NORTH FALLS

Offshore Wind Farm

ENVIRONMENTAL STATEMENT

Appendix 19.1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report

Document Reference:	3.3.20
Volume:	3.3
APFP Regulation:	5(2)(a)
Date:	July 2024
Revision:	0

NORTH FALLS
Offshore Wind Farm

Project	North Falls Offshore Wind Farm
Document Title	Environmental Statement Appendix 19.1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report
Document Reference	3.3.20
APFP Regulation	5(2)(a)
Supplier	Royal HaskoningDHV
Supplier Document ID	PB9244-RHD-ZZ-ON-RP-Z-0156

Revision	Date	Status/Reason for Issue	Originator	Checked	Approved
0	July 2024	Submission	RHDHV	NFOW	NFOW

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Figures (see ES Chapter 19 Figures (Document Reference 3.2.15))

Glossary of Acronyms

ALC	Agricultural Land Classification
BGS	British Geological Survey
Bq	Becquerel
BRE	Building Research Establishment
CDM	Construction Design and Management
CIRIA	Construction Industry Research Information Association
CL:AIRE	Construction Land: Applications in Real Environment
CoCP	Code of Construction Practice
COMAH	Control of Major Accident Hazard sites
CSM	Conceptual Site Model
DCO	Development Consent Order
Defra	Department for the Environment and Rural Affairs
EA	Environment Agency
ES	Environmental Statement
GIS	Geographical Information System
GQRA	Generic Quantitative Risk Assessment
HDD	Horizontal Directional Drilling
LNR	Local Nature Reserves
MAGIC	Multi Agency Government Information for the Countryside
NFOW	North Falls Offshore Wind Farm Limited
NNR	National Nature Reserves
NVZ	Nitrate Vulnerable Zone
PAH	Polycyclic Aromatic Hydrocarbon
PBDE	Polybrominated Diphenyls Ethers
PCB	Polychlorinated Biphenyls
PCL	Potential Contaminant Linkage
PPE	Personal Protective Equipment
PFAS	Polyfluoroalkyl Substances
PRA	Preliminary Risk Assessment
RoFRaS	Risk of Flooding from Rivers and Sea
RSA	Radioactive Substance Authorisations
RWE	RWE Renewables UK Swindon Limited
SAC	Special Conservation Area
SD	Single Dwelling
SPA	Special Protected Areas
SPZ	Source Protection Zone
SSER	SSE Renewables Offshore Windfarm Holdings Limited
SSSI	Site of Special Scientific Interest
SVOC	Semi Volatile Organic Compound

UXB	Unexploded Bomb
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WER	Water Environment Regulations

Glossary of Terminology

Agricultural Land Classification	Agricultural Land Classification is a grading system used to assess and compare the quality of agricultural land in England and Wales. A combination of climate, topography and soil characteristics and their unique interaction determines the grade of the land. The grades range from 1 to 5. Grade 1 being excellent, grade 2 very good, grade 3 good to moderate (no subdivide), grade 4 poor and grade 5 very poor.
Countryside Stewardship Scheme	The Countryside Stewardship Scheme provides financial incentives for farmers, woodland owners, foresters and land managers to look after and improve the environment. Mid-Tier Scheme agreements provide a range of options to help deliver environmental benefits. The Higher Tier agreements require more complex management tailored to individual sites.
Environmental Stewardship Scheme	Environmental Stewardship is an agri-environment scheme run by Department for the Environment and Rural Affairs (Defra) which aims to secure widespread environmental benefits through improving water quality, reducing soil erosion, improving conditions for farmland wildlife, maintaining and enhancing landscape character and protecting the historic environment. The Entry Level aims to encourage large numbers of farmers to deliver effective environmental management in exchange for pay-outs. The Higher Level indicates is designed to support more specific and environmentally beneficial management practices.
Grade II Listed Building	A property or building listed as Grade II has particular historic and or cultural significance and is subject to regulations that protect its unique character.
Jointing bay	Underground structures, constructed at regular intervals along the onshore cable route to connect the sections of cable together so that each cable is a continuous length, as well as facilitating the installation of the cables into the buried cable ducts.
Landfall	The location where the offshore export cables come ashore at Kirby Brook.
Onshore cable route	Onshore route within which the onshore export cables and associated infrastructure would be located.
Onshore export cables	The cables which take the electricity from landfall to the onshore substation. These comprise High Voltage Alternative Current (HVAC) cables, buried underground.
Onshore project area	The boundary within which all onshore infrastructure required for the Project will be located (i.e. landfall; onshore cable route, accesses, construction compounds; onshore substation and cables to the National Grid substation)
Onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the Project so that it can be connected to the National Grid.
Principal Aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
Secondary A Aquifer	These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Secondary B Aquifer	These are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Source Protection Zone (SPZ3)	Source catchment protection zone - defined as the area around an abstraction source within which all groundwater recharge is presumed to be discharged at the abstraction source.

Unproductive Strata	These are predominantly rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report

1.1 Introduction

1. Royal HaskoningDHV has been commissioned by North Falls Offshore Wind Farm Limited (NFOW) (a joint venture between SSE Renewables Offshore Windfarm Holdings Limited (SSER) and RWE Renewables UK Swindon Limited (RWE)) to carry out a Geo-Environmental Desk Study and Preliminary Risk Assessment (PRA). The report has been written to support the Environmental Statement (ES) for the onshore project area for the North Falls Offshore Wind Farm (hereafter referred to as North Falls or the Project). The onshore project area for this PRA is described within Section 1.5.
2. North Falls will consist of offshore and onshore elements. These elements include offshore wind turbines and subsea array cables, offshore and onshore export cables and an onshore substation to accommodate the connection to the transmission grid. A full description of North Falls is provided within ES Chapter 5 Project Description (Document Reference: 3.1.7).

1.2 Objectives

3. The overall objectives of the PRA are as follows:
    - Provide information on the current conditions of the onshore project area with respect to the potential for ground contamination;
    - Provide an initial Conceptual Site Model (CSM) to identify and assess potential contaminant linkages associated with the onshore project area; and
    - Provide high level recommendations for further work and assessments.

1.3 Methodology

4. The PRA has been completed in general accordance with the Environment Agency (EA) 'Land Contamination Risk Management Framework', 2023.
5. The PRA is a desk-based study and forms the initial step in the assessment of potentially contaminated land.
6. The main purpose of the PRA is to identify potential contamination sources and assist in identifying potential liabilities that may be present which may have consequences for the Project.
7. The following desk-based information sources have been reviewed to inform the PRA:
    - Groundsure Geographical Information System (GIS) data comprising environmental sensitivity data and permitting records within the onshore project area;
    - British Geological Survey (BGS) Onshore Geoindex web portal (accessed December 2023);

- BGS Geological Map for Colchester and Brightlingsea, Bedrock and Drift (Sheet number 224 and 242), 2010, 1:50,000;
- BGS Hydrogeological Map of Southern East Anglia (Sheet number 5), 1981, 1:125,000;
- Google Earth, accessed January 2024;
- Multi Agency Government Information for the Countryside (MAGIC) map application (accessed January 2024);
- National Library of Scotland historical maps (accessed January 2024);
- UK Health Security Agency UK maps of Radon; and
- Zetica Unexploded Ordnance (UXO) Unexploded Bomb (UXB) Risk Map accessed November 2023.

1.4 Limitations

8. Limitations associated with this report are provided as Annex 1.

1.5 Study area

9. The study area for the PRA, located within the District of Tendring in the County of Essex, consists of the onshore project area plus a 250m buffer as illustrated on ES Figure 19.1 (Document Reference: 3.2.15).
10. A 100m buffer has been applied around the onshore project area for the review of historical mapping due to the agricultural nature of the surrounding environment.
11. The buffer zone around the onshore project area is extended to 1km for assessing the presence of Control of Major Accident Hazard (COMAH) sites and abstraction points. This is due to the higher risk posed by COMAH sites and the sensitivity of groundwater and surface water abstractions.
12. The onshore project area includes landfall, onshore cable route and the onshore substation.
13. For the purposes of this report, references to on site features refers exclusively to features located within the onshore project area boundary. References to off site features refer to those within the 250m or 1km buffer.

1.6 Environmental setting

1.6.1 Introduction

14. Regulatory authority information relevant to the onshore project area and its surroundings has been obtained from the undertaking of an environmental database search. The information is summarised in subsequent sections. Distances stated are approximate and are taken from the onshore project area to the database recorded entries.
15. The following summary is generally limited to locations within 250m of the onshore project area unless it is considered that installations or activities

beyond that range could potentially have an impact on or be affected by the development of the onshore project area, for example in relation to public potable groundwater abstraction wells.

1.6.2 Pollution control

16. The presence (or absence) of active pollution controls related to industrial processes at or within 250m of the onshore project area has been summarised in Table 1 below with further detail in Table 2.

Table 1 Summary of pollution controls

Control type	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Sites determined as Contaminated Land	No	No	No	No
Historical licensed industrial activities	No	No	No	No
Licensed industrial activities (Part A(1))	No	No	No	Yes
Licensed pollutant release (Part A(2)/B))	No	No	No	No

Table 2 Details of offsite pollution controls

Control type – off site	Name & location	Distance	Details
Licensed industrial activities (Part A(1))	Wix Farms Poultry Limited, Clacton Road, Manningtree, CO11 2NZ	90m	Reference: GP3502BS Description: Intensive Poultry Farm Located to the west of the onshore cable route

1.6.3 Waste

17. The presence (or absence) of waste facilities at or within 250m of the onshore project area has been summarised in Table 3 below with further detail in Table 4 and Table 5.

Table 3 Summary of waste facilities

Facility type	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Active or recent landfill	No	No	No	No
Historical landfill	No	No	No	Yes
Historical waste sites	No	No	No	No
Licenced waste sites	No	No	No	Yes
Active waste exemptions	Yes	No	No	Yes

Table 4 Details of onsite waste facilities

Feature / designation – on site	Name & location	Details
Active Waste Exemptions	Short Lane, Frinton-on-Sea	Reference: WEX068562, WEX062995 Category: Storage of sludge.
	Pond Farm, Swan Road, Beaumont, CO16 0AN	Reference: WEX009364, EPR/BH0374PQ/A001 Category: Crushing and emptying waste vehicle oil filters. Use of waste in construction. Storage of waste in a secure place/container. Burning waste in the open. Use of waste for a specified purpose. Incorporation of ash into soil. Spreading of plant matter to confer benefit. Spreading waste on agricultural land to confer benefit. Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising. Burning of waste as a fuel in a small appliance. Use of mulch. Recovery of scrap metal. Screening and blending of waste. Treatment of waste in a bio bed or biofilter. Deposit of waste from dredging of inland waters.

