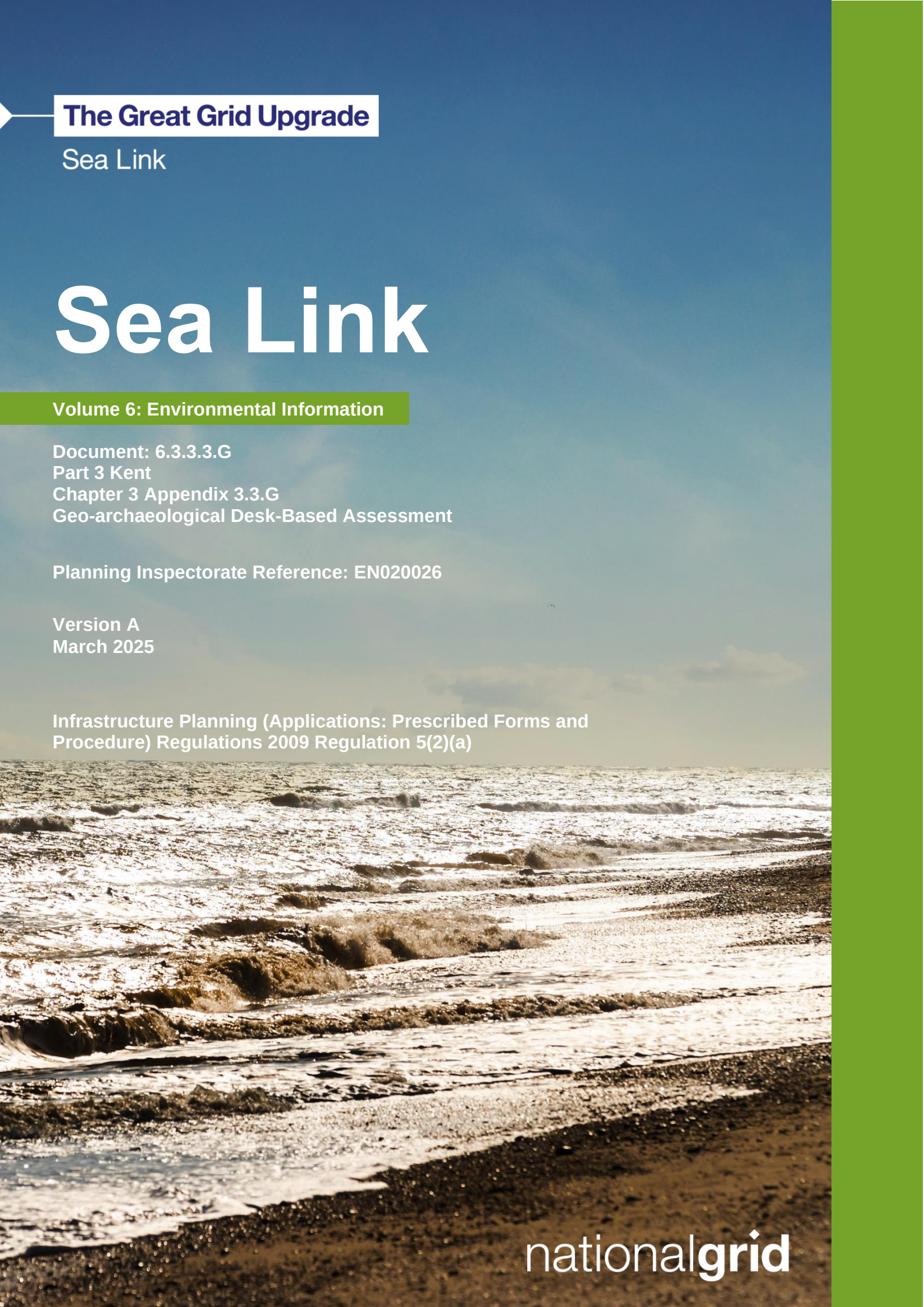




The Great Grid Upgrade

Sea Link

Sea Link

Volume 6: Environmental Information

Document: 6.3.3.3.G
Part 3 Kent
Chapter 3 Appendix 3.3.G
Geo-archaeological Desk-Based Assessment

