FIVE ESTUARIES
OFFSHORE WIND FARM

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VOLUME 9, REPORT 5 : MINERALS SAFEGUARDING ASSESSMENT

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Volume 9, Report 5 Mineral Resource Assessment

Five Estuaries Offshore Wind Farm

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Basis of Report

This document has been prepared by SLR Consulting Limited (SLR) with reasonable skill, care and diligence, and taking account of the timescales and resources devoted to it by agreement with Five Estuaries Offshore Wind Farm Ltd (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

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Acronyms and Abbreviations

BGS	British Geological Survey
DCO	Development Consent Order
EACN	East Anglia Connection Node
ECC	Export Cable Corridor
ES	Environmental Statement
IMAU	Industrial Mineral Assessment Unit
MAR	Mineral Assessment Report
MLP	Mineral Local Plan
MRA	Mineral Resource Assessment
MSA	Mineral Safeguarding Area
NF	North Falls Offshore Wind Farm
NSIP	Nationally Significant Infrastructure Project
OnSS	Onshore Substation
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PRoW	Public Right of Way
TCC	Temporary Construction Compound
TDC	Tendring District Council
VE	Five Estuaries Offshore Wind Farm

1.0 Introduction

1.1 General

SLR Consulting Ltd (SLR) have been instructed by Five Estuaries Offshore Wind Farm Limited (The Applicant) to undertake a desk based Mineral Resource Assessment (MRA) for the proposed onshore Export Cable Corridor (ECC) areas between landfall and the onshore substation location (OnSS). The MRA considers the potential mineral sterilisation from the Applicant's proposed development. It should be noted that the Order limits onshore fully overlap with the North Falls Offshore Windfarm (NF). The Onshore Order Limits location is shown on Drawing 01.

The Essex County Council Minerals Local Plan (MLP, 2014) defines Mineral Safeguarding Areas (MSAs) within the county. Within the area in which VE is situated, several areas of land are defined as being safeguarded for 'Sand and Gravel (including Silica Sand)'. These areas are shown on the Essex County Council Mineral Policies Map[1]. The VE project overlies three main areas of safeguarded minerals.

The main purpose of MSAs as explained in the MLP is to define "*known locations of specific minerals",* so that these areas *'"are not needlessly sterilised by other forms of development whilst acknowledging that this does not create a presumption that the resources defined will ever be worked*."

Policy S8 of the MLP states that the Mineral Planning Authority shall be consulted on *"All planning applications for development on a site located within an MSA that is 5ha or more for sand and gravel..."*[2]*.* A MRA is therefore required under the MLP Policy S8, to determine the existence or otherwise of a mineral resource within the boundary of VE.

1.2 Project Description

VE is a Nationally Significant Infrastructure Project (NSIP) and a proposed extension to the operational Galloper Offshore Wind Farm (OWF).

The onshore elements of VE are located entirely within the administrative boundary of Essex County Council and Tendring District Council (TDC) in south-east England.

The ECC configuration will include ducts for up to four cable circuits connecting the offshore substation to the proposed OnSS and into the proposed National Grid East Anglia Connection Node Substation (EACN). The exact location for this is still being considered by NGET at this stage and is subject to a separate consent process.

The onshore ECC and OnSS have been designed in co-ordination with the adjacent NF project, and the onshore cable routes of the two projects will run within the same corridor. Moreover, the substations have been co-located in the same location to the west of Little Bromley. This approach allows for opportunities to minimise environmental and community disruption through co-ordinated delivery.

Detailed information on the route of the Onshore ECC and associated infrastructure are given in the Environmental Statement (ES) Volume 6, Part 3, Chapter 1 Onshore Project Description.

[1] Essex County Council, Minerals and Waste Planning Policy - Minerals Policy Map (2014). Available at: https://www.essex.gov.uk/minerals-waste-planning-policy/minerals-local-plan [accessed 23 November 2023]

[2] Essex County Council, Essex Minerals Local Plan, Adopted July 2014. Available at: https://www.essex.gov.uk/minerals-waste-planning-policy/minerals-local-plan [accessed 23 November 2023]

1.3 Methodology

Guidance on the production of Mineral Resource Assessments in cases of land located within Mineral Safeguarding Areas is provided by the British Geological Survey (BGS)[3] and within the Scoping Opinion for Five Estuaries Offshore Windfarm, Appendix 1 (2021) consultation response from Essex County Council.

The Essex MLP Policy S8 states that non-mineral proposals that exceed the defined thresholds *"shall be supported by a minerals resource assessment to establish the existence or otherwise of a mineral resource of economic importance. If, in the opinion of the Local Planning Authority, surface development should be permitted, consideration shall be given to the prior extraction of existing minerals."*

In the production of this desk-based assessment, a range of geological, environmental and statutory mapping data sources have been reviewed using a Geographical Information System (GIS) to build a conceptual geological model of the safeguarded minerals. This information has been used to determine the presence or absence and extent of any potential deposit and any parts of the deposit already sterilised by existing development and environmental designations and restrictions. If present, the viability and practicality of prior extraction of the mineral will be assessed and if necessary further recommendation for investigation will be set out. This report accompanies the DCO application for the VE project.

1.3.1 Data Sources

In the production of this Mineral Resource Assessment, it was necessary to consider all available relevant environmental and geological data for the site. Sources can include information on the quarrying history, mineral assessments and market appraisals, boreholes, site investigations, geological memoirs, and the thickness of superficial deposits. No extensive site-specific ground investigation data has been made available at this stage.

In the case of this assessment, the following data have been used to complete the desk study:

- British Geological Survey (BGS) accessed through the BGS Onshore Geoindex:
  - Borehole records;
  - 1:50 000 scale digital geological mapping
  - Mineral Assessment Reports (IMAU series)
  - Minerals Maps
- Ground Investigations
  - Socotec – Five Estuaries and North Falls Onshore Substation Trial Pits – GI Report D3026-23 (July 2023)
  - Five Estuaries Offshore Eind Farm Onshore Substation Area – Palaeolithic Geoarchaeological Evaluation Phase 2, ref. 286890.01, Wessex Archaeology December 2023
- Natural England (NE):
  - Special Protection Areas;
  - Special Areas of Conservation;

[3] McEvoy, F M, Cowley, J, Hobden, K, Bee, E and Hannis, S. A Guide to mineral safeguarding in England. British Geological Survey Open Report, OR/07/035.

  - RAMSAR, and proposed RAMSAR;
  - Sites of Special Scientific Interest (SSSI);
  - Local Geological Sites (LGS);
  - Ancient Woodland.
- Historic England (HE):
  - Listed Buildings;
  - Scheduled Monuments.
- Environment Agency (EA):
  - LIDAR topography;
  - Historic landfill records.
- Google Earth:
  - Historical aerial photography.
- Essex County Council (ECC):
  - Essex County Council Minerals Local Plan (2014) and Mineral Policy Map.

2.0 Planning Context – Safeguarding of Minerals

2.1 National Policy Statement

The Overarching National Policy Statement for Energy (EN-1)[4] states that:

> *"Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after and future decommissioning has taken place."* (EN-1, para 5.11.19)

and:

> *"Where a proposed development has an impact on an MSA, the Secretary of State should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources."* (EN-1, para 5.11.28)

2.2 National Planning Policy Framework

The NPPF (2023) sets out the Government's planning policies for England and how these are expected to be applied. The presumption in favour of sustainable development sits at the heart of the NPPF, and this requires that local planning authorities should positively seek opportunities to meet the development needs of their area, and that local plans should meet objectively assessed needs, with sufficient flexibility to adapt to rapid change. The NPPF also states that development proposals that accord with an up-to-date development plan should be approved without delay (paragraph 11c)[5].

Section 17 of the NPPF sets out the requirements for planning policy to facilitate the sustainable use of minerals, including the requirement to safeguard minerals from sterilisation by non-mineral development (paragraph 210c)[6].

The NPPF recognises that minerals are essential to support sustainable economic growth and mineral planning authorities must ensure that there is an adequate supply of minerals to provide the infrastructure, buildings, energy and goods the country requires. In addition to an adequate supply, it is important to note that minerals are a finite source and can only be worked where they are found, and measures must be put in place to secure their long-term conservation. Planning policies do this in two ways; landbanks and mineral safeguarding.

A 'landbank' is a stock of permitted or allocated minerals sites to be worked in the future. The landbank for sand and gravel is determined to be at least 7 years, and at least 10 years for rock. 'Safeguarding' is the process used in the planning system to ensure the protection of mineral resources from the risk of sterilisation from non-mineral development. Essex County Council have used a number of criteria to identify to develop MSAs that have highlight areas of geology that could constitute an economically viable resource.

2.3 Essex Minerals Local Plan, Adopted 2014

At the heart of the NPPF is a presumption in favour of sustainable development. The NPPF requires that policies in local plans should follow the approach of the presumption in favour of sustainable development. The MLP is therefore based on the principle of sustainable development and this is reflected in the Spatial Vision and the Strategic Objectives, and the

[4] UK Government (2023). National Policy Statements for Energy Infrastructure. Available at https://www.gov.uk/government/collections/national-policy-statements-for-energy-infrastructure [Accessed 29/11/2023]

[5] UK Government (2023). National Planning Policy Framework. Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 [Accessed 23/11/2023]

[6] ibid

policies that seek sustainable solutions. The strategic objectives set out in the MLP are underpinned by an ambition to manage mineral extraction and supply according to the principles of sustainable development and as far as mineral extraction is concerned.