Table 5 Details of offsite waste facilities

Facility type – off site	Name & location	Distance	Details
Licenced waste sites	Lodge Farm, Clacton Road, Great Holland, CO13 0JU	110m	License name: County Skips Ltd. License number: COU103 Located west of the onshore cable route
	Hempstalls Farm, Clacton Road, Manningtree, CO11 2NZ	240m	License name: 4 Seasons Skip Hire & Waste Management Ltd. License number: 4SS001 Located west of the onshore cable route
	Land At Hempstalls Farm, Clacton Road, Manningtree, Essex, CO11 2NZ	230m	License name: 4 Seasons Skip Hire & Waste Management Ltd License number: 4SS001 Located west of the onshore cable route
Waste Exemptions	1 The Esplanade, Frinton-on-Sea, CO13 9EP	20m	Reference: EPR/QH0370YE/A001 Category: Depositing of waste from dredging of inland waters. Located north of landfall
	Frinton Farm Partners, Church Lane, Frinton-on-Sea, CO13 0JS	20m	Reference: EPR/RE5157HX/A001, WEX106372, WEX187206, WEX139517 Category: Storage of Sludge. Located north of landfall
	Bradfield Lodge, Clacton Road, Horsley Cross, CO11 2NS	Adjacent	Reference: WEX168758, EPR/CH0476TH/A001, WEX306666, WEX007417, EPR/VE5785YN/A001, EPR/QE5784XX/A001 Category: Burning waste in the open. Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising. Storage of waste in secure containers. Pig and poultry ash. Spreading of plant matter to confer benefit. Use of waste in construction. Spreading waste on agricultural land to confer benefit. Pig and poultry ash. Use of mulch. Incorporation of ash into soil. Recovery of scrap metal. Burning of waste as a fuel in a small appliance. Mechanical treatment of end-of-life tyres. Located north-east of the onshore cable route.
	Walton Road, CO16 0NN	20m	Reference: WEX316442 Category: Use of waste in construction Located west of the onshore cable route
	Pond Farm, Swan Road, Beaumont, Clacton-on-Sea, CO16 0AN	20m	Reference: WEX009364, WEX170105 Category: Spreading of plant matter to confer benefit. Use of mulch. Use of waste for a specified purpose. Incorporation of ash into soil. Recovery of scrap metal. Burning waste in the open. Burning of waste as a fuel in a small appliance. Deposit of waste from dredging of inland waters. Crushing and emptying waste vehicle oil filters. Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising. Storage of waste in a secure place. Treatment of waste aerosol cans. Treatment of waste in a bio bed or biofilter. Use of waste in construction. Spreading waste on agricultural land to confer benefit. Incorporation of ash into soil. Located east of the onshore cable route
	Great Holland Pits Nature Reserve, CO13 0EU	30m	Reference: EPR/BE5082AJ/A001 Category: Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising. Depositing of waste from dredging of inland waters. Burning waste in the open. Use of waste in construction. Aerobic composting and associated prior treatment. Located west of the onshore cable route

Facility type – off site	Name & location	Distance	Details
	Newhouse Farm, Clacton Road, Manningtree, CO11 2NZ	30m	Reference: WEX190449, WEX032782, EPR/JE5780MM/A001 Category: Burning waste in the open. Deposit of waste from dredging of inland waters. Use of waste in construction Located west of the onshore cable route
	Little Clacton Road, CO13 0ET	50m	Reference: WEX227953 Category: Burning waste in the open Located north of the onshore cable route
	Clacton Road, CO13 0JU	70m	Reference: WEX139517 Category: Storage of sludge Located east of the onshore cable route
	Wolves Hall Farm, Wolves Hall Lane, Tendring, CO16 0DG	100m	Reference: WEX188422, WEX322384, WEX029713, EPR/WH0177TS/A001 Category: Use of waste in construction. Storage of sludge. Burning waste in the open. Deposit of agricultural waste consisting of plant tissue under a Plant Health notice. Deposit of waste from dredging of inland waters. Treatment of waste in a bio bed or biofilter. Aerobic composting and associated prior treatment. Treatment of waste aerosol cans. Treatment of waste food. Manual treatment of waste. Recovery of scrap metal. Screening and blending of waste. Preparatory treatments (baling, sorting, shredding etc). Pig and poultry ash. Use of mulch. Spreading waste on agricultural land to confer benefit. Burning of waste as a fuel in a small appliance. Incorporation of ash into soil. Cleaning, washing, spraying or coating relevant waste. Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising. Mechanical treatment of end-of-life tyres. Sorting mixed waste. Crushing and emptying waste vehicle oil filters. Treatment of non-hazardous pesticide washings by carbon filtration for disposal. Deposit of waste from a portable sanitary convenience. Disposal by incineration. Storage of waste in secure containers/place. Spreading waste on non-agricultural land to confer benefit. Depositing samples of waste for the purposes of testing or analysing them. Sorting mixed waste. Cleaning, washing, spraying or coating relevant waste. Spreading of plant matter to confer benefit. Deposit of agricultural waste consisting of plant tissue under a Plant Health notice. Use of waste for a specified purpose. Use of waste derived biodiesel as fuel. Use of baled end-of-life tyres in construction. Crushing waste fluorescent tubes Located east of the onshore cable route
	Hiskeys Farm, Spratts Lane, Little Bromley, CO11 2PR	140m	Reference: EPR/JF0901CZ/A001, WEX282965, WEX144074 Category: Burning waste in the open Located south of the onshore cable route
	Abbotts Hall, Clacton Road, Horsley Cross, Manningtree, CO11 2NX	160m	Reference: WEX314195, WEX178896, WEX011599, EPR/SE5255DB/A001 Category: Spreading waste on agricultural land to confer benefit. Deposit of waste from dredging of inland waters. Burning waste in the open. Deposit of agricultural waste consisting of plant tissue under a Plant Health notice. Use of waste in construction. Located south of the onshore cable route
	New Hall, Landermere, Thorpe-le-Soken, CO16 0NH	200m	Reference: WEX134710 Category: Use of mulch. Depositing of waste from dredging of inland waters. Disposal by incineration. Spreading of plant matter to confer benefit. Use of waste in construction. Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising. Aerobic composting and associated prior treatment. Use of waste for a specified purpose. Spreading waste on agricultural land to confer benefit. Preparatory treatments (baling, sorting, shredding etc). Cleaning, washing, spraying or coating relevant waste. Burning waste in the open. Storage of waste in a secure place. Located east of the onshore cable route
	Hempstalls Farm, Clacton Road, Manningtree, CO11 2NZ	200m	Reference: EPR/BH0179PU/A001, WEX168532, WEX251008, WEX259073, WEX303111, WEX302577, WEX007413, WEX109217, WEX115635, WEX165109, WEX117763, WEX318622, WEX259275 Category: Spreading of plant matter to confer benefit. Use of waste for a specified purpose. Burning of waste as a fuel in a small appliance. Incorporation of ash into soil. Spreading waste on agricultural land to confer benefit. Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising. Sorting mixed waste. Storage of waste in secure containers/place. Deposit of agricultural waste consisting of plant tissue under a Plant Health notice. Deposit of waste from dredging of inland waters. Burning waste in the open. Cleaning, washing, spraying or coating relevant waste. Crushing and emptying waste vehicle oil filters. Preparatory treatments (baling, sorting, shredding etc). Recovery of scrap metal. Use of waste in construction. Use of mulch. Pig and poultry ash. Treatment of waste in a bio bed or biofilter. Located west of the onshore cable route
	Lodge Lane, Tendring, CO16 0BS	220m	Reference: WEX300822 Category: Burning waste in the open Located west of the onshore cable route
	Mulleys Farm, Bentley Road, Little Bromley, CO11 2PL	250m	Reference: WEX006523, EPR/KE5057AN/A001, EPR/RF0604FP/A001 Category: Use of depolluted end-of-life vehicles for vehicle parts. Storage of waste in a secure place. Located north of the onshore cable route
Historical Landfill	Land West of Great Holland Mill	30m	First recorded input: 17/10/1952 Last recorded input: Not recorded

Facility type – off site	Name & location	Distance	Details
			Accepted wastes: Not recorded Located west of the onshore cable route

18. The locations of the identified waste facilities are shown on ES Figure 19.2 (Document Reference: 3.2.15).

1.6.4 Hazardous substances and health & safety

19. The presence (or absence) of sites subject to restrictions in relation to Health & Safety at or within 250m of the onshore project area (and 1km specifically for COMAH sites) has been summarised in Table 6.

Table 6 Summary of facilities subject to active consents

Facility type	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
COMAH	No	No	No	No
Regulated explosive sites	No	No	No	No
Hazardous substance storage/usage	No	No	No	No
Radioactive Substance Authorisations (RSA)	No	No	No	No

1.6.5 Environmentally sensitive areas & visual / cultural designations

20. The presence (or absence) of environmentally sensitive areas as well as visual and cultural designations at or within 250m of the onshore project area has been summarised in Table 7 below with further detail in Table 8 and Table 9.

Table 7 Summary of environmentally sensitive areas and visual / cultural designations

Feature / designation	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Sites of Special Scientific Interest (SSSI)	Yes	No	No	Yes
Conserved wetland sites (Ramsar)	No	No	No	No
Special Areas of Conservation (SAC)	No	No	No	No
Special Protected Areas (SPA)	No	No	No	No
National Nature Reserves (NNR)	No	No	No	No
Local Nature Reserves (LNR)	Yes	No	No	Yes
Designated ancient woodland	No	No	No	Yes
Biosphere reserves	No	No	No	No
Forest parks	No	No	No	No
Marine conservation zones	No	No	No	No
Green belt	No	No	No	No
Nitrate sensitive areas	No	No	No	No
Nitrate vulnerable zones (NVZ)	Yes	Yes	Yes	Yes

Feature / designation	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
World heritage sites	No	No	No	No
National Landscapes	No	No	No	No
National parks	No	No	No	No
Listed buildings	No	No	No	Yes
Conservation areas	Yes	Yes	No	Yes
Scheduled ancient monuments	No	No	No	No
Registered parks and gardens	No	No	No	No
Priority habitat inventory	Yes	Yes	No	Yes

Table 8 Details of onsite environmentally sensitive areas and visual / cultural designations

Feature / designation – on site	Name & location	Details
SSSI	Holland Haven Marshes - landfall	Designated due to the ditch network, which radiates from Holland Brook and its tributaries, which represents an outstanding example of a freshwater to brackish water transition. The aquatic plant communities within this area contains a range of nationally and locally scarce species.
LNR	Holland Haven - landfall	Designated due to the landscape, coastal grazing areas and wildlife. The LNR supports a range of invertebrate and bird populations.
NVZ	Sandlings and Chelmsford NVZ	Type: Groundwater Present throughout the onshore project area.
Conservation Area	Frinton and Walton Conservation area - landfall	Designation date: 1982.
	Great Holland – onshore cable route	Designation date: 1981.
Priority Habitat Inventory	Landfall	Main Habitat: lowland fens, maritime cliff and slope, coastal and floodplain grazing marsh.
	Onshore cable route	Main Habitat: deciduous woodland located west of Park Lane, south west of Thorpe Road, north of Frinton Road and south east of Lodge Lane.

Table 9 Details of offsite environmentally sensitive areas and visual / cultural designations

Feature / designation – off site	Name & location	Distance	Details
SSSI	Holland Haven Marshes	Adjacent	The SSSI extends off site to the north east and south west.
LNR	Holland Haven	Adjacent	The LNR extends off site to the south west.

Feature / designation – off site	Name & location	Distance	Details
Designated ancient woodland	Simons Wood	30m	Type: Ancient replanted woodland Located to the west of the onshore cable route.
	Holland Hall Wood	90m	Type: Ancient and semi-natural woodland Located north of the onshore cable route.
NVZ	Sandlings and Chelmsford NVZ	Adjacent	Type: Groundwater Extends from the onshore project area in all directions.
Listed Building (all Grade II unless otherwise stated)	Great Holland Lodge, Clacton Road, Great Holland, CO13 0JU	20m	Located west of the onshore cable route.
	Great Holland Mill House, Mill Lane, Frinton-on-Sea CO13 0EU	30m	Located west of the onshore cable route.
	Landermere Cottage, Walton Road, Thorpe-le-Soken, CO16 0NN	30m	Located north east of the onshore cable route.
	Church of All Saints, Church Lane, CO13 0JS	40m	Grade: II* Located north of the onshore cable route.
	Ring Cottage, Little Clacton Road, Frinton-on-Sea, CO13 0EU	70m	Located west of the onshore cable route.
	Church of St Mary, Barlon Road, Manningtree, CO11 2PP	100m	Grade: II* Located north of the onshore cable route.
	Abbott's Hall, Clacton Road, Manningtree, CO11 2NX	150m	Located south of the onshore cable route.
	Pear Tree Cottage, Clacton Road, Mistley, CO11 2NR	160m	Located north of the onshore cable route.
	Thorpe Park Farmhouse, Thorpe Park Lane, Clacton-on-Sea, CO16 0HN	180m	Located west of the onshore cable route.
	Millington House, Colchester Road, Thorpe-le-Soken, CO16 0AB	190m	Located south west of the onshore cable route.
	New Hall, Walton Road, Thorpe-le-Soken, CO16 0NH	200m	Located north east of the onshore cable route.
	Harwich Road, Little Bentley, CO7 8SU	210m	Located south of the onshore cable route.
	Holly Tree Cottage, Clacton Road, Mistley, CO11 2NR	210m	Located north of the onshore cable route.