Planning Inspectorate Reference: EN020026

Version A
March 2025

Infrastructure Planning (Applications: Prescribed Forms and
Procedure) Regulations 2009 Regulation 5(2)(a)

nationalgrid

Page intentionally blank



Sea Link

Geoarchaeological Desk-Based Assessment

January 2025

Prepared for:
National Grid Electricity Transmission PLC
(NGET)

Prepared by:



Project Number:
331201545



Sea Link – Geoarchaeological Desk-Based Assessment

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
1	For client review	[REDACTED]	05/12/24	[REDACTED]	06/12/24	[REDACTED]	12/12/24
2	Revision after client comments	[REDACTED]	13/01/25	[REDACTED]	17/01/25	[REDACTED]	17/01/25



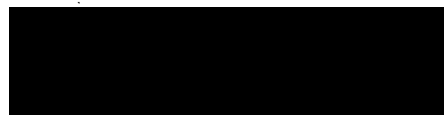
Sea Link – Geoarchaeological Desk-Based Assessment

The conclusions in the Report titled SeaLink Geoarchaeological Desk-Based Assessment are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from Client (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided by the Client to applicable authorities having jurisdiction and to other third parties in connection with the project, Stantec disclaims any legal duty based upon warranty, reliance or any other theory to any third party, and will not be liable to such third party for any damages or losses of any kind that may result.

Prepared by:

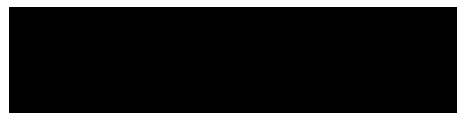


Signature



Printed Name

Reviewed by:

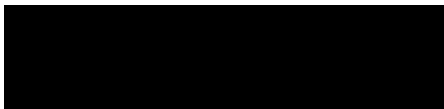


Signature



Printed Name

Approved by:



Signature



Printed Name



Contents

Executive Summary	1
1 Introduction	2
1.1 Project Background	2
1.2 Location, Topography and Geology	2
1.3 Aims and Objectives.....	3
2 Regulatory and Policy Context	5
3 Methodology	6
3.1 Standards and Guidance	6
3.2 Data Sources	6
3.1 LiDAR	6
3.2 Geotechnical Data	7
3.3 Assessment of Significance	7
3.4 Assumptions and Limitations	7
4 Cultural Heritage Baseline and the History of the Wantsum Channel	8
4.1 Introduction	8
4.2 The Wantsum Channel	8
4.3 Archaeological and Historical Background.....	10
4.4 Prehistoric.....	11
4.5 Roman	11
4.6 Medieval.....	11
4.7 Post-medieval	12
4.8 Modern.....	12
5 Geoarchaeological Baseline	13
5.1 Introduction	13
5.2 Excavations at Weatherlees Hill Water Treatment Works.....	13
5.3 The Richborough Connection Project	13
5.4 Geoarchaeological Investigation for the Sea Link Scheme Kent Section	14
6 Review of Geotechnical Data	16
6.1 Introduction	16
6.2 Methodology	16
6.3 Exclusions and Limitations	16
6.4 Newhaven and Seaford Chalk Formations.....	17
6.5 Thanet Formation	17
6.6 Fine grained minerogenic deposits	18
6.7 Stabilisation horizons.....	20
6.8 Made Ground.....	21
7 Statement of Significance	22
7.1 Introduction	22
7.2 Stratigraphic Sequences (Known and Potential)	22
7.3 Local Research Frameworks	22



8	Statement of Effect.....	24
8.1	Introduction	24
8.2	Proposed Development.....	24
8.3	Scale and Significance of Impact.....	24
9	Recommendations for Further Work.....	26
9.1	Introduction	26
9.2	Recommendations for further work	26
10	Conclusion.....	27
11	References.....	28

Figures

Figure 1	Site Location and Geology
Figure 2	Non-Designated Heritage Assets
Figure 3	LiDAR
Figure 4	Location of transects
Figure 5	Long Section 1
Figure 6	Cross Section

Appendices

Appendix A	Figures
------------	---------



Executive Summary

Stantec were commissioned by National Grid Electricity Transmission plc (NGET) to prepare a Geoarchaeological Desk-Based Assessment to inform a Development Consent Order (DCO) application for the Sea Link Scheme. The Scheme aims to reinforce the transmission network between Suffolk and Kent through the installation of a 2GW High Voltage Direct Current (HVDC) cable. The route is approximately 138km in length and is predominantly located offshore. The Scheme also includes the construction of a converter stations substations and new underground and overhead electricity lines in Kent and Suffolk.

