and organic (hydrocarbon-based) contaminants and ACMs may be present. However, historic land use is predominantly agricultural in nature and therefore if contamination is	Direct contact, inhalation, accidental ingestion of soil if areas of Made Ground were exposed.	Current and future site users and construction workers.	Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Unlikely) Desk based evidence indicated historical landfill sites within 1km from the PV Area and Inter-Array Areas. It is considered unlikely that off-site contamination would pose a hazard to on-site human health. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
	present it is likely to be limited in extent.	Overland flow, migration via drainage if areas of Made Ground were exposed during construction phase.	Surface Water – River Welland, South Holland Main Drain, Little South Holland Drain, Moulton River, Abstractions	Moderate/Low Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) Desk based evidence indicates a migration pathway is likely to exist between contaminants arising from landfills to the nearby watercourses and surface water abstractions. Whilst there is potential for the off-site landfills to cause pollution in the local surface waters, it is considered unlikely there would be contaminant migration that would cause elevated risks at the PV Area and Inter-Array Areas. There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
OFF-SITE PV Area and Inter-Array Areas (within 1km): Historical industry (infilled pits, gas valve compound, sewage works, pumping station, mill, smithy, railways, airfield, boathouse and brick works) Made Ground from different sources (historic and current railway and stations, roads, footpaths and residential properties)	A range of potential metallic, inorganic, and organic (hydrocarbon-based) contaminants and ACMs may be present. However, historic land use is predominantly agricultural in nature and therefore if contamination is present it is likely to be limited in extent.	Direct contact, inhalation, accidental ingestion of soil if areas of Made Ground were exposed.	Current and future site users and construction workers.	Moderate / Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, (Probability: Low) Desk based evidence indicated that the surrounding area features historical and present day industry related to infilled pits, railways, sewage works, brick works, mill, pumping station, boathouse, smithy and airfield within 1km from the PV Area and Inter-Array Areas. There are also deposits of Made Ground from a range of sources potentially containing a range of contaminants. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term.

		Overland flow, migration via drainage if areas of Made Ground were exposed during construction phase.	Surface Water – River Welland, South Holland Main Drain, Little South Holland Drain, Moulton River, Abstractions	Moderate/Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) Desk based evidence indicates a migration pathway is likely to exist between contaminants arising from contaminated Made Ground and historical and present day industry to the nearby watercourses and surface water abstractions. Whilst there is potential for the off-site Made Ground to cause pollution in the local surface waters, it is considered unlikely there would be contaminant migration that would cause elevated risks at the PV Area and Inter-Array Areas. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
ON-SITE Grid Connection Corridor: Historical industry (railways, station and pumping stations)	A range of potential metallic, inorganic, and organic (hydrocarbon-based) contaminants and ACMs may be present. However, historic land use is predominantly agricultural in nature and therefore if contamination is present it is likely to be limited in extent.	Direct contact, inhalation, accidental ingestion of soil. Potential for exposure to contaminants during groundworks if areas of Made Ground were exposed.	Current and future site users and construction workers.	Low. Harm to designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Mild, Probability: Low) Desk based evidence indicated that the surrounding area features historical and present day industry related to railways, railway station and pumping station within the within the Grid Connection Corridor. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term. Risks from contamination during groundworks can be mitigated through development of appropriate control measures.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
		Overland flow, migration via drainage if areas of Made Ground were exposed during construction phase.	Surface Water – South Holland Main Drain, Moulton River, Abstraction	Moderate / Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) Desk based evidence indicates a migration pathway is likely to exist between contaminants arising from historical and present day industry. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
ON-SITE Grid Connection Corridor: Made Ground from a range of sources (residential and commercial properties, roads, bridges, railways, station and embankments)	A range of potential metallic, inorganic, and organic (hydrocarbon-based) contaminants and ACMs may be present. However, historic land use is predominantly agricultural in nature and therefore if contamination is present it is likely to be limited in extent.	Direct contact, inhalation, accidental ingestion of soil. Potential for exposure to contaminants during groundworks if areas of Made Ground were exposed.	Current and future site users and construction workers.	Moderate/Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) There are deposits of Made Ground from a range of sources potentially containing a range of contaminants. The sensitivity of the Site setting for human health is considered low, being largely open space. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term. Risks from contamination during groundworks can be mitigated through development of appropriate control measures.