Feature / designation – off site	Name & location	Distance	Details
	Brockett's Hall, Stones Green Road, CO16 0DD	220m	Located east of the onshore cable route.
	Heath Hospital, The Heath, Clacton-on-Sea, CO16 0BZ	230m	Located west of the onshore cable route.
	The Old Rectory, Church Road, Manningtree, CO11 2PP	230m	Located north of the onshore cable route.
	Hempstall's Farmhouse, Clacton Road, Manningtree, CO11 2NZ	240m	Located west of the onshore cable route.
	Bounds Farmhouse, Hungerdown Lane, Ardleigh, CO11 2LY	30m	Located west of the onshore substation.
	Hungerdowns Farmhouse, Hungerdown Lane, Ardleigh, CO7 7LZ	250m	Located north of the onshore substation.
Conservation Area	Frinton and Walton conservation area	Adjacent	Extends off site to the north east.
	Great Holland conservation area	Adjacent	Extends off site to the north east.
Priority Habitat Inventory	N/A	Adjacent to landfall	Main Habitat: maritime cliff and slope; Located to the north east and south west of landfall
			Main Habitat: coastal and floodplain grazing marsh; Located to the south west of landfall.
		90m	Main Habitat: good quality semi-improved grassland; Located south west of landfall.
		110m	Main Habitat: lowland fens; Located south west of landfall.
		Adjacent – 250m	Main Habitat: isolated areas of deciduous woodland to the east and west of the onshore cable route.
		50m	Main Habitat: lowland heathland; Located west of the onshore cable route, west of Mill Lane.
		130m	Main Habitat: traditional orchard; located west of the onshore cable route, south of Lodge Lane.
		160m	Main Habitat: traditional orchard; located east of the onshore cable route, east of Park Lane.
		Adjacent and 200m	Main Habitat: deciduous woodland to the west and north of the onshore substation, east and west of Hungerdown Lane.

21. The locations of identified environmentally sensitive areas are shown on ES Figure 19.3 (Document Reference: 3.2.15).

22. A number of geological SSSIs, local geological sites and other sites of geological interest were highlighted in the scoping report as potential receptors following a review of information available on the GeoEssex website. Following the refinement of the boundary of the onshore project area, these receptors are now located at least 500m away and as such have not been considered further. The location of the geological SSSIs, local geological sites and other sites of geological interest are shown on ES Figure 19.4 (Document Reference: 3.2.15) for context.

1.6.6 Agricultural designations

23. The presence (or absence) of agricultural designations at or within 250m of the onshore project area has been summarised in Table 10 below with further detail in Table 11 and Table 12.

Table 10 Summary of agricultural designation

Designation type	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Agricultural designation	Yes	Yes	Yes	Yes
Open access land	No	No	No	No
Tree felling licence	No	Yes	No	Yes
Environmental stewardship schemes	Yes	Yes	No	Yes
Countryside stewardship schemes	Yes	Yes	Yes*	N/A

*Located within the area of the Norwich to Tilbury substation area

Table 11 Details of onsite agricultural designation

Designation type – on site	Location	Details
Agricultural designation	Landfall	Agricultural Land Classification (ALC) Grade 4 present throughout the landfall area.
	Onshore cable route	ALC Grades 2 and 3 are present throughout the onshore cable route. ALC Grade 1 is present between Payne's Lane and Ardleigh Road.
	Onshore substation	ALC Grade 1 is present throughout the onshore substation area.
Tree felling license	Onshore cable route	Tree Felling Licence: Single Tree; Reference: 018/366/15-16; Located adjacent to the A120.
Environmental stewardship schemes	Landfall and onshore cable route	Entry level plus higher level stewardship; Reference: AG00505273; Start date: 01/12/2013; End date: 30/11/2023. Located between landfall and Little Clacton Road.
Countryside stewardship schemes	Landfall	Higher Tier; Reference: 1257399; Start date: 01/01/2022; End date: 31/12/2026.
	Onshore cable route	Higher Tier; Reference: 618257; Start date: 01/01/2019; End date: 31/12/2028.

Designation type – on site	Location	Details
		Higher Tier; Reference: 1221202; Start date: 01/01/2022; End date: 31/12/2031.
	Onshore cable route	Mid-Tier; Reference: 1415672; Start date: 01/01/2023; End date: 31/12/2027.
		Mid-Tier; Reference: 1273044; Start date: 01/01/2022; End date: 31/12/2026.
		Mid-Tier; Reference: 1469703; Start date: 01/01/2023; End date: 31/12/2027.
		Mid-Tier; Reference: 1101080; Start date: 01/01/2022; End date: 31/12/2026.
		Mid-Tier; Reference: 999263; Start date: 01/01/2021; End date: 31/12/2025.
	Onshore substation*	Mid-Tier; Reference: 1092239; Start date: 01/01/2021; End date: 31/12/2025.

*Located within the area of the Norwich to Tilbury substation area

Table 12 Details of offsite agricultural designation

Designation type – off site	Name	Distance	Details
Agricultural designation	N/A	Adjacent – 250m	Grade 4 ALC land extends to the north east and north west of landfall.
			Grades 1, 2 and 3 ALC land extends in all directions from the onshore cable route.
			Grade 1 ALC land extends in all directions from the onshore substation.
Tree felling licence	N/A	Adjacent – 250m	Tree Felling Licence: Selective Fell/Thin (Conditional); Reference: 018/366/15-16; Located to the east and west of the onshore cable route, parallel to the A120.
		170m	Tree Felling Licence: Selective Fell/Thin (Conditional); Reference: 017/112/13-14; Located east of the onshore cable route, north of Lodge Lane.
Environmental stewardship schemes	N/A	Adjacent – 250m	Entry level plus higher level stewardship; Reference: AG00505273; Start date: 01/12/2013; End date: 30/11/2023. Located to the east and west of landfall and onshore cable route.

1.6.7 Historical industrial land use

24. The presence (or absence) of historical industrial land uses, tanks, energy features, petrol stations, garages and military land at or within 250m of the onshore project area has been summarised in Table 13 below with further detail in Table 14 and Table 15.

Table 13 Summary of historical industrial land uses

Features	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Industrial land uses	Yes	Yes	No	Yes

Features	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Tanks	Yes	No	No	Yes
Energy features	No	No	No	Yes
Current or recent petrol stations	No	No	No	No
Garages	No	No	No	No
Military land	No	No	No	No

Table 14 Details of onsite historical industrial land uses

Feature – on site	Location	Details
Industrial land uses	Landfall	Feature: Disused Gun Emplacement; Date: 1958. Located on beachfront.
		Feature: Unspecified pit/heap; Date: 1925 – 1938. Located adjacent to Frinton Golf Course.
	Onshore cable route	Feature: Cuttings; Date: 1874. Located adjacent to Park Lane.
		Feature: Refuse heap; Date: 1875. Located north of Lodge Lane.
		Feature: Cuttings; Date: 1875. Located south of Stones Green Road.
Tanks	Landfall	Three historical tank locations are identified within the landfall area. Date: 1923.

Table 15 Details of offsite historical industrial land uses

Feature – off site	Distance	Details
Industrial land uses	100m	Feature: Disused Gun Emplacement; Date: 1958. Located south west of landfall.
	Adjacent	Feature: Unspecified mill/provender; Date 1898 - 1967. Located west of the onshore cable route, west of Mill Lane.
		Feature: Unspecified shed; Date 1874 – 1925. Located east of the onshore cable route, west of Mill Lane.
		Feature: Sand and gravel pit; Date: 1974. Located east of the onshore cable route, west of Mill Lane.
		Feature: Cuttings; Date: 1874 – 1955. Located west of the onshore cable route, west of Park Lane.
		Feature: Cuttings; Date: 1875. Located east of the onshore cable route, south of Stone's Green Lane.
		Feature: Unspecified heap; Date: 1967 – 1988. Located east of the onshore cable route, adjacent to Stone's Green Lane.
	30 - 100m	Feature: Smithy; Date: 1875 - 1925. Located west of the onshore cable route, north of the A120.
	50m	Feature: Graveyard; Date:1874. Located west of the onshore cable route, west of Mill Lane.
	50m	Feature: Unspecified workhouse; Date: 1875 – 1921. Located west of the onshore cable route, adjacent to Tendring Heath.
	50m	Feature: Graveyard; Date: 1875. Locates north of the onshore cable route, north of Barlon Road.

Feature – off site	Distance	Details
	50 - 250m	Feature: Gravel pit/unspecified pit/unspecified ground workings; Date:1925 - 1974. Located north of the onshore cable route on Church Road.
	100m	Feature: Unspecified heap/pit; Date: 1925 – 1978. Locates west of the onshore cable route, north and south of Lodge Lane.
	150m	Feature: Quarry; Date: 1875. Located west of the onshore cable route, north of Lodge Lane.
	210m	Feature: Nursery; Date: 1966. Located west of the onshore cable route, adjacent to Lodge Lane.
	210m	Feature: Cuttings; Date: 1875. Located east of the onshore cable route, north of the A120.
	220m	Feature: Cuttings; Date: 1875. Located west of the onshore cable route, north of Lodge Lane.
	Adjacent	Feature: Electricity substation; Date: 1983. Located south of the onshore substation, south of Little Bromley Road.
Tanks	Adjacent	Dated: 1956. Located east of the onshore cable route, located south of Church Lane.
	10m	Dated 1875. Located north of the onshore cable route at Pond Farm.
	190m	Dated: 1959. Located west of the onshore cable route, north of the A120.
	240m	Dated: 1956 – 1997. Located west of the onshore cable route, west of Mill Lane.
Energy features	80m	Feature: Electricity substation; Date: 1989 – 1996. Located south of the onshore cable route, east of The Spennells.
	Adjacent	Feature: Electricity substation; Date: 1983. Located south of the onshore substation, south of Little Bromley Road.

1.6.8 Current industrial land use

25. The presence (or absence) of current industrial land uses, petrol stations, electricity cables and gas pipelines at or within 250m of the onshore project area has been summarised in Table 16 with further detail in Table 17.

Table 16 Summary of current industrial land uses

Features	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Buried Electricity cables	No	No	No	No
Gas pipelines	Yes	Yes	No	N/A
Water pipelines	No	Yes	No	N/A

Table 17 Details of onsite current industrial land uses

Feature – on site	Location	Details
Gas pipelines	Onshore cable route	Operator: Cadent Gas. Located adjacent to Little Clacton Road.
		Operator: Cadent Gas. Located north of Holland Mill Wood.
Water pipeline	Onshore cable route	Operator: Affinity Water. Located throughout the onshore cable route.

26. Private buried utilities may also be present within the onshore cable route. For further information on utilities please refer to ES Chapter 22 Land Use and Agriculture (Document Reference: 3.1.24).

1.7 Historical land use

1.7.1 Introduction

27. The historical development of the onshore project area has been assessed using information available from historical maps available from the National Library of Scotland.

28. In the context of the summary of historical development of the surrounding area, the descriptions are limited to within approximately 100m of the onshore project area, unless specified in the following section.

1.7.2 Site history

Table 18 Summary of onsite historical data

Feature	Map years	Notes
Landfall		
Agricultural land	1840s - present	Agricultural land is present throughout the landfall area.
Pits/ponds	1840s – 1965*	Located parallel to Kirby Brook.
Onshore cable route		
Agricultural land	1840s - present	Agricultural land is located throughout the onshore cable route.
Pit	1840s –1973*	Located adjacent to Long Lane.
Railway	1840s to present	Bisects the onshore cable route, west of Kirby Cross.
Pit/pond	1840s - 1973*	Located east of Damant's Farm Lane.
Pit/pond	1888 – 1973*	Located west of Damant's Farm Lane.
Pit/pond	1840s-1965*	Located east of Tendring Road.

*Latest available map

1.7.3 Surrounding history

29. There are a number of potentially contaminative land uses identified within the onshore project area, the main ones within 100m of the onshore project area are listed in Table 19 below.

Table 19 Summary of offsite historical data

Feature	Map years	Distance	Notes
Pit/pond	1840s - 1914	Adjacent to onshore cable route	Located west of Short Lane.
			Located east of Clacton Road.
Railway	1840s to present	Adjacent to onshore cable route	Extends to the east and west of the onshore cable route, west of Kirby Cross.
Pond	1888 – present	Adjacent to onshore cable route	Located south of Bradfield Lodge.
Pit/pond	1888 – 1973*	Adjacent to onshore cable route	Located south of New Hall.