A review into the current MLP to ensure it meets the Test for Soundness of new plans (NPPF, Paragraph 35) is ongoing. The decision has been made by Essex County Council as part of this exercise to extend the Plan period from its current end date of 2029 to 2040. As part of this review a Call for Sites exercise for mineral extraction and mineral infrastructure has taken place. This Call for Sites closed on 9th November 2022, no further information is available at this stage.

The MLP provides for sand and gravel for the plan period, as of 31 December 2011 the landbank for sand and gravel sat at 8.3 years. The plan was prepared to provide the sub-national apportionment of 4.45 million tonnes per annum (Mtpa) from Greater Essex (4.31Mtpa from Essex and 0.14Mtpa from Thurrock) over the plan period. The landbank was expected to be maintained or increased by planning permission secured on Preferred Sites identified within the MLP.

The Greater Essex Local Aggregates Assessment (LAA) covering the calendar year of 2021 states that the ten-year and three-year average sales figures assessed within the LAA indicate that there have been no years where the actual sales have exceeded the county apportionment. The landbank for permitted sand and gravel reserves in Greater Essex increased to 7.61 years at the end of 2021, this equated to permitted reserves of 33.86Mt[7]. At the time of the LAA preparation (January 2023) there were further pending permissions which if granted would further increase the landbank by 10.57 Mt. The majority of the sand and gravel produced in Essex (about 78%) is used within the County itself. Despite this Approximately 9% of the total amount of land-won sand and gravel consumed in Greater Essex is imported.

At the time of the LAA preparation there were six active sand and gravel quarries within the Tendring District, these were located along the east bank of the River Colne, Elmstead Market and Ardleigh. Across Greater Essex there were 24 active sites in total. Silica sand is produced at a single site within Greater Essex which is located at Martells Quarry in Ardleigh, this site also works sand and gravel.

2.3.1 Policy S8: Safeguarding Mineral Resources and Mineral Reserves

Land within the DCO Limits is not allocated as a Preferred or Reserve site in the adopted Essex MLP but it is located within a Minerals Safeguarding Areas (MSA). The Essex County Council Minerals Local Plan (MLP, 2014) defines MSAs within the county. Within the Tendring district area in which VE is situated, several areas of land are defined as being safeguarded for ‘Sand and Gravel (Including Silica Sand)’. These areas are shown on the Essex County Council Mineral Policies Map[8].

The main purpose of MSAs as explained in the MLP is to define *“known locations of specific minerals are not needlessly sterilised by other forms of development whilst acknowledging that this does not create a presumption that the resources defined will ever be worked.”*

Within the MLP the safeguarded sand and gravel (Including Silica Sand) is given a geographic definition, this mineral type is defined as “*All glacial sand and gravel resources,*

[7] Greater Essex Local Aggregates Assessment (2023). Available at: https://www.essex.gov.uk/planning-land-and-recycling/planning-and-development/minerals-and-waste-planning-policy/minerals-1 [Accessed 25 November 2023]

[8] Essex County Council, Minerals and Waste Planning Policy - Minerals Policy Map (2014). Available at: https://www.essex.gov.uk/minerals-waste-planning-policy/minerals-local-plan [accessed 23 November 2023]

glaciofluvial sand and gravel resources and river terrace deposits as identified from BGS mapping and other supplementary sources of evidence."

Therefore, consideration must be given under Policy S8 of the MLP as to whether the mineral could be subject to prior extraction, and economic and environmental viability of extraction.

Policy S8 of the MLP states that for Mineral Safeguarding Areas:

> *"Mineral Safeguarding Areas are designated for mineral deposits of sand and gravel, silica sand, chalk, brickearth and brick clay considered to be of national and local importance, as defined on the Policies Map.*
>
> *The Mineral Planning Authority shall be consulted on:*
>
> *a) all planning applications for development on a site located within an MSA that is 5ha or more for sand and gravel, 3ha or more for chalk and greater than 1 dwelling for brickearth or brick clay; and*
>
> *b) any land-use policy, proposal or allocation relating to land within an MSA being considered by the Local Planning Authority for possible development as part of preparing a Local Plan (with regard to the above thresholds).*
>
> *Non-mineral proposals that exceed these thresholds shall be supported by a minerals resource assessment to establish the existence or otherwise of a mineral resource of economic importance. If, in the opinion of the Local Planning Authority, surface development should be permitted, consideration shall be given to the prior extraction of existing minerals."*

For Mineral Consultation Areas:

> *"MCAs are designated within and up to an area of 250 metres from each safeguarded permitted minerals development and Preferred and Reserve Site allocation as shown on the Policies Map.*
>
> *The Mineral Planning Authority shall be consulted on:*
>
> *a) Any planning application for development on a site located within an MCA except for the excluded development identified in Appendix 5,*
>
> *b) Any land-use policy, proposal or allocation relating to land within an MCA that is being considered as part of preparing a Local Plan.*
>
> *Proposals which would unnecessarily sterilise mineral resources or conflict with the effective workings of permitted minerals development, Preferred or Reserve Mineral Site allocation shall be opposed."*

Paragraph 3.138 of the MLP states that "*where the sterilisation of a mineral resource is at stake it would be necessary for the development proposal to include a Mineral Resource Assessment to enable the economic importance of the resource to be evaluated".*

As the DCO Limits exceed the thresholds in Policy S8 this Mineral Resource Assessment considers the presence of a potential mineral resource.

Policy S8 does not provide guidance for over what period of time the sterilisation should be considered, nor how temporary land-uses should be assessed when producing a Mineral Resource Assessment. These factors are addressed in the following sections.

3.0 Development Site

3.1 Site Information

The total area of land within the Onshore DCO limits is 412.8 ha. Land use within the Onshore DCO Limits is predominantly arable agricultural, situated between the coastal settlements of Holland-on-Sea, Frinton-on-Sea and Ardleigh.

Detailed information on the route of the Onshore ECC and associated infrastructure are given in Volume 6, Part 3, Chapter 1, Project Description.

Within the DCO limit not all land will be in use and not all land will be disturbed by intrusive works. Several of the project elements such as, but not limited to Temporary Construction Compounds (TCC) and haul roads will not affect the subsurface minerals. In summary, and of relevance to this report, the DCO Limits include land used for access, mitigation and TCC, the Export Cable Corridor (ECC), and Onshore Substation (OnSS).

The project is long lived but temporary in nature, with the potential to sterilise mineral for the life of the Project only (c. 40 years). On decommissioning of the Project it is anticipated that the minerals beneath the project infrastructure would be available for mineral extraction. The duration of land use relating to potential mineral sterilisation can be summarised as follows:

- TCC – Potential sterilisation during construction period only with negligible/minimal disturbance to ground conditions;
- ECC – Potential sterilisation during construction, operational phase and decommissioning of project with negligible/minimal disturbance to ground conditions.
- OnSS – Potential sterilisation during construction, operational phase and decommissioning of project with potential disturbance to ground conditions determined by construction requirements.

The approximate area of the proposed OnSS is 7.2 ha each (i.e. a cumulative area of 14.4 ha for both VE and NF). The remaining 398.4 ha is given to proposed temporary and negligible/minimal disturbance land uses.

3.2 Safeguarded Minerals

The Essex MLP includes the Minerals Policies Map that shows the MSAs and mineral infrastructure for the county. The policies map identifies MSA for ‘sand and gravel’ as pockets and swathes across Tendring District and a Minerals Consultation Area around Great Holland. Drawing 01 identifies the MSA that overly the DCO Limits.

The Onshore ECC has been broken down into several Route Sections in relation to significant local features. The Route Sections are listed in Table 2-1 along with confirmation as to whether or not any land within the section is subject to an MSA. Within the Route Sections there is only partial overlap with an MSA. For the purposes of this report, the specific areas that overlap with MSAs, and therefore require assessment, will be given an area reference, as shown in Table 2-1. The MSA areas are shown on Drawing 02. An area of approximately 178.96 ha is designated as a MSA within the Route Sections 1 to 7.

Table 3-1: Route sections for the Onshore ECC

Route Section	Partial coverage within a Mineral Safeguarding Area?	Area of MSA within the DCO Limits (ha)
1	Yes	25
2	Yes	2
3	No	None
4	Yes	11
5	Yes	12
6	Yes	27
7 (Including OnSS)	Yes	108

4.0 Geology & Minerals

4.1 Regional Geology

The Project is situated within the regional geology of Essex and the London Basin. The local and regional is published within the British Geological Survey (BGS) 1:50,000 scale geological map of the Essex area 'Colchester & Brightlingsea' (Sheet No. 224). The geology of Essex consists of a thick secession of sedimentary rocks deposited during the Palaeogene.

The region occupies the north western limb of a large gently dipping north east to south west trending syncline, whereby the oldest rocks exposed in the region are the Early Jurassic Lias Group, characterised by Mudstones and Limestones in the north west. The succeeding Purbeck & Portland Group, Ancholme Group and Oolite Group occupy a large tract of the region from Swindon to Bedford. The overlying Upper Greensand and Gault Formations are succeeded by the White Chalk Subgroup which is exposed along the Chiltern Hills. These are succeeded by the youngest exposed rocks of the Barnet Group, Bracklesham Group, Thames Group, Lambeth Group and Thanet Group.

Throughout the region, exists patchy but widespread surface ice age and interglacial deposits, laid down between 2Ma to 3Ma (million years ago) during the Quaternary period. They were mostly deposited by rivers and former ice sheets which spanned the region and are most extensive along the River Thames and its tributaries.