		Overland flow, migration via drainage if areas of Made Ground were exposed during construction phase.	Surface Water – South Holland Main Drain, Moulton River, Abstraction	Moderate/Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) Desk based evidence indicates a migration pathway is likely to exist between contaminants arising from Made Ground to the nearby watercourses. However it is considered likely that the majority of Made Ground in the area will be landscaped of covered in hard standing and as such potential for migration will be limited. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term. Risks from contamination during groundworks (e.g. through creation of migration pathways can be mitigated through development of appropriate control measures.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
OFF-SITE Grid Connection Corridor (within 1km): Historical landfill (1 between 501-1000m)	A range of potential metallic, inorganic, and organic (hydrocarbon-based) contaminants and ACMs may be present. However, historic land use is predominantly agricultural in nature and therefore if contamination is present it is likely to be limited in extent.	Direct contact, inhalation, accidental ingestion of soil.	Current and future site users and construction workers.	Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Unlikely) Desk based evidence indicated one historical landfill site within 1km from the Grid Connection Corridor. It is considered unlikely that off-site contamination would pose a hazard to on-site human health. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
		Overland flow, migration via drainage.	Surface Water – River Welland, South Holland Main Drain, Little South Holland Drain, Moulton River, Abstractions	Moderate/Low Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) Desk based evidence indicates a migration pathway is likely to exist between contaminants arising from the landfill to the nearby watercourses and surface water abstractions. Whilst there is potential for the off-site landfills to cause pollution in the local surface waters, it is considered unlikely there would be contaminant migration that would cause elevated risks at the Grid Connection Corridor. There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
OFF-SITE Grid Connection Corridor (within 1km): Historical industry (smithy, railways and stations, mills, sewage works, reservoir and pumping stations)	A range of potential metallic, inorganic, and organic (hydrocarbon-based) contaminants and ACMs may be present. However, historic land use is predominantly agricultural in nature and therefore if contamination is present it is likely to be limited in extent.	Direct contact, inhalation, accidental ingestion of soil. Potential for exposure to contaminants during groundworks.	Current and future site users and construction workers.	Low. Harm to designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Mild, Probability: Low) Desk based evidence indicated that the surrounding area features historical and present day industry related to smithy, railways and stations, mills, sewage works, reservoir and pumping stations within the within the Grid Connection Corridor. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term. Risks from contamination during groundworks can be mitigated through development of appropriate control measures.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
		Overland flow, migration via drainage.	Surface Water – South Holland Main Drain, Little South Holland Drain, Moulton River, Abstraction	Moderate / Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) Desk based evidence indicates a migration pathway is likely to exist between contaminants arising from historical and present day industry. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term.

Source	Potential contaminants	Pathway	Receptor	Risk	Comment
OFF-SITE Grid Connection Corridor (within 1km): Made Ground from a range of sources (residential and commercial properties, roads, bridges, railways and stations and embankments)	A range of potential metallic, inorganic, and organic (hydrocarbon-based) contaminants and ACMs may be present. However, historic land use is predominantly agricultural in nature and therefore if contamination is present it is likely to be limited in extent.	Direct contact, inhalation, accidental ingestion of soil. Potential for exposure to contaminants during groundworks.	Current and future site users and construction workers.	Moderate/Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) There are deposits of Made Ground from a range of sources potentially containing a range of contaminants. The sensitivity of the Site setting for human health is considered low, being largely open space. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term. Risks from contamination during groundworks can be mitigated through development of appropriate control measures.

		Overland flow, migration via drainage.	Surface Water – South Holland Main Drain, Little South Holland Drain, Moulton River, Abstraction	Moderate/Low. Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.	(Severity: Medium, Probability: Low) Desk based evidence indicates a migration pathway is likely to exist between contaminants arising from Made Ground to the nearby watercourses. However it is considered likely that the majority of Made Ground in the area will be landscaped of covered in hard standing and as such potential for migration will be limited. There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term. Risks from contamination during groundworks (e.g. through creation of migration pathways can be mitigated through development of appropriate control measures.

6 Conclusions

6.1 Site History & Potential Sources of Contamination

Review of historical mapping indicates that the Site and the local area have a history of predominantly agricultural land use with only limited urban development from the mid-19th Century onwards.

Within the PV Area and Inter-Array Areas, the following historic features were identified:

- residential properties, roads, bridges and footpaths;
- railway line and embankments;
- an infilled pit;
- pumping stations.