Feature	Map years	Distance	Notes
Pit/pond	1840s – 1965*	Adjacent to onshore cable route	Located adjacent to Holland Haven Marshes.
Pit/pond	1840s – present	Adjacent – 70m north of onshore cable route	Located west of Damant's Farm Lane.
Pond	1840s - present	10m west of onshore cable route	Located west of Clacton Road.
Pit/pond	1840s – present	10m east of onshore cable route	Located east of Bentley Road.
Corn mill	1840s – present	10m west of onshore cable route	Recorded as Great Holland Mill, located east of Great Holland Pits Nature Reserve.
Pit/pond	1840s - 1914	10m east of onshore cable route	Located east of Bentley Road.
Pit/pond	1840s – present	20m south of onshore cable route	Located west of Swan Road.
Pond	1840s - present	20m west of onshore cable route	Located south of Wolves Hall Lane.
Pit	1949 – present	30m – 60m south west of onshore cable route	Located south of Wolves Hall Lane.
Pond	1888 – 1973*	30m east of onshore cable route	Located to the south of Little Clacton Road.
Pit/pond	1892 – 1914	30m west of onshore cable route	Located south of Clacton Road.
Pit/pond	1888 - 1965	40m to 90m south of onshore cable route	Located east of Bentley Road.
Pit	1892 – 1914*	50m east of onshore cable route	Located to the north of Little Clacton Road.
Pit/pond	1937 – present	50m south of onshore cable route	Located east of Tendring Road.
Pit/pond	1840s – 1961*	80m south of onshore cable route	Located west of Tendring Road.
Pit/pond	1840s - 1965	90m south west of onshore cable route	Located west of Landemere Road.
Pit/pond	1840s – 1973*	90m north of onshore cable route	Located north of Little Bromley Hall.
Pit/pond	1840s – 1973*	10m west of onshore substation	Located west of Hungerdown Lane.
Pit/pond	1888 – 1973*	60m west of onshore substation	Located east of Little Bromley Road.
Pit/pond	1840s - present	70m west of onshore substation	Located north of Little Bromley Road.

30. Identified potentially contaminative historical land uses are shown on ES Figure 19.5 (Document Reference: 3.2.15).

1.7.4 Unexploded ordnance

31. An unexploded ordnance (UXO) risk map has been obtained from Zetica and is presented as Annex 2. The map indicates that the onshore project area is

predominantly located within an area deemed as containing a low risk of encountering a UXO. Landfall and the onshore cable route from landfall to just south of Thorpe Cross is however located within an area deemed as containing a moderate risk of encountering a UXO.

32. Given the potential risks of encountering an unexploded bomb within the area between landfall and Thorpe Cross, it is recommended that a detailed UXO survey be conducted in these areas prior to the commencement of any intrusive or construction works.

1.8 Geology, groundwater, hydrology and radon

1.8.1 Geology

1.8.1.1 Geological conditions

33. Information on geological conditions within the onshore project area has been collated from BGS datasets, including 1:50,000 scale geological mapping, historical BGS borehole records and Environmental Database GIS data. Geological conditions are summarised in Table 20. It must be noted, however, that the proportions of each stratum may be variable along the length of the onshore project area.

Table 20 Anticipated geology

Stratum	Unit	Description
Made Ground	Infilled Ground	Located within the onshore cable route (north of Little Clacton Road), likely to be associated with historic quarrying activities.
	Made Ground	Further Made Ground has not been identified on the BGS mapping but is likely to be present in localised areas relating to identified historical land uses.
Superficial Deposits	Storm Beach Deposits	Located along the south eastern edge of landfall.
	Alluvium	Located throughout the landfall area and at locations within the onshore cable route (associated with surface water features).
	Cover Sand	Located throughout the onshore cable route, with the exception of between Thorpe Cross and Lodge Lane where it is absent. Located throughout the onshore substation.
	Kesgrave Catchment Subgroup	Located in isolated areas along the onshore cable route.
Bedrock	Thames Group	Clays, Silts and Sands. Located widely across landfall, onshore cable route and onshore substation.

34. BGS logs have been referred to for information only. The presence (or absence) of BGS logs at or within 100m of the onshore project area has been summarised in Table 21 with further detail in Table 22 and Table 23.

Table 21 Summary of BGS Borehole Logs

Feature	Landfall	Onshore cable route	Onshore substation	Offsite (within 100m)
BGS Borehole log	No	No	Yes	Yes

Table 22 Details of On Site BGS Borehole Logs

Reference Number and Max Depth	Details
TM02NE174, TM02NE175 Max depth: 8.01m Centred on grid reference: 607960, 228400	London Clay: Max depth 8.01m
TM12NW29 Max depth: 1.83m Centred on grid reference: 611305, 226573	Top soil: Max depth: 1.00m Silty Sandy Clay with some Gravel: Max depth: 1.83m
TM02NE14/A, Max depth: 17.37m Grid reference: 608360, 229220	Topsoil: Max depth 0.70m Clayey Sand: Max depth 11.89m Sand and Gravel: Max depth 16.46m London Clay: Max depth 17.37m

Table 23 Details of Off Site BGS Borehole Logs

Reference Number and Borehole Details	Distance and Direction	Details
TM12NW54 Max depth: 20.11m Centred on grid reference: 613050, 227500 Located west of the onshore cable route.	Adjacent	Sand and Gravel: Max depth: 15.24m Blue Clay: Max depth 20.11m
TM22SW12, TM22SW13, TM22SW17 Max depth: 12.19m Centred on grid reference: 620240, 220210 Located east of the onshore cable route.	40m	Topsoil: Max depth 0.30 – 0.38m Stiff Sandy Clay: Max depth 0.60 – 1.07m Sand and Gravel: Max depth 7.32m Stiff fissured Clay: Max depth 12.19m
TM02NE9 Max depth: 9.90m Centred on grid reference: 607250, 228790. Located west of the onshore substation.	40m	Topsoil and Made Ground: Max depth 1.10m Sandy Gravel: Max depth 4.50m Silty Sand: Max depth 7.70m Sandy Gravel: Max depth: 9.10m London Clay: Max depth: 9.90m
TM12NW28 Max depth: 1.83m Centred on grid reference: 611218, 226431 Located west of the onshore cable route.	50m	Topsoil: Max depth: 0.30m Silty Sandy Clay with some Gravel: Max depth: 1.83m
TM22SW14, TM22SW18, TM22SW19, TM22SW20, TM22SW21, TM22SW22 Max depth: 12.19m Centred on grid reference: 620320, 220240 Located east of the onshore cable route.	50m	Topsoil: Max depth 0.30 – 0.45m Sandy Clay: Max depth 0.61 – 0.91m Sand and Gravel: Max depth 3.51 – 3.66m Stiff fissured Clay: Max depth 12.19m
TM02NE15 Max depth: 10.10m Centred on grid reference: 608430, 22855. Located to the south-west of the onshore cable route.	60m	Soil: Max depth: 2.70m Sandy Gravel: Max depth 9.10m London Clay: Max depth 10.10m

1.8.2 Mining and mineral extraction

35. The onshore project area is not located in an area which may be affected by coal mining.

1.8.3 Groundwater

1.8.3.1 Hydrogeology and groundwater vulnerability

36. Hydrogeological information for land within the onshore project area has been collated from the Groundsure environmental database search, BGS hydrogeological maps and Defra MAGIC map application. Superficial and bedrock strata are classified by the Environment Agency according to their resource value and vulnerability as shown in Table 24.

Table 24 Environment Agency groundwater classification

Stratum	Unit	Class
Superficial Deposits	Alluvium – clay and silt	Secondary A Aquifer
	Cover Sand – clay, silt and sand	Secondary B Aquifer
	Kesgrave Catchment Subgroup – sand and gravel	Secondary A Aquifer
Bedrock	Thames Group – clay, silt and sand	Unproductive

1.8.3.2 Groundwater abstractions

37. The absence or presence of groundwater abstraction wells at or within 1km of the onshore project area has been summarised in Table 25 with further detail in Table 26 and Table 27.

Table 25 Summary of groundwater abstraction wells

Features	Landfall	Onshore cable route	Onshore substation	Offsite (within 1km)
Public Potable abstraction well under the jurisdiction of the EA	No	No	No	Yes
Abstraction wells related to farming, irrigation and commercial usage i.e. not potable under the jurisdiction of the EA	No	Yes	No	Yes
Domestic Potable abstraction well under the jurisdiction of the local authority.	No	No	No	Yes

Table 26 Details of onsite groundwater abstraction wells

Licence number	Details	Potable abstraction
8/37/26/*G/0091	Location: A H Brown Farms Dairy House Farm, Frinton-on-Sea, CO13 0EX. Type: General agriculture – spray irrigation. Located within the onshore cable route.	No

Table 27 Details of offsite groundwater abstraction wells

Licence number	Distance	Details	Potable abstraction
Regulation 10 supply	10m	Location: Orchard Cottage, domestic supply.	Yes
Regulation 10 supply (Single Dwelling (SD))	10m	Location: Paynes Cottage, domestic supply.	Yes
Regulation 10 supply	30m	Location: Oakwood, domestic supply.	Yes
Unregulated	30m	Location: Normans Farm, Ardleigh Road, Little Bromley, Manningtree, CO11 2QB. Well and Mains. Used for Irrigation assume that other supplies other than kitchen tap are well fed.	Yes
8/36/19/*G/0092	30m	Location: John Jiggens Limited, Hempstalls Farm. General agriculture – spray irrigation.	No
8/37/25/*G/0172	40m	Location: T & R Fairley Farms Partnership, Abbotts Hall, Mistley, CO11 2NX. General agriculture – spray irrigation. Abstracted from Glacial Sands and Gravels.	No
Regulation 10 supply (shared)	40m	Location: Craigus and Welhams Farm, domestic supplies.	Yes
Unregulated	100m	Location: Hisekys Farm Kennels, assumed domestic supply although is also on the mains.	Yes
Regulation 10 (SD)	110m	Location: The Coach House, domestic supply.	Yes
Unregulated	120m	Richmond Cottage, Paynes Lane, Little Bromley, CO11 2PJ, well and mains.	Yes
8/37/25/*G/0064	120m	Location: Dedham Vale Farms, Badley Hall, Ardleigh, CO7 7NF. General agriculture – general farming and domestic. Abstracted from Glacial Sands and Gravels.	Yes
Regulation 10 supply (SD)	140m	Location: Crabtrees, domestic supply.	Yes
Regulation 10 (SD)	140m	Location: Little Bromley Hall, domestic supply.	Yes
Regulation 10 supply (shared)	160m	Location: Thorpe Park Farm, Thorpe Park House, 1 - 5 Thorpe Park Cottages, domestic supplies.	Yes