This assessment focuses on the Kent section of the Scheme, part of which is located within the former Wantsum Channel, a large stretch of water which once separated the Isle of Thanet from the mainland. The channel played an important role in the development of the area throughout history until it ceased to be navigable in the 17th century. Knowledge of its formation and chronological evolution is therefore critical to the understanding of the history of this area of Kent. The converter station in this part of the Scheme is proposed within the former channel and an understanding of the character, potential and significance of deposits within the channel is needed to understand the impact from the construction of the Scheme and mitigation measures required.

Previous geoarchaeological studies have recorded intact sedimentary sequences within the former Wantsum Channel which can be used to reconstruct palaeoenvironments and site formation processes. This includes a limited programme of geoarchaeological analysis undertaken during the trial trenching for the Sea Link cable route which identified the presence of channel edge deposits with good preservation of paleoenvironmental indicators.

Mapping of the deposits recorded from geotechnical boreholes within the site of the proposed converter station has demonstrated the presence of deep sequences of dominantly alluvial/estuarine minerogenic deposits which appear to be largely undisturbed and have the potential to provide a record of the evolution of the Wantsum Channel and to contain deposits suitable for the preservation of archaeological artefacts and palaeoenvironmental indicators. The Sea Link Scheme is likely to lead to the total loss of these deposits within the footprint of the converter station, so necessitating further geoarchaeological investigation in advance of any development works. This should include scientific dating as the chronology of this complex depositional environment is currently poorly understood.



1 Introduction

1.1 Project Background

- 1.1.1 Stantec have been commissioned by National Grid Electricity Transmission plc (NGET) to prepare a Geoarchaeological Desk Based Assessment to inform a Development Consent Order (DCO) application for the Sea Link Scheme, located in South East England (Figure 1). The Scheme aims to reinforce the transmission network between Suffolk and Kent through the installation of a 2GW High Voltage Direct Current (HVDC) cable. The route is approximately 138km in length and is predominantly located offshore with onshore converter stations, substations and new underground and overhead electricity lines also required in Kent and Suffolk.
- 1.1.2 The Kent section of the Scheme includes the installation of cabling from offshore assets to the landfall point at Pegwell Bay (NGR TR 34517 63625) and a subsequent joint transition bay, approximately 800m inshore, where the cable will transition between offshore and onshore technology. From this point the underground high voltage direct current (HVDC) cabling will run for approximately 2km to a converter station and substation in Minster Marshes to the west (NGR TR 32224 63035). This will be accompanied by the construction of a new high voltage alternating current (HVAC) overhead line, approximately 3.5km in length, which will connect the converter station and substation to the existing Richborough to Canterbury overhead line. It is important to note that the design of the Scheme has not yet been finalised.
- 1.1.3 This assessment is focussed on the onshore elements of the Kent part of the Scheme and does not include any areas of offshore cabling, including the connection through Pegwell Bay to the joint transition bay. The term 'Site' is used in this report to refer to the area within the red line boundary as shown in Figure 1. This includes the four new pylons and overhead lines which will connect Sea Link to the wider energy network.
- 1.1.4 This report has been prepared using Kent Historic Environment Record (KHER) data, Google Earth, LiDAR data from the Environment Agency, existing geotechnical borehole data and relevant primary and secondary sources including published and unpublished reports relating to previous geological, geoarchaeological and archaeological investigations. The intention of the report is to provide information on known sedimentary sequences within the Site, as well as make recommendations for further geoarchaeological work that might be required to mitigate against any potential impacts upon them or inform wider archaeological matters. This report will support preparation of the Environmental Statement for the Scheme and should also be used by the client to guide design and construction planning.
- 1.1.5 This assessment forms part of a wider programme of archaeological investigation which is being undertaken to assess the impact of the Scheme on the Historic Environment. This includes geophysical survey and evaluation trenching, the results of which will be considered in this assessment where relevant.
- 1.1.6 A consultation meeting was held in October 2024 with Simon Mason, the Principal Archaeological Officer at Kent County Council Heritage Conservation Team (KHCT), and Anne de Vareilles, the Science Advisor for Historic England, to discuss key geoarchaeological research aims and confirm the approach for this assessment as outlined in the following sections.