Essex County has a wealth of mineral deposits, including sand and gravel, chalk and brickearth. Sand and gravel is worked extensively around the county, from river terrace and sub-alluvial deposits along flood plains, glacial and glaciofluvial sand and gravel deposits along ancestral river channels and shoulder of valleys.

At the time of writing, there are many quarries across the county of Essex. More locally within the Tendring district there are many historical small scale gravel pits, there are also several active, inactive and restored quarries. The main concentration of the modern quarrying sites are located on the flanks of the River Colne roughly between Brightlingsea and Wivenhoe, there are also three active quarries to the northeast of Colchester, in the Ardleigh area.

The nearest active quarry is situated approximately 2.5km west of Section 7. The quarry is currently operated by SRC Group and is extracting superficial sand and gravel.

4.2 Site Specific Geology

The published information available indicates that the bedrock within the Tendring district area comprises of the Thames Valley Group and small isolated outcrops of the Red Crag Formation. The Thames Valley Group is the most extensive deposit and comprises the bedrock across project area. It is described in the BGS Lexicon as "*Mainly silty clays and clays, some sandy or gravelly, with some silts, sands, gravels and calcareous mudstones. The Thames Group was deposited in environments ranging from marine shoreface ranging out to outer marine shelf. Eocene (early and middle Ypresian).*"[9]

In this area the Thames Group primarily consists of the London Clay Formation. The London Clay outcrops in the centre of the syncline between the Chilton Hills to the north and the Chalk Downs to the south. The London Clay is recorded as up to 150m thick in Essex and the BGS Lexicon describes it as comprising *"bioturbated or poorly laminated, blue-grey or*

[9] British Geological Survey, 2022. Thames Valley Group. The BGS Lexicon of Named Rock Units. [Online] Available at: https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=THAM [Accessed 25/11/2022].

grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay."

BGS mapping indicates that superficial deposits differ across the area and are absent across some parts of the route and bedrock is mapped at surface. BGS Borehole records indicate that where present, significant thicknesses of superficial deposits may be present along the Route Sections. Where superficial deposits are mapped, the Project crosses over Storm Beach Deposits and Alluvium where it landfalls. Further inland the Route Sections cross over Cover Sands and glaciogenic sand and gravel deposits.

The glaciofluvial sand and gravel deposits across the county broadly correspond to the Kesgrave Catchment Group. The deposits were laid down during successive cold phases between 1.5 and 0.5 million years ago in braided rivers associated with the proto-River Thames. The deposits form a semi-continuous blanket across the county, between 5 to 15m of clean pale coloured sand and pebbly sand with subordinate gravel. Within this part of Essex, the Kesgrave deposits are largely exposed at surface comprising hilltop remnants and plateaus. Within the Tendring area, the section of the Kesgrave Catchment Group exposed is named the Ardleigh Gravel Member, and is noted as being formed of the Ardleigh Upper Gravel, Ardleigh Interglacial deposits (comprising sand and silt), and the Ardleigh Lower Gravel.

The mapped bedrock and superficial geology within the DCO Limits and surrounding area is shown on Drawing 01 and described in Table 4-1.

Table 4-1: Geological Summary

Age	Formation	Lithology	Average Thickness (m)
Quaternary (Holocene and/or Pleistocene)	Alluvium	Clay, silt, sand and gravel.	N/A Variable
	Cover Sand	Clay, silt and fine- to very fine-grained sand	0-20
	Kesgrave Catchment Group	Sand and gravel deposits deposited by meltwater streams during the ice age. Quartz and quartzite sand and gravel	0-15
Paleogene (Eocene - early and middle Ypresian)	Thames Valley Group – London Clay Formation	Clay, silt, sand, gravel and calcareous mudstone	~45- 150m

4.3 Site Specific Minerals

4.3.1 Section 1

Section 1 intersects the MSA to the west of Great Holland. Within Section 1 there is no available published data on the thickness or quality of the mapped sand and gravel deposits and no site investigation has taken place. As a result, assumptions based on the immediate surrounding area and geological literature have been made to assess the potential viability of any mineral deposit.

There are several published borehole records located within the vicinity of the section, available and accessed on the BGS Onshore GeoIndex. Around 600m to the north the historic gravel workings at Great Holland Pits, west of Pork Lane, a series of boreholes drilled in 1967 around the location of the 'Great Holland Water Tower' recorded around 1-3ft (approximately 0.3-1m) of topsoil. Underlying the topsoil was a unit of sand and gravel ranging in thickness from 7ft to 20ft (approximately 2m to 6m), there is no detailed description of the lithology of the sand and gravel. A unit of 'stiff grey fissured clay' was

recorded at the base of the sand and gravel in each borehole, this is thought to be the Thames Group bedrock. In the boreholes water was recorded as struck at 3ft – 4ft (1-1.3m) below ground level. The mean average thickness of sand and gravel recorded in nearby boreholes is 3.2m.

Although there are no borehole records directly within Section 1, the Great Holland Pits Nature Reserve is located adjacent to Section 1 which is a former sand and gravel pit, that was subsequently partially backfilled. The Essex Mineral Resource Map[10] also indicates that land to the east of the Great Holland Pits was worked out, however this is not recorded on other documentation or historic landfill data. This would suggest that the sand and gravel deposits in this area have historically been considered workable.

4.3.2 Section 2

Within Section 2 searches have returned no published borehole information. Much of Section 2 is dominated by Cover Sand deposits, with the Kesgrave sand and gravel mapped as cropping out on the western boundary of the area.

4.3.3 Section 3

Section 3 does not intersect the MSA.

Superficial deposits are only mapped at the far north of section 3, at the intersection of Swan Road and the B1035. No published geological information is available for this area, which with the locations of the highways, built development and water features, would not be viable for extraction.

4.3.4 Section 4

The central and northern thirds of Section 4 are dominated by Cover Sand deposits. No superficial deposits are mapped in the southern third of Section 4.

Section 4 intersects the MSA at its northern extent, which broadly corresponds to the outcrop of the Kesgrave Catchment Group locally. Local BGS borehole records provide limited reliable information for this area, which sits directly to the south of Section 5. The assumptions derived from boreholes around Section 5 apply to Section 4, however the area of Section 4 sits on the marginal edge of the deposit, and as such there is greater uncertainty on the nature of the geology.

4.3.5 Section 5

Within Section 5 published hand auger data is available through the BGS that appears to be associated with the ground investigation for the A120 for Essex County Council around 1968. The boreholes follow the current route of the A120 however, the hand auger hole were terminated at 6ft (~1.8m). The geological units recorded were around 0.3m of topsoil and 1.5m of brown sand silty clay referred to on the logs as glacial loam. These boreholes correlate with the mapped outcrop of Cover Sand. These boreholes do not prove the bedrock clay, therefore it is unknown what geological horizons lie at depth. A BGS well shaft record adjacent to the A120 indicates that 28 ft (8.5m) of gravel sand and clay and 16 ft (5m) of gravel was proved over of blue clay. There are no further details of the strata and no mineral quality data.

The local, publicly available borehole data suggests that the first ~1.8m of the material underlying Section 5 is unlikely to be a suitable construction material source due to the

[10] Bloodworth, A J and 8 others, 2002. Mineral Resource Information in Support of National, Regional and Local Planning: Essex (comprising Esses, Southend-on-sea, Thurrock, Longon Boroughs of Barking & Dagenham, Havering, Redbridge and Waltham Forest). British Geological Survey Commissioned Report CR/02/127N.

predominance of clay. The one well shaft indicates that at depth it is possible there could be sand and gravel at depth, however once again the presence of clay may indicate this this material is not suitable for processing. In summary, there is not enough information to determine the presence or absence of a mineral deposit within Section 5.

4.3.6 Section 6

Three nearby borehole records indicate 4.0-6.9m of sand and gravel, of unknown quality, underlying 1.1-2.1m topsoil and subsoil. Whilst these results from outside of the Section cannot be relied upon as fully representative of the ground conditions within the boundary, they indicate that sand and gravel is present, but do not confirm the thickness and quality of the materials.

4.3.7 Section 7

The Industrial Mineral Assessment Unit (IMAU) Mineral Assessment Report (MAR) number 14 'The sand and gravel resources of the country east of Colchester, Essex'[11] describes the national resources of sand and gravel of the resource sheet TM 02. The location of Section 7 partly falls within the resource Block C area described within this report. However, within Section 7 there is no available published data on the thickness or quality of the mapped sand and gravel deposits. As a result, assumptions based on the immediate surrounding area and geological literature have been made to assess the potential viability of any mineral deposit.

The IMAU MAR report describes Block C as being underlain by loam, glacial sand and gravel and London Clay. The glacial sand and gravel is mapped in all of the reported boreholes and varies in thickness from 4.3m to 9.8mm, with a mean of 6m. It is noted that there is not a consistent trend in thickness. The loam is considered as overburden within the report and thicknesses vary from 0.8m to 5.2m, with a mean of 2.5m. The report also notes that the upper part of the sand and gravel has been classified as overburden because it has been tested as having an excessive fines content. A review of the published boreholes in the vicinity of the Section 7 boundary confirms the material thicknesses are similar to that reported in the IMAU report (which covers a larger area).

The IMAU MAR boreholes in the vicinity of Section 7 underwent Particle Size Distribution testing which showed that on average that there were 2-5% fines (-63micron), and generally 50/50 sand and gravel.