Licence number	Distance	Details	Potable abstraction
8/37/26/*G/0080	200m	Location: T W Salmon & Co, Slough Farm, Slough Lane, Ardleigh, CO7 7RK. General agriculture – spray irrigation. Abstracted from Glacial Sands and Gravels.	No
Regulation 10 supply	220m	Location: Dypaca, domestic supply.	Yes
Regulation 10 supply (SD)	230m	Location: Mulleys Farm, domestic supply.	Yes
Regulation 10 (SD)	230m	Location: The Old Rectory, domestic supply.	Yes
8/37/25/*G/0191	250m	Location: Dedham Vale Farms, Badley Hall, Ardleigh, CO7 7NF. General agriculture – spray irrigation (direct). Abstracted from Glacial Sands and Gravels.	No
Regulation 10 supply	280m	Location: Woodside, domestic supply.	Yes
Regulation 10 supply (SD)	290m	Location: Mulleys Cottage, domestic supply.	Yes
Regulation 10 supply	300m	Location: Barlon House, domestic supply	Yes
Unregulated	320m	Location: Triangle Farm, well that fed the farm and used in the yard.	Yes
Regulation 10 supply (SD)	330m	Location: Grove Cottage, domestic supply.	Yes
Regulation 9	350m	Location: The Haywain Commercial Premises	Yes
Regulation 10 (SD)	360m	Location: Mulberry Lodge, domestic supply.	Yes
Regulation 10 (SD)	370m	Location: Jennings Farm House, domestic supply.	Yes
8/37/25/*G/0143	420m	Location: D C Williamson Ltd, Barn Farm Freezer Store, Barn Farm, CO11 2UX. Abstraction name: Old Shields Farm 1, Ardleigh. General agriculture – spray irrigation, anti-frost. Abstracted from Glacial Sands and Gravels.	No
	470m	Location: D C Williamson Ltd, Barn Farm Freezer Store, Barn Farm, CO11 2UX. Abstraction name: Old Shields Farm 2, Ardleigh. General agriculture – spray irrigation, anti-frost. Abstracted from Glacial Sands and Gravels.	No
8/37/26/*G/0037	450m	Location: Parkers Nurseries Limited, Bradewick Nursery, Thorpe. General Farming & Domestic. Abstracted from Fluvial Sands and Gravels	Yes
Regulation 10 supply (SD)	540m	Location: The Haven, domestic supply.	Yes
AN/037/0025/031	550m	Location: Boxford (Suffolk) Farms Ltd, Stoke By Nayland Club, Keepers Lane, CO6 4PZ. General agriculture – trickle irrigation. Abstracted from Glacial Sands and Gravels.	No

Licence number	Distance	Details	Potable abstraction
8/37/25/*G/0275	620m	Location: Ashdown Nursery, 84 Hungerdown Lane, Lawford, CO11 2LY. General agriculture – trickle irrigation.	No
Regulation 10 supply (shared)	640m	Location: 2/3 Memorial Cottages, Church Road, Little Bromley, Manningtree CO11 2PP, domestic supplies.	Yes
8/37/25/*G/0281	650m	Location: Boxford (Suffolk) Farms Ltd, Hill Farm, Brick Kiln Hill, Boxford, CO10 5NY. General agriculture – spray irrigation. Abstracted from Glacial Sands and Gravels.	No
Regulation 10 supply	680m	Location: Badely Hall, domestic supply.	Yes
Regulation 10 supply (SD)	700m	Location: 1 Church Road / 1 Memorial Cottage, Church Road, Little Bromley, Manningtree CO11 2PP, domestic supply.	Yes
8/36/19/*G/0133	800m	Location: E Schwier & Sons Ltd, Bradfield Hall, CO11 2QZ. General agriculture – spray irrigation. Abstracted from Glacial Sands and Gravels.	No
8/36/19/*G/132	810m	Location: D McNair Ltd, Dickley Hall, Mistley, Manningtree, CO11 2NW. General agriculture – spray irrigation. Abstracted from Fluvial Sands and Gravels.	No
8/37/25/*G/0279	820m	Location: Solanum Rigg Ltd, 89 Hungerdown Lane, Lawford, CO11 2LY. General agriculture – spray irrigation.	No
8/36/19/*G/0132	830m	Location: D Mcnair Ltd, Dickley Hall, Mistley, CO11 2NW. General agriculture – spray irrigation. Abstracted from Glacial Sands and Gravels.	No
Regulation 10 supply	940m	Location: Bottle House, domestic supply	Yes
Regulation 10 supply	950m	Location: Coppice View, domestic supply	Yes
8/37/25/*G/0258	975m	Location: Wallings Nursery Limited, The Stoke by Nayland Club, Keepers Lane, Leavenheath, CO6 4PZ. General agriculture – trickle irrigation. Abstracted from Glacial Sands and Gravels.	No

38. It should be noted that the data search in relation to EA licenced abstractions has not included identification of unlicensed water supplies abstracting less than 20m^3 of water per day. For abstractions below 20m^3 per day an EA abstraction licence is not required provided that the abstraction is part of a single operation.

1.8.3.3 Groundwater source protection zones

39. Groundwater Source Protection Zones (SPZs) are defined around abstraction boreholes used for potable water supply to delineate the area where release of a contaminant into the aquifer could impact on the abstraction.

40. The area of the onshore cable route to the north of Tendring Green up to and including the onshore substation is located within an SPZ 3. The remainder of the onshore project area is not located within an SPZ. The location of the SPZ is shown in ES Figure 19.6 (Document Reference: 3.2.15).

1.8.3.4 Groundwater bodies

41. The presence (or absence) of groundwater bodies at or within 250m of the onshore project area has been summarised in Table 28 with further detail in Table 29 and Table 30.

Table 28 Summary of groundwater bodies

Features	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Water Environment Regulations (WER) groundwater bodies	No	Yes	Yes	Yes

Table 29 Details of onsite groundwater bodies

Feature – on site	Details
WER groundwater bodies	Present as isolated areas within the onshore cable route from the south of Clacton Road to Stones Green Road. The WER groundwater body, with the exception of an area surrounding Holland Brook, occupies the entirety of the onshore cable route and onshore substation north and west of Stones Green Road. Name: Essex Gravels.

Table 30 Details of offsite groundwater bodies

Feature – off site	Distance	Details
WER groundwater bodies	Adjacent	Located adjacent to the onshore cable route and the onshore substation. Name: Essex Gravels.

1.8.3.5 Surface water abstractions

42. The absence or presence of surface water abstractions at or within 1km of the onshore project area has been summarised in Table 31 with further detail in Table 32 and Table 33.

Table 31 Summary of surface water abstractions

Features	Landfall	Onshore cable route	Onshore substation	Offsite (within 1km)
Surface water abstractions	Yes	Yes	No	Yes

Table 32 Details of onsite surface water abstractions

Feature – on site	Details
Abstraction well	Location: James Fairley and Sons Farms. Licence: AN/037/0026/015 and 8/37/26/*S/0054. Type: General agriculture – spray irrigation. Located in the centre of the onshore cable route.

Table 33 Details of offsite surface water abstractions

Feature – off site	Distance	Details
Surface Water abstraction point	Adjacent	Location: Abbots Hall. Licence: 8/37/26/*S/0067 and AN/037/0026/006. General agriculture – spray irrigation. Located to the north of the onshore cable route.
	Adjacent	Location: Wolves Hall, James Fairley & Sons (Farm) Limited. Licence 8/37/26/*S/0054 issue 103. Type: General agriculture – spray irrigation. Located to the north of the onshore cable route.
	240m	Location: Hempstalls Farm. Licence: 8/37/26/*S/0083. General agriculture – spray irrigation. Located to the west of the onshore cable route.
	220m and 720m	Location: Wolves Hall. Licence: 8/37/26/*S/0011 and 8/37/26/*S/0069. General agriculture – spray irrigation. Located to the west of the onshore cable route.
	300m	Location: AH Brown Farms. Licence: 8/37/26/*S/0074. Type: General agriculture – spray irrigation. Located to the west of the landfall area.
	350m	Location: Slough Farm. Licence: AN/037/0025/035. General agriculture – spray irrigation. Located to the south of the onshore cable route.
	350m	Location: Reedlands Farm. Licence: 8/37/26/*S/0088. Type: General agriculture – spray irrigation. Located to the east of the onshore cable route.
	400m	Location: Glebe Farm, Licence 8/37/26/*S/0011. Type: General agriculture – spray irrigation. Located to the west of the onshore cable route.
	410m	Location: Yew Tree Farm. Licence: 8/37/26/*S/0090. General agriculture – spray irrigation. Located to the west of the onshore cable route.
	520m	Location: Badley Hall Farm. Licence: 8/37/26/*S/0045. General agriculture – spray irrigation. Located to the south of the onshore cable route.
	530m	Location: Bradfield Hall. Licence: 8/36/19/*S/0053. General agriculture – spray irrigation. Located to the east of the onshore cable route.
	650m	Location: Great Holland Hall Farm. Licence: AN/037/0026/016 and 8/37/26/*S/0102/R01. Type: General agriculture – spray irrigation. Located to the north of the landfall area.
	820m	Location: Reedlands Farm. Licence: 8/37/26/*S/0073. General agriculture – spray irrigation. Located to the west of the onshore cable route.

Feature – off site	Distance	Details
	820m	Location: Sladbury's Farm. Licence: 8/37/26/*S/0086. Type: General agriculture – spray irrigation. Located to the west of the landfall area.

1.8.4 Hydrology

1.8.4.1 Surface waters

43. The presence (or absence) of surface water features within 250m of the onshore project area has been summarised in Table 34 with further detail in Table 35 and Table 36.

Table 34 Summary of surface water features

Features	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Surface water features	Yes	Yes	Yes	Yes
WER surface water body catchments	Yes	Yes	Yes	Yes
WER surface water bodies	No	Yes	No	Yes

Table 35 Details of onsite surface water features

Feature – on site	Details
Surface water features	Streams and ditches associated with agriculture are present throughout the onshore project area. The following named features are located within the onshore project area: • Kirby Brook: landfall; • Holland Brook: landfall and onshore cable route; and • Tendring Brook: onshore cable route.
WER surface water body catchments (Ecological and WER classification 2022 all Moderate unless otherwise stated). *	Name: Holland Brook; Waterbody ID: GB105037077810; Chemical classification: Fail (2019) due to concentrations of mercury (and its compounds) and polybrominated diphenyls ethers (PBDE); Location: Present at landfall, throughout the onshore cable route and north eastern part of the onshore substation.
	Name: Wrabness Brook; Waterbody ID: GB105036040800; Chemical classification: Fail (2019) due to concentrations of mercury (and its compounds) and PBDE; Ecological and WER classification: Good; Location: Present as an isolated area of the onshore cable route north of Harwich Road along the onshore cable route.
	Name: Tenpenny Brook; Waterbody ID: GB105037041310; Chemical classification: Fail (2019) due to concentrations of mercury (and its compounds) and PBDE; Location: Present within the onshore cable route west of Paynes Lane to Ardleigh Road and throughout the onshore substation.
WER surface water bodies*	Name: Holland Brook; Waterbody ID: GB105037077810; Type: River; Chemical classification: Fail (2019) due to concentrations of mercury (and its compounds) and PBDE; Ecological and WER classification: Moderate. Location:. Crosses the onshore cable route running north to south.

*Although Ecological and WER classification for each feature are available for 2022, assessment of chemical classification was not required and so data from 2019 has been included in the table above.

Table 36 Details of offsite surface water features

Feature – off site	Distance	Details
Surface water features	Adjacent – 250m	Streams and ditches are located within 250m of the onshore project area. Named features include: • Holland Brook; • Kirby Brook; • Tendring Brook.
		A number of ponds and lakes are located within 250m of the onshore project area.
	Adjacent	The North Sea is located immediately east of landfall.
WER surface water body catchments	Adjacent – 250m	The WER surface water body catchments identified within Table 35 also extend 250m in all directions. No additional catchments are located within 250m.
WER surface water bodies	Adjacent - >250m	The WER surface water bodies identified within Table 35 also extend 250m in all directions. No additional catchments are located within 250m.

1.8.4.2 Flooding

44. The presence (or absence) of flood potential and events at or within 250m of the onshore project area has been summarised in Table 37 below with further detail in Table 38 and Table 39.

Table 37 Summary of flooding potential and events

Designation type	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Risk of Flooding from Rivers and Sea (RoFRaS)	Yes	Yes	No	N/A
Flood Zone 2	Yes	Yes	No	Yes
Flood Zone 3	Yes	Yes	No	Yes
Flood defences	No	No	No	No
Flood storage areas	No	No	No	No

Table 38 Details of onsite flooding potential and events

Designation type – on site	Details
RoFRaS	Low to high risk throughout the landfall area.
	Very low to high risk associated with where Tendring Brook and Holland Brook cross the onshore cable route.
Flood Zone 2	Located throughout the landfall area and isolated locations along the onshore cable route.
Flood Zone 3	

Table 39 Details of offsite flooding potential and events

Designation type – off site	Distance (direction)	Details
Flood Zone 2	Adjacent	Located adjacent to the landfall area and at isolated locations along the onshore cable route.
Flood Zone 3		

1.8.4.3 Discharges to controlled waters

45. The presence (or absence) of discharges to controlled waters at or within 250m of the onshore project area has been summarised in Table 40 below with further detail in Table 41.