Within 1km of the PV Area and Inter-Array Areas, the following historic features were identified:

- residential and commercial properties, caravan parks, playing fields, roads, bridges and footpaths;
- boathouse;
- mill, smithy and brick works;
- pumping stations, reservoirs and sewage works;
- gas valve compound;
- railway lines, embankments and stations;
- airfield;
- infilled pits;
- landfills.

Also, within the Grid Connection Corridor the following historic features were identified:

- residential properties, roads, bridges and footpath;
- railway lines, station and embankments;
- pumping stations.

Within 1km of the Grid Connection Corridor, the following historic features were identified:

- residential properties, roads, bridges and footpath;
- railway lines, stations and embankments;
- mill and smithy;
- pumping stations, reservoirs and sewage works;
- landfill.

Potential sources of contamination at the Site and surrounding areas are associated with the following activities:

- Made Ground within the Site, associated with a limited historic development extent within the Site footprint;

- Historical industrial works (including mills, boathouse, smithies, gas valve compound, sewage works, pumping stations and railway lines and railway stations), and associated Made Ground within 1km of the Site;
- Historical pits, and associated Made Ground, at various locations within 1km of the Site;
- Historical landfills, and associated Made Ground, at various locations within 1km of the Site.

6.2 Environmental Risk Assessment Summary

The following conclusions can be drawn from the preliminary environmental risk assessment undertaken for the Site under present conditions:

- The risk to construction workers and future site users is assessed as being Moderate / Low

There is the potential for encountering contaminated Made Ground within the Site, although the likelihood of encountering widespread contamination is low based upon historic mapping data, which shows that land use has been predominantly agricultural. The main risk is to site construction workers who may undertake earthworks in areas of potentially contaminated Made Ground as part of the development works. Contamination may pose a short-term (acute) or long-term (chronic) risk to workers during construction and maintenance. However, potential risks can be mitigated through adoption of good working practices on site as part of wider site management during construction.

- The risk to surface water is assessed as being Moderate / Low

There is the possibility that any earthworks in potentially contaminated Made Ground could expose contaminated soils and introduce a new pathway to surface waters, this should be considered during the design of any proposed works. The control of sediment run off during any proposed works should also be considered to be protective of surface waters.

While the presence of widespread or significant contamination is unlikely based upon the findings of this desk based study it is recommended that measures to deal with any unexpected contamination that may be encountered during future site development are contained within a dedicated Construction Environmental Management Plan (CEMP) for the Site.

A Methodology for Preliminary Environmental Assessment

The methodology for this assessment is based on the Environment Agency's Land Contamination Risk Management (LCRM, which replaces previous guidance within CLR11). Stage 1: Risk Assessment requires that a Tier 1 Preliminary Risk Assessment is carried out ahead of development to assess the potential risk. The methodology used to establish the preliminary risk assessment is described below.

A.1 Site History

Ordnance Survey maps of Britain are available from the late 1840s to the present time. These maps provide an excellent record of historical uses of a site. This can be very important in assessing the potential for environmental liabilities associated with a site, since the site owner may be held responsible for historic pollution which could be released, even if it is not caused by current activities operating on the site. Historical maps can show if the facility was, for example, the location for a former industrial site, mineral working or landfill.

A.2 Site sensitivity

The vulnerability of the site with respect to the potential for contamination of the surface and subsurface aqueous environments was assessed using British Geological Survey (BGS) data and Environment Agency (EA) data on groundwater and surface water sensitivity. With respect to groundwater, and wherever possible surface water, likely receptors in the form of abstractions have been obtained from BGS and the EA. Information, pertaining to the classification of the aquifer, nature and direction of groundwater flow, distance to licensed abstractions, nature of overlying strata and whether the site was located within a groundwater protection zone was sought from EA and available map information from the BGS, in order to determine the hydrogeological sensitivity. The 1:25,000 Ordnance Survey sheet for the area was used to determine the location of surface watercourses, the quality of which were then determined through consultation with EA data. The combination of distance to the watercourse and its quality were used to assess its sensitivity to pollution. Based on all the available information a summary assessment of vulnerability to contamination of surface and sub-surface waters was made.

A.3 Qualitative Risk Assessment Methodology

Risk assessment is the process of collating known information on a hazard or set of hazards in order to estimate actual or potential risks to receptors. The receptor may be human health, a water resource, a sensitive local ecosystem or even future construction materials. Receptors can be connected with the hazard under consideration via one or several exposure pathways (e.g. the pathway of direct contact). Risks are generally managed by isolating or removing the hazard, isolating the receptor, or by intercepting the exposure pathway. Without the three essential components of a source (hazard), pathway

and receptor, there can be no risk. Thus, the mere presence of a hazard at a site does not mean that there will necessarily be attendant risks. The following risk assessment thus focuses on those parts of the site where hazards or potential hazards have been identified and is not general to the whole site.