A geoarchaeology study[12] was undertaken across Section 7. This study included excavation of 30 trial pits and was undertaken to assess the recent geological formations (late Pleistocene and Holocene). The report provides a detailed assessment of the overburden formations and the upper surface of the Ardleigh Gravel deposits. The overburden formations include topsoil, Head-Brickearth, Head-Gravel, and fine-medium sand, with a total varying thickness up to 3.2m. The trial pits did not prove the base of the sand and gravel deposit.

A limited geoenvironmental ground investigation was undertaken in the east of Section 7. This ground investigation is summarised in a report[13] describing the results of trial pitting

[11] Ambrose, J. D. 1975. The sand and gravel resources of the country east of Colchester: Description of 1:25 000 resource sheet TM02. *Miner. Assess, Rep. Inst. Geol. Sci.* No. 14, 96 pp

[12] Five Estuaries Offshore Eind Farm Onshore Substation Area – Palaeolithic Geoarchaeological Evaluation Phase 2, ref. 286890.01, Wessex Archaeology December 2023

[13] Five Estuaries and North Falls Onshore Substation Trial Pits – Ground Investigation Report D3026-23, Socotec, July 2023

which proved overburden thicknesses similar to those described above. The trial pits did not prove the base of the sand and gravel deposit.

SRC Group currently operate several quarries within Essex, three of which are to the northeast of Colchester, west of Area D. The closest site, Martells Quarry lies approximately 2-2.5km to the west of Section 7. Martells Quarry works a resource of sand and gravel and silica sand.

In summary, the local, publicly available borehole data and IMAU report suggests that there may be workable deposits of sand and gravel within Section 7. Further intrusive investigation and sampling of the sand and gravel deposits would be required to confirm the quantity and quality of the materials within Section 7.

5.0 Constraints

5.1.1 Background

In considering the safeguarding of mineral resources, any existing constraints are considered as they may impact the potential viability of minerals that may be present. This section provides a brief summary of the heritage, environmental, water and other land use constraints.

Heritage constraints can include World Heritage Sites, Registered Battlefields, Registered Parks and Gardens and Listed Buildings. In general, presence of such a constraint overlying or in the general vicinity of a potential mineral resource would be a significant constraint on the potential viability of extraction due to the potential harm to the receptor.

Environmental and land use constraints include local and national, statutory and non-statutory designations and other factors that would be considered in relation to identifying mineral resources for extraction. These include, Special Area of Conservation (SAC), Ramsar sites, Special Protection Area (SPA), Special Site of Scientific Interest (SSSI), Local Wildlife Sites (LWS), nature reserves, Local Geological Sites (LGS), Ancient Woodland, historic landfills, infrastructure, and Public Rights of Way (PROW). The impacts of mineral extraction on such constraints would need to be considered on a case by case basis by an appropriate assessment.

Where features exist, including transport infrastructure and residential properties, buffer zones are used in Mineral Assessments to estimate the potential impact on the quantity of mineral resources that may be viable for extraction. These buffer zones are discussed further in Section 6.0.

Hydrogeological and Hydrological constraints include the consideration of the water environment, both in terms of protection of water sources and quality, and protection against flooding. Datasets considered include; Source Protection Zones (SPZ), Drinking Water Protection Zones, Aquifer Properties, Water Courses, and Flood Zone mapping.

The constraints for each section are summarised below.

5.1.2 Section 1

Table 5-1:Section 1 Constraints

Constraint		Summary
Heritage	Designated Sites	none
	Listed Buildings	Grade II Listed buildings within 250m - around Great Holland
Environment & Land Use	Designated Sites	SSSI – Holland Haven Marshes
	Local Sites	Local Nature Reserve - Holland Haven LGS – Great Holland Gravel Pits (also historic landfill)
	Infrastructure & Access	Numerous roads and PROW cross section
	Other	Coastal area golf course
Water	Hydrogeology	Superficial deposits are Secondary A & B (potential to be locally productive) aquifers. Bedrock is unproductive. No SPZ or other designations.
	Hydrology	Coastal area is Flood Zone 2&3.

Constraint		Summary
		Minor water courses in coastal area and north of Great Holland Gravel Pit

5.1.3 Section 2

Table 5-2: Section 2 Constraints

Constraint		Summary
Heritage	Designated Sites	none
	Listed Buildings	Grade II Listed buildings > 250m - around Thorpe le Soken and along Thorpe Road
Environment & Land Use	Designated Sites	none
	Local Sites	none
	Infrastructure & Access	Railway to south of section and Thorpe Road to north. No PROW
	Other	none
Water	Hydrogeology	Superficial deposits are Secondary A & B (potential to be locally productive) aquifers. Bedrock is unproductive. No SPZ or other designations.
	Hydrology	none

5.1.4 Section 3

Table 5-3: Section 3 Constraints

Constraint		Summary
Heritage	Designated Sites	Thorpe Hall - South of Thorpe le Soken (c. 1km away from DCO boundary)
	Listed Buildings	Grade II & II*Listed buildings > 250m - around Thorpe le Soken
Environment & Land Use	Designated Sites	none
	Local Sites	LGS – Beaumont Reg Crag Outlier to north of section.
	Infrastructure & Access	Numerous minor roads and PROW
	Other	none
Water	Hydrogeology	No superficial deposits. Bedrock is unproductive. No SPZ or other designations.
	Hydrology	none

5.1.5 Section 4

Table 5-4: Section 4 Constraints

Constraint		Summary
Heritage	Designated Sites	none
	Listed Buildings	Grade II & II* Listed buildings >250m - around Tendring and Tendring Heath
Environment & Land Use	Designated Sites	none
	Local Sites	none
	Infrastructure & Access	Numerous minor roads and PROW
	Other	
Water	Hydrogeology	Superficial deposits are Secondary A & B (potential to be locally productive) aquifers. Bedrock is unproductive. Within SPZ 3 but unlikely to be relevant to mineral extraction with suitable controls in place
	Hydrology	Tendring Brook flood zone 2&3

5.1.6 Section 5

Table 5-5: Section 5 Constraints

Constraint		Summary
Heritage	Designated Sites	none
	Listed Buildings	Grade II Listed buildings nearby - around Horsley Cross (Hempstall's Farmhouse c. 200m)
Environment & Land Use	Designated Sites	none
	Local Sites	none
	Infrastructure & Access	Numerous minor roads and PROW
	Other	
Water	Hydrogeology	Superficial deposits are Secondary A & B (potential to be locally productive) aquifers. Bedrock is unproductive. Within SPZ 3 but unlikely to be relevant to mineral extraction with suitable controls in place
	Hydrology	Minor Water course - Ditch west of Clacton Road flood zone 2&3

5.1.7 Section 6

Table 5-6: Section 6 Constraints

Constraint		Summary
Heritage	Designated Sites	none

Constraint		Summary
	Listed Buildings	Grade II & II* Listed buildings nearby - on Church Road
Environment & Land Use	Designated Sites	none
	Local Sites	none
	Infrastructure & Access	Numerous minor roads and PROW
	Other	
Water	Hydrogeology	Superficial deposits are Secondary A & B (potential to be locally productive) aquifers. Bedrock is unproductive. Within SPZ 3 but unlikely to be relevant to mineral extraction with suitable controls in place
	Hydrology	none

5.1.8 Section 7

Table 5-7: Section 7 Constraints

Constraint		Summary
Heritage	Designated Sites	none
	Listed Buildings	Grade II & II* Listed buildings nearby - on Church Road
Environment & Land Use	Designated Sites	none
	Local Sites	none
	Infrastructure & Access	Some minor roads and PROW
	Other	Numerous overhead power cables from substation to the south of section.
Water	Hydrogeology	Superficial deposits are Secondary A & B (potential to be locally productive) aquifers. Bedrock is unproductive. Within SPZ 3 but unlikely to be relevant to mineral extraction with suitable controls in place
	Hydrology	none

6.0 Resource Assessment

6.1 Viability of Prior Extraction

6.1.1 Practicality of Extraction

To define and quantify a mineral resource, consideration should be given to the nearby environmentally sensitive receptors that could be impacted by the extraction of mineral. Impacts and effects of mineral extraction on these sensitive receptors can be reduced and mitigated by buffer zones or 'stand-offs', which maintain a suitable distance between the mineral extraction site and the potential receptors.

Buffer zones will depend upon the nature of the operation and the receptor, the potential pathway for the impact, and thus will vary on a site-by-site basis. Essex County Council's Minerals Local Plan does not specify typical buffer zones for mineral types, so experience of existing operations and other policy areas has been used.

The following buffer zones have been applied to this assessment to reflect the environmental and economic viability of the mineral resource:

- Residential dwelling: 100m
- Industrial and commercial: 10m
- Public roads: 10m
- Steel tower overhead services: 15m from footings and 7.5m from cables
- Historical workings or made ground: 10m
- General site boundaries: 10m

The method of extraction for different mineral resources will vary depending on the properties of the mineral resource and the environment around the extraction area (for example the ground water elevation). For the potential sand and gravel mineral resources identified within the site, the following extraction methods would be typical:

- Dry working - when worked dry due to absence of groundwater or displacement of groundwater by dewatering. The material is extracted by excavator with sloping side wall profiles formed at around 45° (1v:1h) or shallower; or
- Wet Working - when worked wet due to high ground water; typically by a long reach excavator forming a lake with shallow side slopes at around 18° (1v:3h).

The presence and depth of groundwater is a critical factor in assessing the potential viability of mineral extraction. Abstraction, transfer, and discharge of groundwater for mineral extraction requires an Environmental Permit. The requirements of permits for the protection of groundwater can impact the viability of extracting mineral deposits.