Table 40 Summary of discharges to controlled waters

Feature	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Licensed Active Discharges	No	No	No	Yes
Pollutant release to surface waters (red list)	No	No	No	No
Pollutant release to public sewer	No	No	No	No
Discharge of List 1 dangerous substances	No	No	No	No
Discharge of List 2 dangerous substances	No	No	No	No

Table 41 Details of offsite discharges to controlled waters

Feature – off site	Distance	Details
Licensed active discharges	120m north of landfall	Address: Frinton - Esplanade/Second Ave Cso, Frinton Esplanade/Second Avenue, Frinton-on-Sea, Essex, CO13 9ER; Effluent type: Sewage discharge – sewer storm overflow – water company; Permit reference: ASECS12191; Effective date: 31/03/2018; End date: Not recorded, assumed active; Receiving water: North Sea.
	70m west of onshore cable route	Address: Silver Fern, 105 Landermere Road, Thorpe-Le-Soken, Clacton-on-Sea, Essex, CO16 0NG; Effluent type: sewage discharges - final/treated effluent - not water company; Permit reference: EPRHB3398VC; Effective date: 14/12/2017; End date: Not recorded, assumed active; Receiving water: ditch tributary of Ladermere Creek.
	90m north of onshore cable route	Address: Site of The Wolves Hall Cottages, Wolves Hall Lane, Tendring, Essex, CO16 0DG; Effluent type: sewage discharges - final/treated effluent - not water company; Permit reference: PRENF11615; Effective date: 16/04/1999; End date: Not recorded, assumed active; Receiving water: tributary of Holland Brook.
	100m north of onshore cable route	Address: 1 and 2 Abbotts Hall Cottages, Harwich Road, Horsley Cross, Manningtree, Essex, CO11 2PH; Effluent type: sewage discharges - final/treated effluent - not water company; Permit reference: EPRLB3599NN; Effective date: 15/10/2013; End date: Not recorded, assumed active; Receiving water: surface water (name not recorded).
	140m south west of onshore cable route	Address: 7 Parsonage Lane, Tendring, Clacton-on-Sea, Essex, CO16 0DE; Effluent type: sewage discharges - final/treated effluent - not water company; Permit reference: PRENF20831; Effective date: 07/08/2007;

Feature – off site	Distance	Details
		End date: Not recorded, assumed active; Receiving water: tributary ditch of Holland Brook.
	140m south west of onshore cable route	Address: 5 Parsonage Lane, Tendring, Clacton-on-Sea, Essex, CO16 0DE; Effluent type: sewage discharges - final/treated effluent - not water company; Permit reference: EPRNB3090NC; Effective date: 09/09/2013; End date: Not recorded, assumed active; Receiving water: Holland Brook.
	180m east of onshore cable route	Address: Chatsworth Farm, 19 Thorpe Road, Kirby Cross, Frinton-on-Sea, Essex, CO13 0NJ; Effluent type: sewage discharges - final/treated effluent - not water company; Permit reference: EPRJB3095WL; Effective date: 17/04/2018; End date: Not recorded, assumed active; Receiving water: tributary of the Holland Brook.
	250m south west of onshore cable route	Address: Tendring Green Water Recycling Cent, Chapel Lane, Tendring, Clacton-on-Sea, Essex, CO16 0DH; Effluent type: sewage discharges - final/treated effluent - not water company; Permit reference: AW2NFE04083; Effective date: 20/01/2016; Effective date: 09/09/2013; End date: Not recorded, assumed active; Receiving water: tributary of Holland Brook.

1.8.4.4 Pollution incidents and inventories

46. The presence (or absence) of pollution incidents at or within 250m of the onshore project area has been summarised in Table 42 below with further detail in Table 43.

Table 42 Summary of incidents and inventories

Feature	Landfall	Onshore cable route	Onshore substation	Offsite (within 250m)
Pollution Incidents	No	No	No	Yes
Pollutant inventory substances	No	No	No	Yes
Pollutant inventory waste transfers	No	No	No	No

Table 43 Details of offsite incidents and inventories

Feature – off site	Distance	Details
Pollution Incidents	Adjacent to onshore cable route – west of B1035	Category 4 (no impact) to land, water or air; Date: 05/07/2001; Pollutant: Unidentified oil; Incident ID: 13962.
	20m east of onshore cable route – located on Wolves Hall Lane	Category 3 (minor) to land; Date: 12/02/2003; Pollutant: Biodegradable material or waste; Incident ID: 136607.
Pollutant inventory substances	80m west of onshore cable route	Operator name: Wix Farms Poultry Ltd; Activity description: Intensive poultry farming >40,000 poultry; Permit ID: GP3502BS; Location: Wix Farms Poultry, Kellys Farm Clacton Road Horsley Cross Essex, CO11 2NZ.

1.8.5 Radon gas

47. The presence of radon gas is assessed in the UK according to the number of homes likely to be above the Action Level (200 Becquerel per cubic metre (Bq m^3)). Under Building Regulations, the requirement for protection measures (as described in Building Research Establishment (BRE), 2001) in the construction of new buildings, conversions or extension is dependent on Radon Potential.

48. BGS data indicate that the onshore project area is located within a lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level), therefore no protective measures are necessary in the construction of new buildings.

1.9 Preliminary conceptual site model and qualitative risk assessment

49. Land contamination is assessed through the identification of Potential Contaminative Linkages (PCLs) The assessment involves the development of a CSM which describes the relationship between on and offsite potential sources of contamination (and contaminants), potential receptors to such contamination and anticipated pathways between the two. Where all three (source-pathway-receptor linkage) are present, they are described as a PCL which can be subject to the risk assessment process.

50. The following discusses the potential sources, pathways and receptors present.

1.9.1 Potential sources, receptors and pathways

51. The potential sources of contamination and contaminants of concern are summarised below in Table 44 and Table 45.

52. Potential receptors and pathways are outlined in Table 46.

Table 44 Potential onsite sources

Potential source	Associated contaminants	Landfall	Onshore cable route	Onshore substation
Agricultural land / practices for fertilisers, pesticides and herbicides.	Herbicides, pesticides and fertilisers, in addition it is not uncommon for discarded material to be buried on farmland which could potentially contain a range of contaminants including asbestos.	✓	✓	✓
Potentially infilled pits and ponds.	Localised Made Ground may be present in areas associated with the backfilling of former pits and/or ponds should this have been undertaken within the onshore project area. Potential contaminants include, but are not limited to, asbestos, metals and metalloids, polycyclic aromatic hydrocarbons (PAHs), fuel and oil hydrocarbons, Volatile and Semi-Volatile Organic Compounds (VOCs and SVOCs)), inorganic and organic contaminants, herbicides, polychlorinated biphenyls (PCBs) and ground gas	✓	✓	X
Made Ground (including potentially demolished infrastructure and cuttings).	Asbestos containing materials and associated fibres are commonly identified in Made Ground deposits, particularly localised to where building demolition has occurred, and material has been buried/used. Other contaminants of concern that may be present are dependent on the nature of the Made Ground materials present within the onshore project area.	✓	✓	✓
Railway land.	Railway land is a potential source of contamination and Made Ground. Contaminants associated with railway land includes herbicides, metals and metalloids, fuel and oil hydrocarbons, PAHs, PCBs, glycols and sulphates. Asbestos can also be associated with the materials used within the track bedding material, fill used in the formation of embankments and within the trains themselves.	X	✓	X
Tanks.	The contents of the tank are not recorded, therefore a range of potential contaminants of concern may be associated with this area. These may include, but are not limited to, fuel and oil hydrocarbons, PAHs, VOCs and SVOCs. Vapour risks may also be present.	✓	X	X
Unspecified heap.	The contaminants of concern are dependent on the materials deposited within the heap. Potential contaminants include, but are not limited to, asbestos, metals and metalloids, PAHs, fuel and oil hydrocarbons, VOCs and SVOCs, inorganic and organic contaminants, PCBs, polyfluoroalkyl substances (PFAS), landfill leachate and ground gas.	✓	X	X

Table 45 Potential offsite sources

Potential source	Associated contaminants
Agricultural land and historical practices.	Herbicides, pesticides and fertilisers, in addition it is not uncommon for discarded material to be buried on farmland which could potentially contain a range of contaminants.
Potentially infilled pits/ponds.	Asbestos, metals and metalloids, PAHs, fuel and oil hydrocarbons, VOCs and SVOCs, inorganic and organic contaminants, PCBs vapours and ground gas.
Made Ground.	
Landfill/unspecified heap.	Potential contaminants include, but are not limited to, asbestos, metals and metalloids, PAHs, fuel and oil hydrocarbons, VOCs and SVOCs, inorganic and organic contaminants, PCBs, PFAS, landfill leachate and ground gas.
Railway land.	Contaminants associated with railway land includes herbicides, metals and metalloids, fuel and oil hydrocarbons, PAHs, PCBs, glycols and sulphates. Asbestos can also be associated with the materials used within the track bedding material, fill used in the formation of embankments and within the trains themselves.
Smithy.	Metals and metalloids, cyanides, sulphates, phosphates, PAHs, fuel and oil hydrocarbons, solvents, and asbestos. There is the potential for vapours to be generated within the area of the former smithy which have the potential to migrate into the onshore project area.
Electricity substation.	Asbestos, metals and metalloids, PAHs, fuel and oil hydrocarbons and PCBs.
Tanks.	A number of unspecified tanks have been recorded within 250m of the onshore project area, therefore a range of potential contaminants of concern may be associated with these areas. These may include, but are not limited to, fuel and oil hydrocarbons, PAHs, VOCs and SVOCs. Vapour risks may also be present.

Table 46 Potential receptors and pathways

Receptors	Pathways	Landfall	Onshore cable route	Onshore substation
Human health				
Future site users not involved with the Project (e.g. farmers) during construction and operation	Direct exposure through ingestion or inhalation of soils/dusts and asbestos fibres.	✓	✓	✓
Neighbouring site users (commercial and residential) during construction	Inhalation of ground gas and volatile contaminants.	✓	✓	✓
Construction / Maintenance Workers	Direct exposure through dermal contact, ingestion or inhalation of soils and dusts during ground-breaking activities. Inhalation of asbestos containing soils and dusts.	✓	✓	✓

Receptors	Pathways	Landfall	Onshore cable route	Onshore substation
	Inhalation of ground gas and volatile contaminants.			
Controlled waters				
Alluvium – Secondary A Aquifer	Leaching, dissolution and migration of contaminants from existing unsaturated soils. Vertical migration through the creation of preferential pathways.	✓	✓	X
Kesgrave Catchment Subgroup – Secondary A Aquifer		X	✓	✓
Cover Sand – Secondary B Aquifer		X	✓	✓
SPZ 3		X	✓	✓
Surface waters	Lateral migration and discharge of groundwater and surface water runoff.	✓	✓	✓
Buildings and utilities				
Future buildings/utilities	Direct contact with building foundations. Diffusion into services.			
	Explosion due to ground gas accumulation.			
Other				
Environmentally Sensitive areas – Holland Haven Marshes SSSI and Holland Haven LNR.	Migration of dissolved contaminants in groundwater and discharge to surface water.	✓	X	X

1.9.2 Preliminary conceptual site model and qualitative risk assessment

53. The CSM and PRA are presented in Table 47. Definitions of probability and consequence have been based on guidance in Construction Industry Research Information Association (CIRIA) 552 and are summarised in Annex 3.

54. A combination of probability and consequences produces a risk level based on the risk evaluation and likely action required. The land contamination risk, which is a function of the probability and the consequence, can be defined using the risk matrix. The limitations associated with the assessment are provided in Annex 3.