1.2 Location, Topography and Geology

- 1.2.1 The onshore section of the Sea Link Scheme starts near Cottington Hill to the north of the A256 at an elevation of approximately 15m aOD. From this point the proposed cable route runs westwards for approximately 2km through agricultural land to the proposed converter station site where the average ground level is 3m aOD. The existing overhead cables, which will be replaced as part of the Scheme, are located to the west, further into the Minster Marshes, and are aligned northwest to southeast. Plate 1, taken during a recent trial trench



evaluation, shows the topography and land use in the area facing southeast, with the higher ground of the Ebbsfleet Peninsula visible in the foreground and the lower lying Minster Marshes further south.



Plate 1. View of Site facing southeast towards the Minster Marshes

1.2.2 The underlying bedrock geology in the Site is recorded as Thanet Formation, as shown in Figure 1 (BGS Geology Viewer, 2024). This is a sedimentary bedrock which formed between 59.2 and 56 million years ago. The bedrock differs to the north of the Site, being composed of chalk from the Seaford Formation and the Margate Chalk Member. The Quaternary aged superficial geology of northeast Kent is characterised by areas of head deposits and tidal flat or estuarine deposits. The proposed location of the converter station is located within an area of Quaternary clay and silt tidal flats which extend in a wide curving band from the northern coast at Reculver eastwards towards Pegwell Bay, roughly following the course of the River Stour after the town of Sarre. The tidal deposits to the east of the site are characterised by increased sand content reflecting greater marine influence along the coast. There are no superficial deposits recorded in the northeastern part of the Site, with topsoil and subsoil directly overlying the bedrock.

1.2.3 Made ground is not recorded within the Site but is known to be present in the vicinity of Stonelees Golf Club which was built up with reworked ground (Structural Soils, 2024).

1.3 Aims and Objectives

1.3.1 The purpose of this Geoarchaeological Desk Based Assessment is to provide, as far as reasonably possible from existing records and observations, an understanding of the geoarchaeological potential of the deposits within the Site in order to formulate:

- an assessment of the potential for intact stratigraphic sequences to survive within the Site including assessment of previous impacts;



Sea Link – Geoarchaeological Desk-Based Assessment

- an assessment of the significance of the known or predicted deposits considering their geoarchaeological interest;
- an assessment of the potential for deposits with conditions favourable for the preservation of materials suitable for palaeoenvironmental analysis to survive within the Site;
- proposals for any further geoarchaeological investigation.



2 Regulatory and Policy Context

- 2.1.1 The Sea Link Scheme is considered to be a Nationally Significant Infrastructure Project (NSIP) and as such will be delivered through a Development Consent Order (DCO).
- 2.1.2 There is national legislation, planning policy and guidance relating to the protection of, and development on, or near heritage assets. Full information regarding the legislation and national and local planning policies relating to the historic environment which are considered relevant to this Scheme is included in the Cultural Desk Based Assessment (AECOM, forthcoming) which is being prepared for the Scheme.



3 Methodology

3.1 Standards and Guidance

3.1.1 This assessment has been carried out in accordance with the following guidance documents:

- Historic England's 'Environmental Archaeology. A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-Excavation' (Second Edition) (2011)
- Historic England's 'Geoarchaeology. Using Earth Sciences to Understand the Archaeological Record' (HEAG067) (2015)
- Historic England's 'Deposit Modelling and Archaeology. Guidance for Mapping Buried Deposits' (HEAG272) (2020)
- Historic England's 'Piling and Archaeology: Guidance and Good Practice (HEAG270) (2019)

3.2 Data Sources

3.2.1 This assessment will primarily focus on borehole data from within the Site but will draw on geoarchaeological studies from the wider area which are relevant to the development of the Wantsum Channel and its environs, particularly at its eastern end. This approach was agreed with the Principal Archaeologist at Kent County Council and the Science Advisor for Historic England.

3.2.2 The assessment was informed by desk-based research. A site visit has not been undertaken nor purposive geoarchaeological boreholes taken at this time.