Overburden formed from either soils or unsaleable superficial strata will typically be 'stripped' to uncover the mineral deposits and stored in heaps around the perimeter of the site or adjacent to the excavation for later use in site restoration.

Restoration of excavation sites will vary on a site-specific basis, and can consist of open water bodies, nature reserves, or they can be returned to their original ground level through the importation of other material such as waste products.

6.1.2 Potential Design Criteria

In order to provide an estimate of the potential mineral resource present within the DCO boundary, an area of potential excavation has been defined by the relevant standoff and

buffer zones to the nearby potential receptors, as described in section 6.1.1. There is little published data on the specific quality or thickness of the sand and gravel deposit within the DCO Limit, therefore the estimates have been based on calculating the surface area of mineral deposits presently unconstrained by buffer zones, multiplied by average thicknesses and recovery percentages. Typical conversion factors of 1.75 t/m³ and 20% wastage have been applicate to the volume estimates.

Areas for calculating sand and gravel volumes have been established based on geometries that could be achieved with typical extraction methods. Areas of land within the MSA smaller than 1ha, or with geometries unsuitable for mineral extraction (for example, narrow or inaccessible) have been excluded from the potential resource estimates on the basis that they would not be cost effective to extract minerals from.

6.1.3 Value of the Mineral Resource

Construction aggregates, for use in concrete, asphalt, mortar, or as low value fill material, are considered as low 'place-value' products. Their low value and high cost of transport is such that the distance to market is critical in defining market values and viability of production sites. It is not possible to estimate the specific value of a construction mineral resource on a general basis, as many operational factors such as processing costs, overburden ratios, water management, as well typically high capital costs for items such as land acquisition, planning and permits, and plant and infrastructure are bound up in the cost of producing the mineral. Different products (i.e. rock types, sizes) will have different market values determined by their end uses, and factors of supply and demand. Certain materials may be sold 'at cost' in order to access more valuable materials within a site.

In general, aggregate products are only cost effective if transported over relatively short distances, and thus in order to make extraction viable, there must be a source of demand near-by. In the case of the DCO Limits, the towns of Chelmsford and Colchester would form the predominant markets for materials extracted in this area, with higher value materials travelling further afield.

The nature of the road network must also be considered. Most aggregate produced in Essex is transported within the county by HGV's. The MLP states that only certain roads are appropriate for HGV's and a suitable road network has been defined by National Highways. In the case of the DCO Limits, which is located in rural areas of Tendring District the nature of the immediate road network is comprised of unclassified roads and B-Roads that pass through small hamlets and villages.

Extraction and processing of the mineral deposits requires significant up-front investments in processing plant to produce saleable products from the raw materials. Such large investments require a suitably large mineral reserve to justify the life of the investment, with many of the existing quarry sites (such as those around Ardleigh and the River Colne) having been in operation for many years.

The scarcity of the mineral should also be considered in the relative value of a deposit. As discussed above, the mineral deposits outcropping within the DCO Limits are formed from extensive superficial strata that also outcrop outside of the site, both within the Tendring District and across Essex as a whole. Whilst very little specific quality data has been found in relation to the deposits within the site, references within geological literature, and the general presence of a modern quarrying industry within the district suggest that the deposits found here have the potential to be considered a workable mineral resource.

6.1.4 Use within the Development

Sand and gravel deposits typically require some form of processing prior to their use as construction materials. This processing includes washing and screening to achieve the correct specification for the defined end use. Whilst direct use within the development may

not be feasible due to the requirement to remove the material to a processing site (e.g. an existing quarry), this material could offset the aggregates required for construction.

6.1.5 Areas Affected

The linear sections of the DCO Limits (Sections 1-6, and the ECC within Section 7) which contain the ECC are shown at 90m wide. This area determines the potential route of the installation of the VE and NF ECCs, which, subject to detailed design, will be installed within this width. The exact method of installation, the specific route, and the potential interaction of the two ECCs is awaiting determination.

Within the DCO limit not all land will be in use and not all land will be disturbed by intrusive works. Route refinement will reduce the area impacted during construction. Several of the project elements such as, but not limited to Temporary Construction Compounds (TCC) and haul roads will not affect the subsurface minerals. The project is long lived but temporary in nature, with the potential to temporarily sterilise mineral for the life of the Project only (c. 40 years). On decommissioning of the Project it is anticipated that the minerals beneath the project infrastructure would be available for mineral extraction.

During the life of the Project the permanent easement for each Project ECC is 20m wide, so the maximum width of the combined permanent easement will be c. 40m wide, within the 90m wide DCO Limits. On this basis, whilst there may be viable mineral within the 90m wide area, only up to c. 40m will be potentially sterilised by the permanent easement. The resource estimates provided below are on the basis of a 40m width within the DCO Limit sections as a ‘worst case scenario’ for potential mineral sterilisation.

The area of Section 7 contains the OnSS for both VE and NF, TCC, soil storage and ecological mitigation areas, and the search area of the EACN Substation. The resource estimate for Section 7 includes all of these areas, in order to consider the potential cumulative impact within the DCO Limits, which are subdivided on the basis that they may not all have the potential to sterilise minerals for a significant period of time.

TCC areas would only temporarily sterilise potential mineral deposits for the duration of construction activities. This land would be vacated and available for mineral extraction following construction, should this be pursued by a third party.

The ECC route would temporarily sterilise potential mineral deposits for the lifetime of the project within the permanent easement. The disturbance to the ground conditions would be negligible/minimal following decommissioning of the ECC and the land would be vacated and available for mineral extraction following construction, should this be pursued by a third party.

The OnSS for VE and NF would temporarily sterilise potential mineral deposits for the lifetime of the project. The disturbance to the ground conditions would depend on the nature of construction and decommissioning of the OnSS.

6.2 Potential Resource Estimates

6.2.1 Section 1

Within Section 1 approximately 25 ha has been designated as an MSA.

The maximum 40m wide ECC permanent easement runs the length of approximately 2.5 km through the Section 1 MSA and has the potential to sterilise potential resources within the DCO boundary.

Taking into account the buffer zones and an appropriate geometry for extraction, up to approximately 6 ha of land is covered by the 40m ECC easement where a potential mineral resource may exist.

Based on the available local geological information, which is taken from nearby borehole records, an overburden thickness of 1m for topsoil and subsoils, and an average of 3.2m sand and gravel has been assumed across the section.

Resource assumptions:

- Overburden thickness: 1m
- Sand and gravel thickness: 3.2m
- Density: 1.75t/m³
- Wastage: 20%

Based on the assumptions described above, the potential mineral resource within Section 1 may total approximately 269,000 tonnes.

This potential mineral resource could be sterilised for the duration of the project and would no longer be sterilised following decommissioning.

6.2.2 Section 2

Within Section 2 approximately 2.3 ha has been designated as an MSA.

However, taking into account the buffer zones and an appropriate geometry for extraction, no potential mineral resources have been identified in Section 2.

6.2.3 Section 3

Section 3 does not intersect the MSA.

6.2.4 Section 4

Within Section 4 approximately 11 ha has been designated as an MSA.

Taking into account the buffer zones and an appropriate geometry for extraction, up to approximately 2.9 ha of land remains within the MSA where a potential mineral resource may exist.

However, based on the available local geological information, this area may contain relatively thick overburden, ranging from at least 1.8m of loam up to 8.5m of gravelly clay. There is insufficient information on the thickness and quality of any sand and gravel that may be present to estimate a potential resource.

The area of land within Section 4, south of the A120 and east of Clacton Road is of a suitable shape and size that future mineral extraction may be viable. This land is the location of a proposed TCC, which will be removed following installation of the ECC. On this basis, there is no sterilisation of potential mineral resources within section 4.

6.2.5 Section 5

Within Section 5 approximately 12.3 ha has been designated as an MSA.

The maximum 40m wide ECC permanent easement runs the length of approximately 1.1 km through the Section 5 MSA and has the potential to sterilise potential resources within the DCO boundary.

Taking into account the buffer zones and an appropriate geometry for extraction, up to approximately 4.8 ha of land remains within the MSA where a potential mineral resource may exist.

However, based on the available local geological information, this area may contain relatively thick overburden, ranging from at least 1.8m of loam up to 8.5m of gravelly clay.

There is insufficient information on the thickness and quality of any sand and gravel that may be present to estimate a potential resource.

This potential mineral resource could be sterilised for the duration of the project and would no longer be sterilised following decommissioning.

6.2.6 Section 6

Within Section 6 approximately 27 ha has been designated as an MSA.

The maximum 40m wide ECC permanent easement runs the length of approximately 2.1 km through the Section 6 MSA and has the potential to sterilise potential resources within the DCO boundary.

Taking into account the buffer zones and an appropriate geometry for extraction, up to approximately 6.5 ha of land remains within the MSA where a potential mineral resource may exist.

Based on the available local geological information, which is taken from nearby borehole records, an overburden thickness of 1.45m for topsoil and subsoils, and an average of 5m sand and gravel has been assumed across the section. Due to the distance of the borehole records from the DCO Limits, this information may not be representative of the actual ground conditions within the DCO Limits. Further ground investigation would be required to assess the specific viability of this potential resource.

Resource assumptions:

- Overburden thickness: 1.5m
- Sand and gravel thickness: 5.0m
- Density: 1.75t/m³
- Wastage: 20%

Based on the assumptions described about, the potential mineral resource within Section 6 may total approximately 456,000 tonnes.