Table 47 Preliminary conceptual site model

Source	Pathway	Receptor	Associated hazard	Potential consequence of contaminant linkage	Likelihood of contaminant linkage	Risk classification	Justification
Onsite sources as discussed in Table 44	Dermal contact, ingestion and inhalation of soils, dust and asbestos fibres. Inhalation of volatile contaminants.	Future site users not involved with the Project (e.g. farmers) during construction and operation.	Human health	Medium	Low likelihood	Moderate to low	The onshore project area is located within an area comprising predominantly of agricultural or undeveloped land. This represents the potential for contaminants associated with the usage of herbicides and pesticides to be present. Regulations associated with the chemical composition of herbicides and pesticides have evolved over time reducing their impacts to both the environment and human health. It is anticipated that the contaminants associated with past and current usage of herbicides may have diluted over time and are considered unlikely to pose an unacceptable risk to human health. In localised areas where potential contamination has been identified there is the potential for buried contaminants to be disturbed and brought to the surface during the construction and operational phases. These activities have the potential to pose a risk to neighbouring site users during the construction phase and to future site users during the operational phase. The potential risks to neighbouring and future site users could be reduced to low through the implementation of appropriate mitigation measures. These measures may include, but are not limited to, targeted ground investigations in areas of potential concern, this would confirm the presence (or absence) of contamination. Should contamination be confirmed, appropriate mitigation measures would be implemented to either reduce or break the contaminant linkage.
		Neighbouring site users (commercial and residential) during construction.		Medium	Low likelihood	Moderate to low	
		Construction / Maintenance Workers		Medium	Low likelihood	Moderate to low	Without the implementation of appropriate mitigation measures, there is the potential for construction and maintenance workers to encounter buried contaminants within the localised areas of concern. Where it is not possible to avoid a potential area of contamination, risks to construction and maintenance workers could be reduced to low with the use of appropriate working methods incorporated into a Code of Construction Practice (CoCP) and use of personal protective equipment (PPE). The CoCP would also include measures to be implemented should unforeseen contamination be encountered. Likewise, potential impacts to maintenance workers during the operational phase can be mitigated through the development, and adherence to, task specific method statements and risk assessments. Implementation of the above measures would reduce the likelihood of a contaminant linkage to unlikely.
	Leaching, dissolution and migration of contaminants from existing unsaturated soils.	Groundwater within superficial deposits: Alluvium and Kesgrave Catchment Subgroup - Secondary A Aquifers; and Cover Sands – Secondary B Aquifer.	Controlled waters	Medium	Low likelihood	Moderate to low	The potential sources of contamination identified within the onshore project area have the potential to be disturbed and mobilised as a result of the intrusive nature of the construction phase. Mobilisation of pre-existing contamination has the potential to result in the migration of contaminants into groundwater bearing strata. The potential sources of contamination are in localised areas within the onshore project area and not present throughout. Therefore, potential risks to groundwater associated with the Secondary A and B Aquifers from the disturbance of pre-existing contamination is limited. The creation of preferential pathways could occur during the construction of the onshore cable route, however, any works are likely to be above the water table. If piling is required within the onshore project area then there is the potential for preferential pathways to be created, albeit the potential sources of contamination within these areas are minimal. There are no potable groundwater abstractions recorded within the onshore project area, however, several are recorded within 1km. With the exception of one record, information in relation to which strata the groundwater is abstracted from has not been provided, therefore the potential consequence of a contaminant linkage has been conservatively determined as medium. Should further information become available during the Development Consent Order (DCO) process with regards to which strata the potable abstractions are taken from, the potential consequences of a contaminant linkage may be reduced.
	Vertical migration through the creation of preferential pathways.			Medium	Low likelihood	Moderate to low	

Source	Pathway	Receptor	Associated hazard	Potential consequence of contaminant linkage	Likelihood of contaminant linkage	Risk classification	Justification
	Leaching, dissolution and migration of contaminants from existing unsaturated soils.	Groundwater within SPZ 3		Medium	Low likelihood	Moderate to low	The area of the onshore cable route to the north of Tendring Green up to and including the onshore substation is located within an SPZ 3. This zone is not considered to be at risk from the general cable construction works as excavations would generally be shallow in nature. Where trenchless crossing techniques (e.g. Horizontal Directional Drilling (HDD)) or piling are to be undertaken these could present a risk to the SPZ. There is the risk of creating preferential pathways albeit the sources of contamination are limited within the onshore project area.
	Vertical migration through the creation of preferential pathways.			Medium	Low likelihood	Moderate to low	
	Lateral migration and discharge of groundwater and surface water runoff.	Surface waters and Environmentally Sensitive Areas.		Medium	Low likelihood	Moderate to low	Contaminants present in soils have the potential to be disturbed as a result of construction and maintenance works. There is the potential for these contaminants to be mobilised as a result of disturbance and leach into surrounding surface water bodies. Mobilisation of contaminated groundwater also has the potential impact surface water bodies via direct discharge into the feature. Ecological receptors within and adjacent to landfall may be impacted both directly and indirectly by the Project. The sensitive sites are designated due to the unique habitats and species that are supported. Migration of contaminated groundwater into these areas may impact the functionality of the site and render it unsuitable for the species that inhabit it. The specific nature of the species associated with the designations determines how plausible the potential contaminant linkage is. Targeted pre-construction ground investigations would allow for the appropriate management of the risks posed to surface water bodies as a result of the construction and operation of the Project.
	Migration of dissolved contaminants in groundwater and discharge to surface water.			Medium	Low likelihood	Moderate to low	
	Direct contact and diffusion through drinking water pipes.	Future buildings/utilities	Building and foundation corrosion and impact to potable water supply pipes	Mild	Unlikely	Low	Potential contamination within the onshore substation has the potential to impact on the integrity of concrete foundations through creating aggressive ground conditions. However, limited potential sources of contamination have been identified at the location of the onshore substation where foundations are likely to be built hence the unlikely contaminant linkage. Potential organic contaminants could permeate potable water supply pipes and have a detrimental impact on human health. However, it is considered that there is not likely to be potable water supply pipes at the proposed substation location.
	Gas and vapour migration and accumulation in buildings.	Future onsite users working within confined spaces (assumed to be buildings associated with the onshore substation only).	Health risk (methane, carbon dioxide and volatiles)	Severe	Unlikely	Moderate to low	There is the potential for ground gas and vapours to be produced from materials used in localised areas associated with potential infilled pits/ponds and landfills. However, these features have not been identified within the onshore substation. In the absence of a viable source, the contaminant pollutant linkage does not exist.
			Explosion (methane)	Severe	Unlikely	Moderate to low	
		Construction/ground workers. Maintenance workers during the operational phase	Health risk (methane, carbon dioxide and volatiles)	Severe	Low likelihood	Moderate	Without mitigation, there is the potential for construction and maintenance workers to be exposed to potential sources of ground gas (e.g. in areas where potentially infilled land within the onshore cable route) whilst working within confined spaces (e.g. whilst working within cable joint bays). Exposure to potential sources of ground gas may result in acute or chronic effects to the construction and maintenance workers. To mitigate the risks to construction workers during excavation activities (particularly if entry into confined spaces is required) the use of appropriate working methods incorporated into the CoCP and use of PPE would reduce the potential risk to low. The potential risks to maintenance workers could also be reduced to low through the use of appropriate working methods and PPE.
			Explosion (methane).	Severe	Low likelihood	Moderate	

Source	Pathway	Receptor	Associated hazard	Potential consequence of contaminant linkage	Likelihood of contaminant linkage	Risk classification	Justification
		Future buildings/utilities	Explosion (methane).	Severe	Unlikely	Moderate to low	There is the potential for ground gas and vapours to be produced from materials used in localised areas associated with potential infilled pits/ponds and landfills. However, these features have not been identified within the onshore substation as such in the absence of a viable source, the contaminant pollutant linkage does not exist.
Offsite sources as described in Table 45	Lateral migration of dissolved phase contaminants in groundwater and migration. Leaching and migration from unsaturated contaminated soils.	Groundwater within superficial deposits: Alluvium and Kesgrave Catchment Subgroup - Secondary A Aquifers; and Cover Sands – Secondary B Aquifer.	Controlled waters	Medium	Low likelihood	Moderate to low	Areas of localised potential contamination lie adjacent to the onshore project area (e.g. landfills and potentially infilled pits/ponds). There is the potential for contaminants within soils, leachates and groundwater to migrate into the onshore project area and be encountered, exposed or mobilised during construction works. Where potential offsite sources of contamination have been identified, pre-construction targeted ground investigations would help to establish whether areas of the onshore project area have been impacted by offsite sources.
		Groundwater within SPZ 3		Medium	Low likelihood	Moderate to low	
	Gas and vapour migration	Construction/ground workers.	Health risk (methane, carbon dioxide and volatiles). Explosion (methane).	Severe	Low likelihood	Moderate	There is the potential for ground gas and vapours to migrate into the onshore project area from offsite sources through permeable strata. Without mitigation, construction workers working in confined spaces may be exposed to the migrating ground gas and vapours during excavation works. Maintenance workers could also be exposed to migrating ground gas and vapours should they be required to enter confined spaces (e.g. joint bays along the onshore cable route). The potential risks to construction and maintenance workers could be lowered through the implementation of appropriate working methods and correct usage of PPE.
		Maintenance workers during the operational phase.		Severe	Low likelihood	Moderate	
		Future buildings/utilities	Explosion (methane).	Severe	Unlikely	Moderate to low	Migrating ground gases from offsite sources have the potential to accumulate within the buildings associated with the onshore substation. Without mitigation, there is the potential for accumulated gases to result in destruction of the buildings through an explosion. However, these features have not been identified within 250m of the currently proposed footprint of the onshore substation buildings, In the absence of a viable source, the contaminant pollutant linkage does not exist. Should the location of the proposed onshore substation buildings change, i.e. be located towards the western edge of the onshore project area, a reassessment of the potential risks relating to ground gas may be required due to the presence of potentially infilled land along Hungerdown Lane.

1.10 Conclusions and recommendations

1.10.1 Conclusions

55. The key objectives of the desk study and PRA were to provide information on the current condition of the onshore project area with respect to contamination, characterise the environmental setting and identify potential land quality risks and constraints associated with the Project.

1.10.2 Summary of human health risk assessment

56. Based on the findings of the PRA, the risk posed to future and neighbouring site users from the isolated potential sources of contamination is considered to be Moderate to low. Potential risks to future onsite users in relation to ground gas and vapours from onsite sources of contamination is considered Moderate to low. Potential risks to construction and maintenance workers from both onsite and offsite sources of contamination are considered to be Moderate, inclusive of risks associated with ground gas.

1.10.3 Summary of controlled waters risk assessment

57. Based on the findings of the PRA, the potential risks posed to superficial Secondary A and B Aquifers from localised potential onsite and offsite sources of contamination are considered to be Moderate to low. Potential risks to the SPZ 3 are considered to be Moderate to low in relation to potential onsite and offsite sources of contamination.

58. Potential risks to surface water bodies from potential onsite sources of contamination are considered to be Moderate to low.

1.10.4 Summary of other receptors

59. The risk posed to Environmentally Sensitive Areas from potential onsite sources of contamination are considered to be Moderate to low.

60. The risks posed to future buildings and utilities from potential sources of contamination and ground accumulation are considered to be Moderate to low in relation to potential onsite sources of contamination. Potential risks to future buildings in relation to offsite sources is considered to be Moderate to low.

1.10.5 Other identified risks

61. The risk posed by UXO is considered to be Low, with the exception of the area south of Thorpe Cross which is considered to be Moderate.

1.10.6 Recommendations and next steps

62. Based on the findings of the PRA the following recommendations are made:

- A post consent targeted intrusive ground investigation in potential source areas and generic quantitative risk assessment (GQRA) to help better determine the presence, magnitude and extent of contaminants within the onshore project area and inform discussions on appropriate mitigation

measures to lower the risk to the potential receptors identified within this PRA.