3.2.3 The following sources were consulted to inform the presence of important stratigraphic sequences within the Site:

- British Geological Survey borehole data (<https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/>)
- Borehole data from the Sea Link Ground Investigations Factual Report (Structural Soils, 2024)
- The Kent HER for archaeological sites, events, findspots, historic buildings and historic landscape character data. The HER data provided by AECOM and had been ordered in September 2024. Relevant entries are provided in Figure 2
- Relevant primary and secondary sources including published and unpublished reports relating to previous archaeological investigations, geoarchaeological investigations and ground investigation works considered relevant.

3.1 LiDAR

3.1.1 The Environment Agency LiDAR data utilised in this assessment was processed in accordance with Historic England's guidance document 'Using Environment Agency LiDAR data' (2018). In this instance Composite Digital Terrain Model (DTM) data for Ordnance Survey Sheet Kent XXVII.SW and XXVII.SE, surveyed at 1m intervals, was downloaded. The DTM data was processed using the Relief Visualisation Toolkit (RVT) to create a range of visualisations. A multi hillshade visualisation with interpretation is reproduced in Figure 3.



3.2 Geotechnical Data

- 3.2.1 The approach and methodology adopted for the review of geotechnical data is set out in Section 6. Figures 4 – 6 show the locations of the boreholes reviewed, the transects and corresponding sections.

3.3 Assessment of Significance

- 3.3.1 The Overarching National Policy Statement for Energy (NPS E, EN-1) requires an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The NPS E specifies that the level of detail required should be proportionate to the assets' importance, and no more than is sufficient to understand the potential impacts of the proposal on their significance (NPS E, 2023).
- 3.3.2 The significance of heritage assets is defined in terms of their value to this and future generations because of their heritage interest and derives not only from the physical presence of the heritage asset but also from their setting. Heritage interests set out in NPS E draw upon those used in the National Planning Policy Frame (NPPF) and which are defined in Planning Policy Guidance (2019) as:
- **“Archaeological interest:** There will be archaeological interest in a heritage asset if it holds, or potentially holds, evidence of past human activity worthy of expert investigation at some point”. Given that palaeoenvironmental remains are capable of providing a record of human activity and interaction with the changing landscape over time, deposits capable of yielding well preserved and dateable palaeoenvironmental remains can be interpreted as holding archaeological interest whether associated artefacts or features are demonstrably present or not.
 - **“Architectural and artistic interest:** These are interests in the design and general aesthetics of a place. They can arise from conscious design or fortuitously from the way the heritage asset has evolved. More specifically architectural interest is an interest in the art or science of design, construction and craftsmanship and decoration of building and structures of all types. Artistic interest is an interest in other human creative skills for instance sculpture.”
 - **“Historic interest:** An interest in past lives and events (including prehistoric). Heritage assets can illustrate or be associated with them. Heritage assets with historic interest not only provide a material record of our nation's history but can also provide meaning for communities derived from their collective experience of a place and can symbolise wider values such as faith and cultural identity.”

3.4 Assumptions and Limitations

- 3.4.1 Data used to compile this report consists of secondary information derived from a variety of sources. The assumption is made that this data, as well as that derived from other secondary sources, is reasonably accurate.
- 3.4.2 The records held by the Kent HER are not a record of all surviving heritage assets, but a record of the discovery of a wide range of archaeological and historical components of the historic environment, usually driven by development in a particular area. The information held within them is not complete and does not preclude the subsequent discovery of further heritage assets that are, at present, unknown, notably buried assets.
- 3.4.3 The borehole data presented in Section 6 was obtained for the purpose of geotechnical investigations to inform design requirements. Whilst providing sufficient information to characterise deposits within the Site, they have not been taken to address geoarchaeological research questions and as such are unlikely to be of a sufficient resolution to identify smaller scale stabilisation horizons. If any material has been retained from the study, it is unlikely to be suitable for further geoarchaeological analyses including scientific dating.



4 Cultural Heritage Baseline and the History of the Wantsum Channel

4.1 Introduction

- 4.1.1 The following section provides an overview of the formation and development of the Wantsum Channel. It also discusses the known heritage assets within the surrounding area to contextualise the development of the Wantsum Channel as part of the wider historic environment.