Any potential mineral resource could be sterilised for the duration of the project and would no longer be sterilised following decommissioning.

6.2.7 Section 7

Within Section 7 approximately 108 ha has been designated as an MSA.

Section 7 differs from the previous sections, in that the DCO Limit comprises the area proposed for construction of the proposed VE and NF OnSS, VE and NF ECC routes, as well as the search area for the proposed EACN substation (Figure 1). On this basis it is necessary to consider the cumulative impact on potential mineral sterilisation within the entire section of the DCO Limits, whilst considering the different areas within the section which may be subject to short term temporary (during the construction phase) and longer-term temporary (for the life of the ECC and OnSS) sterilisation.

Taking into account the locations of buffer zones for nearby residential properties, overhead transmission lines (from the existing substation outside the DCO Limit) and roads, and selecting areas with suitable geometries for extraction, a total area of 72.9 ha remains within Section 7 where a potential mineral resource could be sterilised. Areas without suitable geometry for extraction are considered non-viable.

Given the limited boreholes surrounding the area, the same assumptions apply to the whole area (as described in Section 4.3.7).

No information is provided regarding the depth of groundwater within Section 7. This may have a material impact on the viability of mineral extraction within this area, subject to the environmental permit requirements that may be imposed to the protect the groundwater.

Resource assumptions:

- Overburden thickness: 2.5m
- Sand and gravel thickness: 6.0m
- Density: 1.75t/m³
- Wastage: 20%

Based on the assumptions described above, the potential mineral resource within the entirety of Section 7 of the DCO Limits may total approximately 6,127,000 tonnes.

The EACN search area is included in the DCO Limit but not part of the VE or NF Project, so can be subtracted from this estimate. The TCC areas will only sterilise mineral during the construction phase, so can also be subtracted from the estimate, however sections of these areas may be used for mitigation purposes and therefore subject to variable durations of sterilisation.

The remaining VE and NF OnSS and ECC areas provide a potential mineral resource estimate of 1,710,000 tonnes.

Due to the thickness of the overburden (c. 2.5m), it is likely that any construction and decommissioning activities will not extend into the mineral deposit.

Potential mineral deposits within the ECC could be sterilised for the duration of the project and would no longer be sterilised following decommissioning. The construction and decommissioning of the ECC would have a negligible/minimal impact on ground conditions and any in-situ mineral resource.

Potential mineral deposits within the OnSS areas could be sterilised for the duration of the project and may no longer be sterilised following decommissioning. The construction and decommissioning of the OnSS may have an impact on ground conditions, subject to the design of the OnSS.

The quantities of potential mineral deposits within Section 7 can be subdivided as shown in Table 6-1:

Table 6-1: Section 7 Mineral Estimate

Proposed Use	Potential Mineral Area	Overburden Volume	Estimated Mineral tonnage	Note
VE OnSS	7.2 ha	180,000 m³	605,000 t	Potential sterilisation for duration of project only, subject to design of OnSS.
NF OnSS	7.2 ha	180,000 m³	605,000 t	
ECC	6.0 ha	149,000 m³	500,000 t	Temporary sterilisation duration of project only, with negligible impact on ground conditions / mineral.
TCC & Substation works zone	34.2 ha	855,000 m³	1,460,000 t	Short term sterilisation for construction period only.

Proposed Use	Potential Mineral Area	Overburden Volume	Estimated Mineral tonnage	Note
EACN Search Area	35.2 ha	880,000 m³	2,957,000 t	Land within DCO Limit but outside of scope of proposed project.

Figure 1 illustrates the subdivision of areas for Section 7.

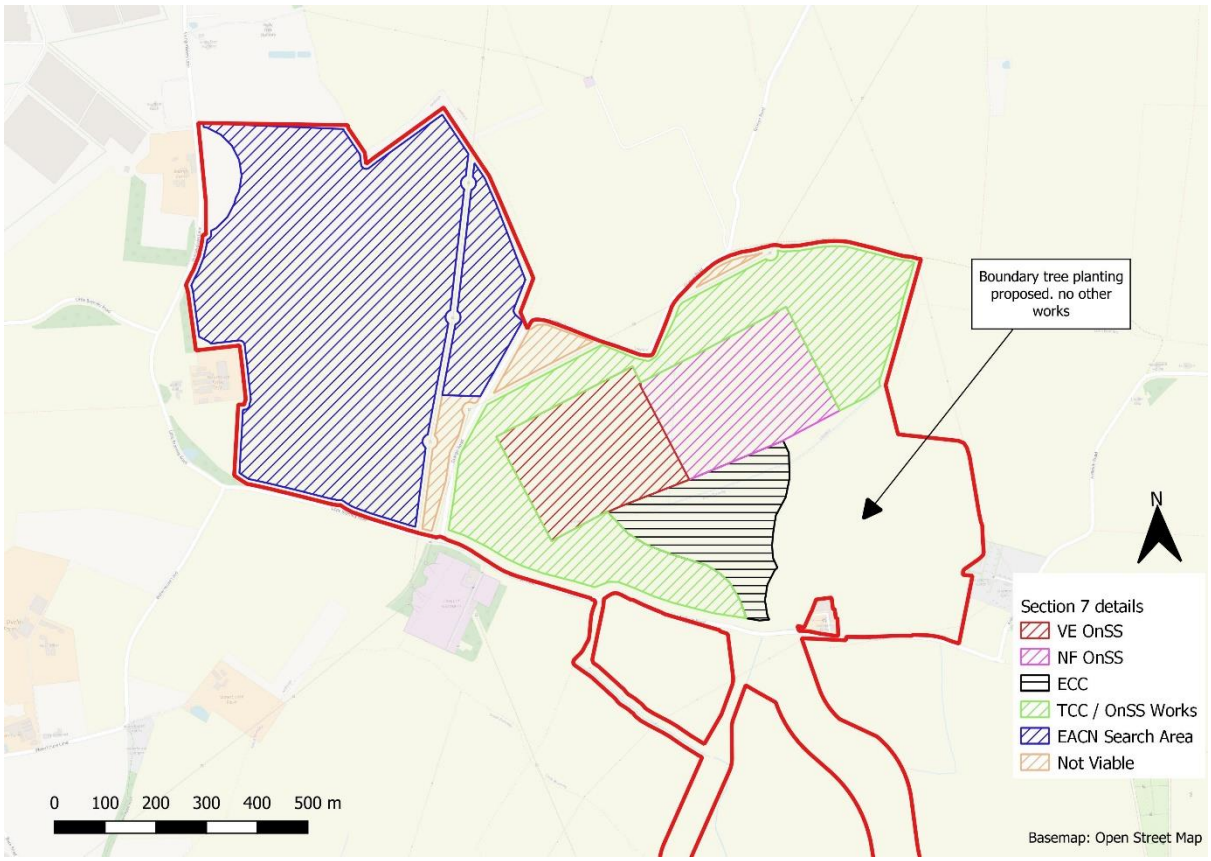

Figure 1 Section 7 Detail

6.3 Mineral Resource Summary

In summary, a total area of 135.5 ha of land within the DCO Limits has been identified as potentially containing resources of sand and gravel, when taking into account typical buffer zones and geometries for practicable extraction. Using geological information inferred from sparse, non-specific datasets within the local area, it has been estimated that in total this land could have the potential to yield and **Inferred Resource**[14] of approximately 8.3 million tonnes of sand and gravel, see Table 6-1 and Table 6-2.

A significant proportion of this land may only be subject to temporary sterilisation by the proposed work, due to the land being demarcated for temporary compounds and access during construction. The permanent easement for the ECC may sterilise minerals in order to protect the installed infrastructure for the life of the Project. The OnSS for VE and, or NF

[14] Definition of an **Inferred Resource**: Part of a mineral resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. Inferred from geological evidence but has no verification of quality or continuity. Not defined by any intrusive ground investigation or inferred from very wide drill hole spacing, which does not verify continuity. Does not have planning permission for extraction.

may sterilise minerals for the life of the Project, and may require excavations for construction, pending detailed review of ground conditions at the detailed design stage.

The potential mineral resource within the OnSS covered by both VE and NF totals 1,210,000 tonnes (estimated as approximately 605,000 tonnes each).

These estimates represent a likely worst-case scenario for the magnitude of sterilisation and may be significantly reduced during the detailed design stage of the proposed development.

Table 6-2: Mineral Resource Estimates for the Onshore ECC and Substation Areas

Section Reference	Mineral Area (ha)	Overburden Volume	Estimated Mineral tonnage	Note
1	6.0	60,000 m^3	269,000 t	ECC – temporary sterilisation with negligible impact on ground conditions / mineral
2	0	-	-	No potential mineral resource
3	0	-	-	No potential mineral resource
4	2.9	Unknown	Unknown	Insufficient geological information, however, area affected is for ECC – temporary sterilisation with negligible impact on ground conditions / mineral
5	4.8	Unknown	Unknown	As above
6	6.5	94,000 m^3	456,000 t	ECC – temporary sterilisation with negligible impact on ground conditions / mineral
7	20.4	509,000 m^3	1,710,000 t (see Table 6-1)	OnSS and ECC totals for VE & NF in section 7 subject to potential temporary sterilisation for duration of project. All other areas TCC or EACN

7.0 Summary

A desk based MRA has been completed to consider the potential for sterilisation of sand and gravel within the DCO Limits for VE and NF.

The Assessment comprised a review of the public domain geographical and geological information to estimate the volume of sand and gravel within the DCO Limits, taking into account typical stand-offs to boundaries and receptors.