- Continued engagement and consultation with the Regulators (e.g. Local Authority Environmental Health Team) at an early stage (pre intrusive ground investigation) to agree a scope of works and gain agreement to the proposed approach.
- Due to the potential risks of encountering an unexploded bomb within the area between landfall and Thorpe Cross, it is recommended that a detailed UXO survey be conducted in these areas prior to the commencement of any intrusive or construction works.
- Development of a CoCP for use during construction works to protect construction workers, neighbouring site users, groundwater and surface water. The report should be informed by the results of the targeted intrusive ground investigation.
- To protect construction workers, the works should be undertaken in accordance with the requirements of the Health and Safety at Work Act 1974 and the Construction Design and Management (CDM) Regulations 2015.
- Protocols for dealing with unexpected contamination should be set in place prior to construction to ensure that procedures are known and agreed with the Regulators should unexpected, contaminated materials be encountered.
- Should piling be required within the vicinity of a sensitive water environment receptor, such as within an SPZ or within the vicinity of a potable groundwater abstraction (private or public), post consent hydrogeological and piling risk assessments should be undertaken (piling specifically associated with the construction of the onshore substation) to protect the water environment from potential contamination.
- If the onshore cable route or landfall have the potential to directly interact with abstractions for potable or agricultural purposes), a hydrogeological risk assessment should be undertaken to consider the creation of turbidity within the aquifer unit and disturbance of flow pathways to protect the water environment especially during dewatering activities.
- Specific hydrogeological risk assessments are likely to be required at HDD surface water crossings to assess the potential interactions and potential impact to the water environment.
- The movement and reuse of materials within the onshore project area should be undertaken in accordance with the Construction Land: Applications in Real Environment (CL:AIRE) Code of Practice (CL:AIRE 2011) ‘The definition of waste: Development Industry Code of Practice’, where applicable; or an environmental permit that authorises the deposit of excavated material for recovery.
- The management of any waste material offsite must be at a site with an environmental permit and any waste activity must consider the waste

hierarchy; hazardous waste must be managed in accordance with Hazardous Waste Regulations 2005; and any disposal of materials offsite to landfill should be undertaken in accordance with the Landfill Regulations 2002.

1.11 References

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Annex 1 Limitations

Limitations

The direct assessments and judgements given in this report are limited by both the finite data on which they are based and the proposed works to which they are addressed. The acquisition of data is constrained by both physical and economic factors and, by definition, is subject to limitations. Conditions at the site will change over time due to natural variations and may be affected by human activities.

This document has been prepared for the titled project and should not be relied upon or used for any other project. Royal HaskoningDHV accepts no responsibility or liability for the consequences of this document being used for a purpose other than that purpose for which it was commissioned. The assessments and judgements contained herein should not be relied upon as legal opinion.

The findings and opinions are relevant to the dates of the information reviewed and should not be relied upon to represent conditions at later dates. The opinions included herein are based on the information obtained from the assessments undertaken in the study area and from the experience of the reviewers.

This Geo-Environmental Desk Study and Preliminary Risk Assessment has utilised a variety of publicly available data sources such as the Environment Agency, Envirocheck, historical maps and the British Geological Survey. Therefore, the study is limited by the age and limitations inherent in the data described.

Annex 2 UXO Maps

UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 608627,228086

LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
- **Moderate:** Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre.
- **Low:** Areas indicated as having 15 bombs per 1000acre or less.

miltary | **industry** | **UXO find**
transport | **dock** | **Luftwaffe targets**
utilities | **Bombing decoy** | **other**

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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 608794,229582

LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
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miltary | **industry** | **UXO find**
transport | **dock** | **Luftwaffe targets**
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UNEXPLODED BOMB RISK MAP

zeticaUXO

SITE LOCATION

Map Centre: 610637,227622

LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
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miltary	**industry**	**UXO find**
transport	**dock**	**Luftwaffe targets**
utilities	**Bombing decoy**	**other**

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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 610977,229838

LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
- **Moderate:** Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre.
- **Low:** Areas indicated as having 15 bombs per 1000acre or less.

miltary	**industry**	**UXO find**
transport	**dock**	**Luftwaffe targets**
utilities	**Bombing decoy**	**other**

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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 612430,227386

LEGEND

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miltary | **industry** | **UXO find**
transport | **dock** | **Luftwaffe targets**
utilities | **Bombing decoy** | **other**

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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 612748,230268

LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
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miltary | **industry** | **UXO find**
transport | **dock** | **Luftwaffe targets**
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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 613178,228396

LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
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miltary | **industry** | **UXO find**
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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 614049,226448

LEGEND

High: Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.

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miltary | **industry** | **UXO find**

transport | **dock** | **Luftwaffe targets**

utilities | **Bombing decoy** | **other**

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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 615314,225046

LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
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miltary	**industry**	**UXO find**
transport	**dock**	**Luftwaffe targets**
utilities	**Bombing decoy**	**other**

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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 617275,224123

LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
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miltary | **industry** | **UXO find**
transport | **dock** | **Luftwaffe targets**
utilities | **Bombing decoy** | **other**

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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 618336,223086

LEGEND

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miltary | **industry** | **UXO find**
transport | **dock** | **Luftwaffe targets**
utilities | **Bombing decoy** | **other**

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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 619685,222183

LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
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miltary | **industry** | **UXO find**
transport | **dock** | **Luftwaffe targets**
utilities | **Bombing decoy** | **other**

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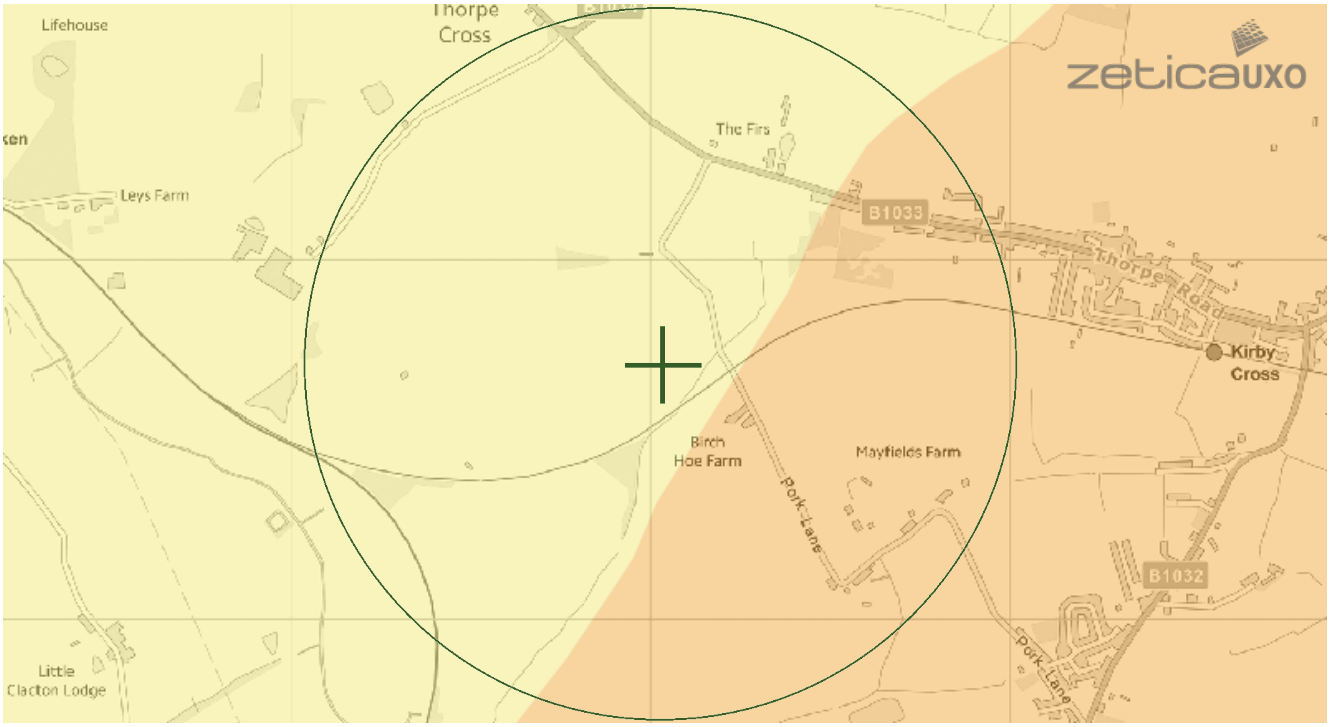
UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 620040,220712



LEGEND

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miltary	**industry**	**UXO find**
transport	**dock**	**Luftwaffe targets**
utilities	**Bombing decoy**	**other**

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UNEXPLODED BOMB RISK MAP

zeticauxo

SITE LOCATION

Map Centre: 620613,219428

LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
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miltary	**industry**	**UXO find**
transport	**dock**	**Luftwaffe targets**
utilities	**Bombing decoy**	**other**

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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 621053,219345

LEGEND

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miltary	**industry**	**UXO find**
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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 621860,217781

LEGEND

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miltary | **industry** | **UXO find**
transport | **dock** | **Luftwaffe targets**
utilities | **Bombing decoy** | **other**

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Annex 3 Risk Assessment Methodology

Qualitative Methodology

The risk assessment considers the sources and potential receptors identified, together with linking pathways. These linkages are summarised in the Preliminary Conceptual Site Model and Qualitative Risk Assessment within the report, where the associated environmental risk is assessed for a given source and the end-use of the site. This assessment also takes account of specific chemicals of concern or groups of similar chemicals of concern. The column designated as 'Potential Consequence of Source-Pathway – Receptor-Linkage' in the Preliminary Conceptual Site Model and Qualitative Risk Assessment gives an indication of the sensitivity of a given receptor to a particular source/chemical of concern being considered. It is a worst-case classification and is based on full exposure via the particular linkage being examined. The derivation of the classes used to rank this particular aspect is as follows based on CIRIA 552 'Contaminated Land Risk Assessment, A Guide to Good Practice' 2001:

Classification	Human Health	Controlled Water	Ecological	Built Environment
Severe	Acute risk to human health likely to result in 'significant harm' as defined by the Environmental Protection Act 1990, Part 2A	Substantial pollution of sensitive water resources	Significant change to the number of one or more species or ecosystems	Catastrophic damage to buildings, structures or the environment
Medium	Chronic damage to human health ('significant harm').	Pollution of sensitive water resources	Change to population densities of non-sensitive species	Damage to sensitive buildings, structures or the environment
Mild	Harm but not necessarily significant harm to humans	Pollution to non-sensitive water resources	Some change to population densities but with no negative effects on the function of the ecosystem	Easily repairable effects of damage to buildings or structures
Minor	Harm but not necessarily significant harm to humans which can easily be prevented with the use of PPE.	Slight pollution to non-sensitive water resources	No significant changes to population densities in the environment or in any ecosystem	Very slight non-structural damage or cosmetic harm to buildings or structures

Subsequently, in the column designated 'Likelihood of PCL, an assessment is made of the probability of the selected source and receptor being linked by the identified pathway. This assessment is ranked based on-site specific conditions as follows:

Classification of probability	Definition
High likelihood	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 likelihood	There is a pollution linkage and circumstances are possible under which an even could occur. However, it is by no means certain that even over a longer period such 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 in the very long term.

The 'Risk Classification' column is an overall assessment of the actual risk, which considers the likely consequence of a given risk being realised and the likelihood of that risk being realised. The risk classifications are assigned using the following consequence/likelihood matrix:

Matrix				
Severe	Moderate to low	Moderate	High	Very high
Medium	Low	Moderate to low	Moderate	High
Mild	Very low	Low	Moderate to low	Moderate
Minor	Very low	Very low	Low	Moderate to low
Likelihood	**Unlikely**	**Low likelihood**	**Likely**	**High likelihood**

Overall risks are described as follows:

Classification of likelihood	Definition
Very low	The presence of the identified source does not give rise to the potential to cause unacceptable harm.
Low	It is possible that harm could arise to a designated receptor from an identified source, however, this is unlikely to be unacceptable.
Moderate to low	It is possible that harm could arise to a designated receptor from an identified source, but it is likely that such harm would be relatively localised or non-permanent - remedial action may be necessary.
High	A designated receptor is likely to experience unacceptable harm from an identified source without remedial action.
Very high	There is a high probability that severe unacceptable harm could arise to a designated receptor from an identified source without appropriate remedial action.

In cases of physical features, such as foundations and underground services, harm is defined as impact which would result in non-serviceability of the identified receptor or extra over build costs associated with redevelopment.

NORTH FALLS

Offshore Wind Farm

sse Renewables | RWE

HARNESSING THE POWER OF NORTH SEA WIND

North Falls Offshore Wind Farm Limited

A joint venture company owned equally by SSE Renewables and RWE.

To contact please email contact@northfallsoffshore.com