4.2 The Wantsum Channel

- 4.2.1 The Sea Link Scheme is partly located within the former Wantsum Channel, a large stretch of water which once separated the Isle of Thanet from the mainland. The channel played an important role in the development of the area throughout history until it ceased to be navigable in the 17th century. Knowledge of its formation and chronological evolution is therefore critical to our understanding of the history of this area of Kent. The channel is referred to as both the 'Wantsum' and 'Wansum' in historical literature, with the name 'Wantsum' being used in this report for consistency.
- 4.2.2 The Isle of Thanet is formed of Cretaceous Upper Chalk which has formed into an uplifted area known as the Thanet Anticline through tectonic folding. The southern edge of this feature slopes into an area of downfold known alternatively as the Richborough syncline (Hubbard, 2021) or the Wantsum syncline (Lawson and Killingray, 2004) which forms a shallow basin that curves from the modern town of Reculver in the north to Ebbsfleet in the east. During the Devensian, the area was subjected to the impacts of the prevailing periglacial conditions, leading to the formation of the numerous dry valleys recorded across the northern, southern and eastern edges of the anticline.
- 4.2.3 At the end of the Devensian glaciation, Britain was joined to the Continent by a broad area of low-lying land which is now the location of the English Channel. The Isle of Thanet was part of a larger area of chalk upland and was considerably further inland than at present. The onset of the Holocene interglacial period led to rapid warming which subsequently caused progressive sea level rise through glacial melt. This in turn led to the submergence of the landmass known as Doggerland which connected Britain and Europe, including the flooding of the English Channel which borders the eastern edge of the Isle of Thanet. As part of this process, the depression to the south of the Thanet Anticline was infilled with sea water creating a navigable passage between the Thames Estuary and the English Channel (the Wantsum Channel) and finalising the process by which the Isle of Thanet was isolated from the mainland. The precise date of this event is unknown, but it is believed to have occurred by the start of the Neolithic period (AECOM, forthcoming).
- 4.2.4 The maximum extent of the Wantsum Channel is generally considered to have occurred during the Roman period based on the extent of the alluvial deposits, however, the chronology of its development is poorly understood. Much of the debate surrounding the Wantsum focuses on its demise rather than formation and leans heavily on information gained from historic sources rather than detailed scientific analyses.
- 4.2.5 Plate 2 shows the proposed extent of the Wantsum Channel during the Roman period, during which the Isle of Thanet was fully separated from the mainland. The siting of the key Roman fortification sites of Reculver (*Regulbium*) and Richborough (*Rutupiae*) at the northern and southern entrances to the channel respectively demonstrate the importance of the channel at this time and shows it to have been of a width and depth suitable for navigation by large vessels. Alluvial deposits indicate that these mouths of the channel would have been approximately 4km and 3km across respectively, reducing to around 1.8km at the narrowest point between Wall End and Sarre (Perkins, 2004). A number of islands are likely to have existed within the channel, including that on which the Roman settlement of Richborough was



located. The translation of the Latin name for Richborough, *Rutupiae*, as ‘muddy estuary’ also gives an indication of what the channel might have looked like at this point (Williams, 2007).