The DCO Limit is situated in an area containing broad but variable deposits of glacio-fluvial sand and gravel. These deposits are worked for production of construction materials, including ready-mixed concrete, at a number of quarries within the region.

These deposits are safeguarded under national and local planning policies, with the aim that mineral deposits are not needlessly sterilised by incompatible development. The Essex County Council Landbank requires a continual supply of mineral, which is provided through site allocations and planning permissions. No land within the DCO Limit is currently allocated or permitted for mineral extraction.

There will be a need within Essex County Council Landbank for further permissions during the operational life of the proposed development. It is likely that sufficient unconstrained resources of sand and gravel can be developed outside of the DCO Limit within the lifetime of the proposed development to satisfy the future landbank requirements.

A total of 8.3Mt of potential sand and gravel resource has been estimated within the DCO Limits, which includes the areas of ECC, TCCs, OnSS and the EACN. When excluding the TCC, where the potential sterilisation will be short term in duration, and the EACN, which is not within the remit of the Applicant, a total of 2.435Mt of potential sand and gravel resources may be temporarily sterilised for the duration of the development.

The ECC Route Sections, which comprises a permanent easement up to 40m, within which only a small proportion of the width will contain the electrical circuits. Whilst the land will be temporarily sterilised for the life of the development, the installation, operation, and decommissioning of the infrastructure will have a negligible to minimal impact on the ground conditions and mineral, which will no longer be sterilised following decommissioning. The total potential mineral resource within the ECC area is 1.225Mt.

The remaining area, comprising the footprint of the VE and NF OnSS, will be subject to temporary sterilisation for the lifetime and decommissioning of the infrastructure. Depending on the nature of construction, the installation, operation, and decommissioning of the infrastructure may have a minimal impact on the ground conditions on the mineral, which will no longer be sterilised following decommissioning. The total potential mineral resource within the OnSS area is 1.21Mt.

The project is long lived but temporary in nature, with the potential to sterilise mineral for the life of the Project only. Therefore, the proposed development will not permanently sterilise the potential mineral resources, which will be available for exploitation following decommissioning and removal of the proposed development.

Drawings

Volume 9, Report 5 Mineral Resource Assessment

Five Estuaries Offshore Wind Farm Windfarm

Five Estuaries Offshore Wind Farm Ltd

SLR Project No.: 404.05356.00010

5 March 2024

610000 615000 620000 625000

230000 225000 220000 215000

Section 7
Section 6
Section 5
Section 4A
Section 4B
Section 3
Section 2
Section 1

Martells Pit
Beaumont Red Crag Outlier LGS
Beaumont Quay Limekiln LGS
Dakings Pit LGS
Cesspool Disposal Site
Old Gravel Pit
Gutteridge Hall Farm
Poplars Chase Farm
Thors Farm
Robinson Road
Martins Farm
Western Promenade Tip
Kiln Farm
Oyster Tank Road
Point Clear Bay Holiday
East Road
Rear of 796-886 St Osyth Main Road
Rush Green Road
Rose Farm
Land West of Great Holland Mill
Great Holland Pits Nature Reserve LGS
Holland On Sea Cliff SSSI
Frinton and Walton Urban District Council
Maltings Lane
Harmers Foundry
Ramsey Creek
Dovercourt

Lawford
Bradfield
Mistley
Ramsey
Little Oakley
Great Oakley
Wix
Bromley Cross
Great Bromley
Little Bromley
Elmstead Market
Tendring
Little Bentley
Great Bentley
Weeley
Thorrington
Alresford
Little Clacton
Kirby-le-Soken
Kirby Cross
Frinton-on-Sea
Holland-on-Sea
Jaywick Sands
Clacton-on-Sea
Pewit Island
Horsey Island
Crabknowe Spit
Pye Sand
Stone Point
Hamford Water
Hamford Water National Nature Reserve
Holland Gap
Sandy Point
Revetment de frise Point
Holland Haven
Country Park
Dovercourt
Ramsey
Harwich
Felixstowe
Ipswich
Colchester
Southend-on-Sea
Chelmsford
Braintree
Maldon
Witham
Wivenhoe
Brightlingsea
Mersea Island
Southminster
Burnham-on-Crouch
Foulness Point
Suffolk Coast and Heaths
Greater Gabbard
London Array

N

LEGEND

- Onshore Order Limits
- Offshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor
- ECC Study Area (Onshore Order Limits 250 m Buffer)
- Substation Operational Boundary
- North Falls Indicative Substation Operational Boundary
- Landfall Compound Zone
- National Grid East Anglia Connection Node (EACN) Substation Zone
- Substation Works Area
- Substation Study Area (Substation Works Area 1 km Buffer)
- Local Geological Site (LGS)
- Holland on Sea Cliff Site of Special Scientific Interest (SSSI)
- Historic Landfill Site
- Authorised Landfill Site

Superficial Geology

- Alluvium - Clay and Silt
- Intertidal Deposits - Clay and Sand
- Intertidal Deposits - Clay and Silt
- Lowestoft Formation - Sand and Gravel
- Kesgrave Catchment Subgroup - Sand and Gravel
- Cover Sand - Clay Silt and Sand
- Head - Diamicton
- Head - Silt
- River Terrace Deposits 2 - Sand and Gravel
- River Terrace Deposits 3 - Sand and Gravel
- Interglacial Deposits - Clay and Silt
- Storm Beach Deposits - Sand and Gravel
- Bedrock at or Near Surface

0 0.5 1 2
Kilometres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
SUPERFICIAL GEOLOGY

VER	DATE	REMARKS	Drawn	Checked
1	16/02/2024	ES Submission	MW	JRS

DRAWING NUMBER: 6-5-2-1

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:60,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM

610000 615000 620000 625000

230000 225000 220000 215000

Section 7
Section 6
Section 5
Section 4A
Section 4B
Section 3
Section 2
Section 1

Martells Pit
Ramsey Creek
Dovercourt
Beaumont Red Crag Outlier LGS
Beaumont Quay Limekiln LGS
Cesspool Disposal Site
Dakings Pit LGS
Old Gravel Pit
Gutteridge Hall Farm
Poplars Chase Farm
Thors Farm
Robinson Road
Martins Farm
Western Promenade
Tip
Oyster Tank Road
Kiln Farm
Point Clear Bay Holiday
East Road
Rear of 796-886 St Osyth Main Road
Rush Green Road
Bovills Hall
Rose Farm
Land West of Great Holland Mill
Great Holland Pits Nature Reserve LGS
Holland On Sea Cliff SSSI
Frinton and Walton Urban District Council
Maltings Lane
Harmers Foundry