A.4 Hazards

Potential sources of contamination are identified for the site, based on a review of the current and previous site uses. Not only the nature but also the likely extent of any contamination is considered, e.g. whether such contamination is likely to be localised or widespread.

A.5 Receptors

The varying effects of a hazard on individual receptors depends largely on the sensitivity of the target. Receptors include any people, animal or plant population, or natural or economic resources within the range of the source which are connected to the source by the transport pathway. Receptors can, in addition, extend to remediation processes and future construction materials that may be adversely affected by on-site contamination. In general, however, receptors can be divided into a number of groups, dependant on the final use of the site.

A.6 Pathways

The mere presence of contamination does not infer a risk. The exposure pathway determines the dose delivered to the receptor and the effective dose determines the extent of the adverse effect on the receptor. The pathway which transports the contaminants to the receptor or target generally involves conveyance via soil, water or air.

A.7 Exposure Assessment

By considering the source, pathway and receptor, an assessment is made for each contaminant on a receptor-by-receptor basis with reference to the significance and degree of the risk. In assessing this information, a measure is made of whether the source contamination can reach a receptor, determining whether it is of a major or minor significance. The exposure risks are assessed against the present site conditions. The assessment of risk presented here has been based upon the procedure outlined in DEFRA Circular 01/2006. In addition, DEFRA, with the Collaborative Centre of Excellence in Understanding and Managing Natural and Environmental Risks, Cranfield University, has published guidance on risk assessment (Guidelines for Environmental Risk Assessment and Management). A guide to good practice for contaminated land risk assessment has also been produced by CIRIA (CIRIA C552 2001). This guidance from DEFRA and CIRIA states that the designation of risk is based upon a consideration of both:

- The severity of the potential consequence [takes into account both the potential severity of the hazard and the sensitivity of the receptor].

- The likelihood of an event (probability); [takes into account both the presence of the hazard and receptor and the integrity of the pathway].

Table A-1 provides a classification of the potential severity of contamination risks occurring at the site, while Table A-2 summarises the probability classifications.

Table A-1: Classification of associated hazard [potential severity] (modified from CIRIA C552)

Classification	Associated hazard [potential severity]
Severe	Short-term (acute) risks to human health likely to result in significant harm. Short-term risk of pollution to a sensitive water resource or ecosystem. Catastrophic damage to crops/buildings/property/infrastructure, including off-site soils. Short-term risk to a particular ecosystem or organism forming part of such an ecosystem.
Medium	Chronic damage to human health. Risk of pollution of sensitive water resource or ecosystem. Significant change in a particular ecosystem. Significant damage to crops/buildings/property/infrastructure (on or off-site). Contamination of off-site soils.
Mild	Pollution of non-sensitive water resources. Significant damage to crops/buildings/property/infrastructure (on or off-site).
Minor	Harm, although not necessarily significant harm which may result in a financial loss. Easily preventable, non-permanent health effects on humans, or no effects. Easily repairable damage to crops/buildings/property/infrastructure.

Table A-2: Classification of probability

Classification	Definition of probability
High	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage, and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low	There is a pollution linkage, and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term.
Unlikely	There is a pollution linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.