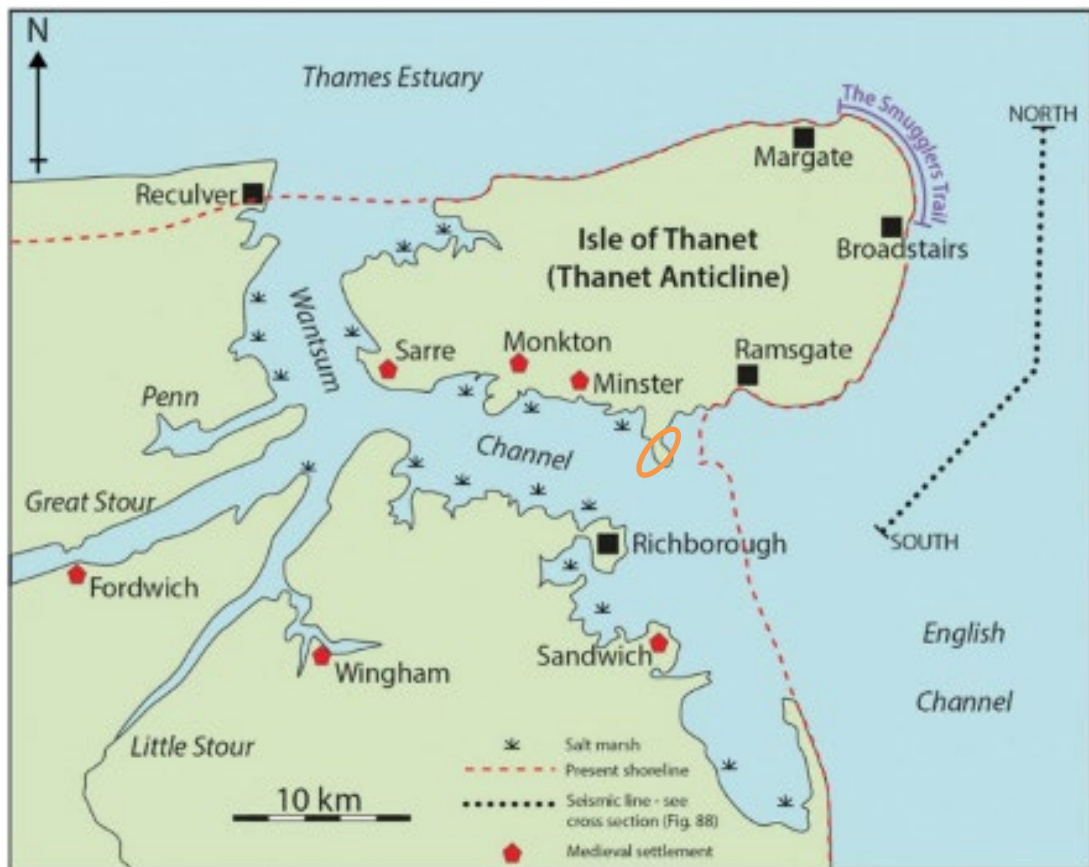


Plate 2. Map of northeast Kent showing the extent of the Wantsum Channel at the time of the Roman occupation (after Hubbard, 2021). Approximate location of the Site circled in orange.

- 4.2.6 A key feature in the development of the Wantsum Channel is the Stonar Spit, known also as the Stonar Bank, Stonar Shingle and Stonar Beach (Dowker, 1897; Perkins, 2007; Moody, 2008; QUEST, 2016). The importance of this feature lies in its role in the subsequent silting and infilling of the channel, with the location and chronology of its development being highly debated yet poorly understood. As the spit grew, tidal scour reduced leading to the build-up of fine sediment behind the spit. As this process of silting increased, mud flats developed, eventually evolving into salt marsh which further trapped sediment (Hubbard, 2021). Although the presence of the spit is agreed on there has been much debate on its formation and subsequent impact on the evolution of the Wantsum. The geologist George Dowker was a proponent of the theory that the spit grew southwards from the Thanet cliffs and largely obstructed the Ebbsfleet entrance to the Wantsum during the Roman period. Evidence has since disputed this, showing that the spit becomes more attenuated the further north it goes (Perkins, 1994). Hardman and Stebbing revisited Dowker's theory in 1940 postulating alternatively that there was a northern and southern entrance to the channel either side of the spit. Bates and Pine (1994) argue conversely that the spit grew northwards from its southern extent.
- 4.2.7 In 1953 Robinson and Cloet published a study on the spit which looked in detail at its formation processes but was only able to provide a tentative chronology, indicating that it post-dated the Neolithic period. Moody (2008) refined this date using sea level data and the work of Devoy (1979) to provide an estimated formation date of the early Bronze Age. A limited number of radiocarbon dates have since been obtained from sequences at Sandwich Business Park (QUEST, 2016) which show accumulation of shingle prior to the late Bronze Age. This work also demonstrated the presence of open water on both sides of the spit during or after the Late Bronze Age/Early Iron Age which is consistent with the Wantsum having been

an open waterway in the Roman period. An additional spit was also concurrently forming further south near Sandwich Bay and adding to the overall changing landscape at the channel entrance (Lawson and Killingray, 2004).