Lawford
Bradfield
Bradfield Heath
Mistley Heath
Little Bromley
Burnt Heath
Bromley Cross
Great Bromley
Elmstead Market
Hare Green
Little Bentley
Tendring
Tendring Heath
Tendring Green
Stones Green
Wix
Clayhall
Great Oakley
Little Oakley
Foulton Hall
Pewit Island
Crabknowe Spit
Pye Sand
Stone Point
Horsey Island
Hamford Water National Nature Reserve
Hedge-end Island
Moze Cross
Old Moze Hall
New Moze Hall
Potland
Oldhouse
Ramsey
Kirby-le-Soken
Kirby Cross
Thorpe-le-Soken
Great Bentley
Weeley Heath
Thorrington
Alresford
Elmstead Heath
Aingers Green
South Heath
Little Clacton
Holland Haven
Holland Gap
Sandy Point
Country Park
Reveley's de frise Point
Holland-on-Sea
FRINTON-ON-SEA
Clacton-on-Sea
Southend-on-Sea
Colchester
Ipswich
Felixstowe
Harwich
Chelmsford
Braintree
Maldon
Witham
Halstead
Sudbury
Dedham
Manningtree
Wivenhoe
Brightlingsea
Aldeburgh
Woodbridge
Framlingham
Saxmundham
Leiston
Southwold
Lowestoft
Great Yarmouth
Clacton Pier
Walton Pier
Frinton Pier
Harwich Pier
Felixstowe Pier
Aldeburgh Pier
Southwold Pier
Lowestoft Pier
Great Yarmouth Pier
Gorleston Pier
Southend Pier
Shoeburyness
Foulness Point
Canvey Island
Benfleet
Rochford
Hockley
Rayleigh
Wickford
Billericay
Brentwood
Ongar
Epping
Harlow
Bishop's Stortford
Saffron Walden
Great Dunmow
Thaxted
Haverhill
Clare
Newmarket
Bury St Edmunds
Stowmarket
Needham Market
Diss
Thetford
Attleborough
Wymondham
Norwich
Aylsham
Cromer
Sheringham
Holt
Fakenham
Wells-next-the-Sea
Hunstanton
King's Lynn
Downham Market
Ely
Cambridge
Huntingdon
St Ives
St Neots
Bedford
Kettering
Corby
Peterborough
Stamford
Grantham
Sleaford
Boston
Spalding
Wisbech
March
Chatteris
Whittlesey
Oundle
Thrapston
Wellingborough
Northampton
Daventry
Towcester
Brackley
Banbury
Bicester
Oxford
Abingdon
Wantage
Didcot
Wallingford
Henley-on-Thames
Reading
Basingstoke
Newbury
Hungerford
Marlborough
Swindon
Cirencester
Tetbury
Malmesbury
Chippenham
Calne
Devizes
Trowbridge
Frome
Shepton Mallet
Wells
Glastonbury
Street
Yeovil
Sherborne
Dorchester
Weymouth
Portland
Lyme Regis
Bridport
Axminster
Honiton
Exmouth
Sidmouth
Budleigh Salterton
Exeter
Crediton
Okehampton
Tiverton
Bampton
Barnstaple
Ilfracombe
Braunton
Bideford
Torrington
Great Torrington
Holsworthy
Bude
Launceston
Wadebridge
Padstow
Newquay
St Austell
Truro
Falmouth
Helston
Penzance
St Ives
Redruth
Camborne
Hayle
Gwithian
Portreath
Perranporth
Newquay
St Agnes
Mawgan Porth
Bedruthan Steps
Trevose Head
Padstow
Rock
Polzeath
Wadebridge
Camel Estuary
Padstow Bay
Hayle Estuary
St Ives Bay
Mount's Bay
Lizard Point
Kynance Cove
Cadgwith
Coverack
Helford River
Falmouth Bay
Carrick Roads
Fowey
Looe
Polperro
Whitsand Bay
Rame Head
Plymouth Sound
Cawsand
Kingsand
Mount Edgcumbe
Tamar Estuary
Saltash
Torpoint
Plymouth
Yealmpton
Kingsbridge
Salcombe
Dartmouth
Brixham
Torbay
Paignton
Teignmouth
Dawlish
Starcross
Exmouth
Lyme Bay
Chesil Beach
Portland Bill
Durdle Door
Lulworth Cove
Kimmeridge Bay
Swanage
Studland
Poole Harbour
Brownsea Island
Bournemouth
Christchurch
Hengistbury Head
Mudeford
Needles
Alum Bay
The Solent
Yarmouth
Lymington
Hurst Castle
Milford-on-Sea
New Forest
Beaulieu
Hythe
Southampton
Netley
Calshot
Fawley
Cowes
East Cowes
Ryde
Sandown
Shanklin
Ventnor
St Catherine's Point
Freshwater
Totland
Yarmouth
Isle of Wight
Portsmouth
Gosport
Fareham
Titchfield
Hamble
Lee-on-the-Solent
Stubbington
Portchester
Havant
Emsworth
Chichester
Bognor Regis
Littlehampton
Worthing
Shoreham-by-Sea
Brighton
Hove
Newhaven
Seaford
Eastbourne
Pevensey
Hastings
Bexhill
Rye
Winchelsea
Dungeness
Romney Marsh
Folkestone
Dover
Deal
Sandwich
Ramsgate
Margate
Broadstairs
North Foreland
Reculver
Herne Bay
Whitstable
Faversham
Sittingbourne
Rochester
Chatham
Gillingham
Sheerness
Isle of Sheppey
Medway
Thames Estuary
Tilbury
Gravesend
Dartford
Crayford
Bexleyheath
Woolwich
Greenwich
Deptford
Rotherhithe
Wapping
Tower Bridge
London Bridge
Southwark
Lambeth
Westminster
Chelsea
Kensington
Hammersmith
Fulham
Putney
Wandsworth
Battersea
Clapham
Brixton
Camberwell
Peckham
Dulwich
Lewisham
Blackheath
Eltham
Bromley
Croydon
Sutton
Kingston upon Thames
Richmond upon Thames
Twickenham
Hounslow
Heathrow Airport
Staines-upon-Thames
Windsor
Eton
Slough
Uxbridge
Harrow
Wembley
Brent
Ealing
Hanwell
Acton
Chiswick
Barnes
Mortlake
Kew
Richmond
Hampton Court
Esher
Epsom
Leatherhead
Dorking
Guildford
Godalming
Haslemere
Petersfield
Liphook
Alton
Farnham
Aldershot
Camberley
Bagshot
Ascot
Maidenhead
Marlow
High Wycombe
Amersham
Chesham
Berkhamsted
Tring
Aylesbury
Thame
Watlington
Henley-on-Thames
Goring
Pangbourne
Theale
Reading
Wokingham
Bracknell
Crowthorne
Sandhurst
Farnborough
Fleet
Hook
Basingstoke
Whitchurch
Andover
Romsey
Eastleigh
Winchester
Alresford
New Alresford
Petersfield
Midhurst
Pulborough
Arundel
Littlehampton
Bognor Regis
Chichester
Selsey
Pagham
Bognor Regis
Littlehampton
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Blackheath
Eltham
Bromley
Croydon
Sutton
Kingston upon Thames
Richmond upon Thames
Twickenham
Hounslow
Heathrow Airport
Staines-upon-Thames
Windsor
Eton
Slough
Uxbridge
Harrow
Wembley
Brent
Ealing
Hanwell
Acton
Chiswick
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Mortlake
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Petersfield
Midhurst
Pulborough
Arundel
Littlehampton
Bognor Regis
Chichester
Selsey
Pagham

N

LEGEND

- Onshore Order Limits
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- Onshore Export Cable Corridor
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- Substation Operational Boundary
- North Falls Indicative Substation Operational Boundary
- Landfall Compound Zone
- National Grid East Anglia Connection Node (EACN) Substation Zone
- Local Geological Site (LGS)
- Holland on Sea Cliff Site of Special Scientific Interest (SSSI)
- Historic Landfill Site
- Authorised Landfill Site
- Mineral Safeguarding Area (Sand and Gravel)

0 0.5 1 2

Kilometres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

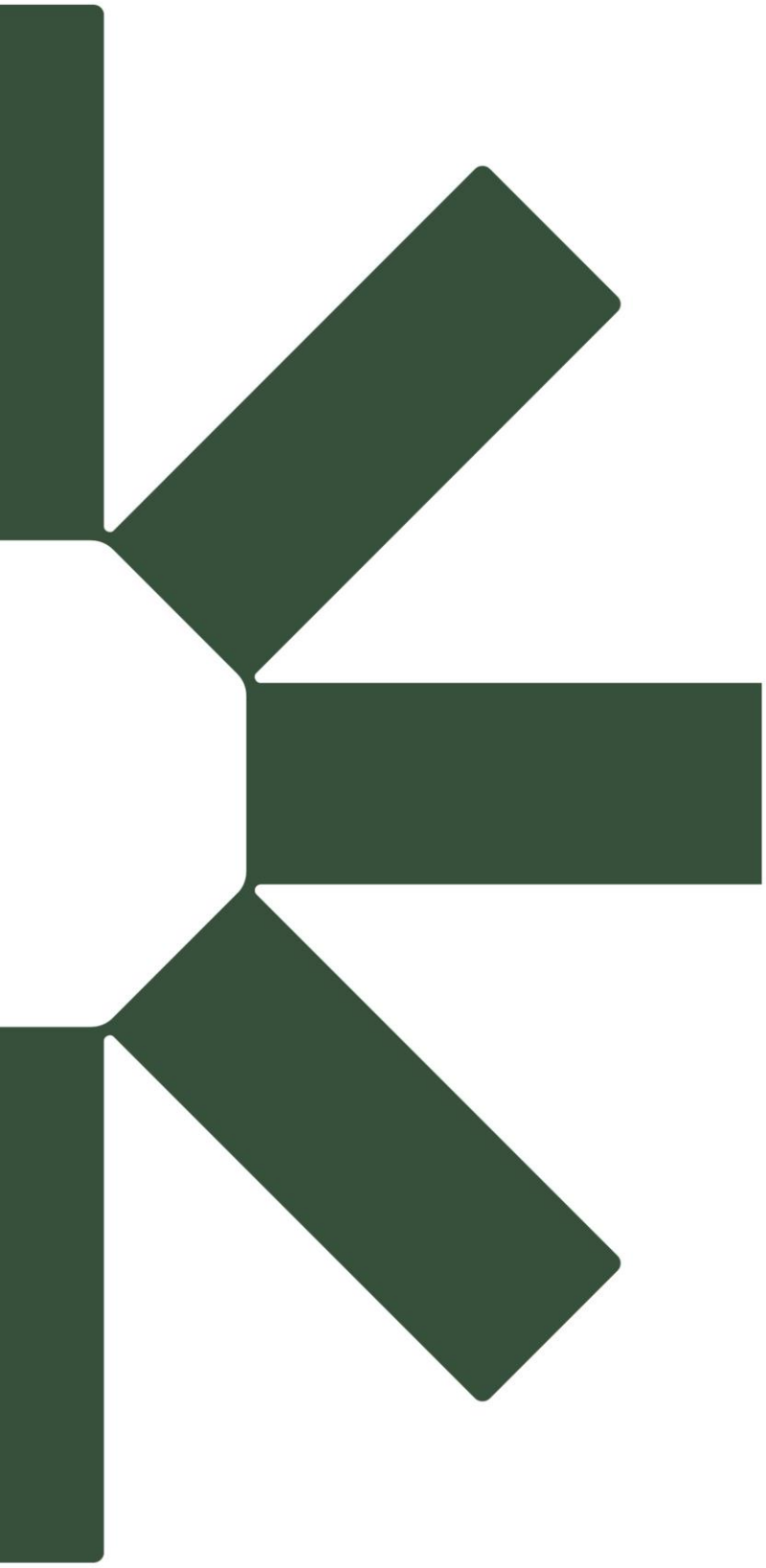
MINERAL SAFEGUARDING AREA

VER	DATE	REMARKS	Drawn	Checked
1	16/02/2024	First Draft	MW	JRS

DRAWING NUMBER: 6-5-2-2

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:60,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM



Making Sustainability Happen

FIVE ESTUARIES
OFFSHORE WIND FARM

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Windmill Hill Business Park
Whitehill Way, Swindon, SN5 6PB
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