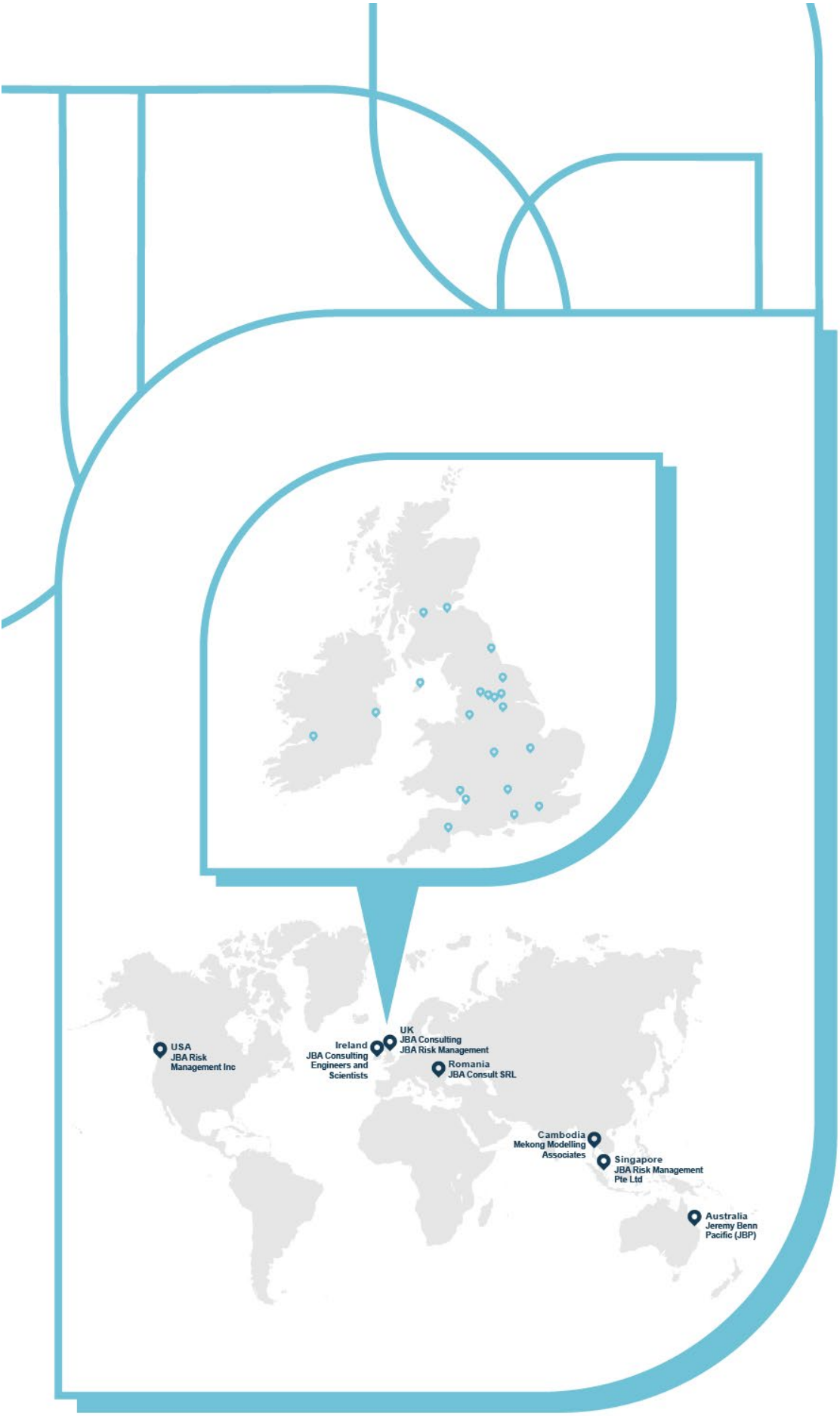
Once the classification of consequence and probability has been assigned to a pollution linkage, the risk associated with it can be evaluated. Table A-3 shows how a risk category is assigned based on the consequence and probability. Definitions of each risk category and the investigation actions that are likely to be necessary in each case are given in Table A-4. These definitions and the risk matrix are based upon CIRIA C552.

Table A-3: Contamination risk matrix

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High	Very high risk	High risk	Moderate risk	Moderate / low risk
	Likely	High risk	Moderate risk	Moderate / low risk	Low risk
	Low	Moderate risk	Moderate / low risk	Low risk	Very low risk
	Unlikely	Moderate / low risk	Low risk	Very low risk	Very low risk

Table A-4: Description of the risk classifications and likely action required

Classification	Definition and likely actions required
Very high	There is a high probability of severe harm to a defined receptor, or there is evidence that severe harm is currently taking place. The risk is likely to result in a substantial liability. Urgent investigation (if not already undertaken) and remediation is likely to be required.
High	Harm to a designated receptor is likely. The risk, if realised, is likely to present a substantial liability. Urgent investigation (if not already undertaken) is likely to be required.
Moderate	Harm to a designated receptor is possible. However, it is either relatively unlikely that the harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation is likely to be required to clarify the level of potential liability and risk.
Low	Harm to a designated receptor is possible but is likely to be mild at worst. Further investigation is not required at this stage.
Very low	There is a low possibility of harm to a designated receptor occurring, and if it were to be realised it would be likely to be mild at worst. Further investigation is not required at this stage.



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