- 4.2.8 It is clear that natural processes contributed significantly to the development of the Wantsum, however, they were not the sole factor responsible for its demise. From the medieval period onwards, human intervention played an increasing role as is borne out through the archaeological record and historic documents. The first historical reference to the Wantsum was made in the 8th century by Bede who recorded it as Uantsumu (Moody, 2008). He described it as being three furlongs long (approximately 600m) and fordable in two locations.
- 4.2.9 The principal anthropogenic influence on the Wantsum Channel is the process of land reclamation, also known as innings. This is the process by which marshland is embanked and drained to create land suitable for farming. The Wantsum Channel is one of many areas of coastal wetland which were subjected to this process with Rippon (2000) claiming that most of the coastal marshes around Northwest Europe were embanked and drained by the 13th century.
- 4.2.10 Land reclamation within the Wantsum Channel may have begun as early as the 11th century when the religious houses of Christ Church and St Augustine in Canterbury were granted land at Minster to create more grazing lands (Andrews et al, 2015). An evaluation at Ebbsfleet recorded marine/estuarine deposits overlain by slowly accumulating alluvium, within which was found a purposeful arrangement of tree limbs, interpreted as a possible revetement (Perkins, 2007). A 12th century date was assigned to this transition on the basis of the pottery present.
- 4.2.11 Physical evidence for the process of reclamation is preserved in the form of The Abbot's Wall, an earthen sea bank which begins just south of Monkton and extends for 7km towards Richborough. The date of this feature is unknown but a reference to the blocking of a creek at Minster around 1293 may refer to its construction (Hasted, 1800).
- 4.2.12 Despite the increase in innings activity, cartographic evidence from 1414 shows the Wantsum to still be navigable at that time. How the channel would have been entered throughout the medieval period is unclear with Hardman and Stebbing (1941) stating that silting around the Stonar bank would have blocked the entry north of the bank (near Ebbsfleet) leaving only the Sandwich entrance. As the 15th century progressed the silting of the Wantsum increased rapidly, particularly around the narrow mid-point at Sarre. In 1485 Henry VII granted an Act of Parliament permitting the construction of a bridge at Sarre to replace the ferry which was only able to operate for an hour a day at high tide (Moody, 2008).
- 4.2.13 The channel remained navigable until the 17th century with the last ship from London recorded as passing through in 1672. Reclamation at the southern part of the channel was effectively completed by the construction of the Stonar Cut in 1770 which by passed the final 11km meander of the river Stour and improved drainage across the reclaimed land to the east (Lawson and Killingray, 2004). The closure of the northern part was finalised by the construction of the wall between Reculver and Westgate in 1808 (Hubbard, 2021).

4.3 Archaeological and Historical Background

- 4.3.1 A Cultural Heritage DBA has been undertaken for the Sea Link Scheme which looks in detail at the archaeological potential of the Site (AECOM, forthcoming). This includes records within a 500m radius of the Scheme (known as the Study Area). A 2km radius was applied to the convertor station, sub-station and OHL in order to provide an assessment of potential setting impacts on designated assets. The key findings are summarised by period below to provide the archaeological context for the development of the Wantsum Channel.



4.4 Prehistoric

- 4.4.1 There is an absence of finds dating to the Palaeolithic period within the Study Area, something which Moody (2008) interprets as being attributable to topsoil loss and scouring during the Devensian.
- 4.4.2 Mesolithic artefacts have been recorded in the lower lying land around the Ebbsfleet Peninsular. As discussed previously, the Wantsum Channel would have been an inland river valley during the Early Holocene which would have been a favourable environment for hunter-gatherer communities. Inundation of the valley by the sea increased as the Mesolithic period progressed eventually leading to the isolation of the Isle of Thanet from the mainland by the start of the Neolithic period (AECOM, forthcoming).
- 4.4.3 Evidence for Neolithic activity has been recorded within the vicinity of the proposed Scheme, particularly around Weatherlees Hill, Cliffs End Farm and Ebbsfleet. Although the evidence available is fairly limited, it has been possible to identify patterns of occupation characterised by settlement on the lower lying areas near to water and tool preparation/working on the higher ground (Andrews *et al*, 2015).
- 4.4.4 There is greater evidence available relating to the Bronze Age occupation of the area, with settlement activity appearing to be focused around the Ebbsfleet Peninsula. Funerary activity is recorded from the Early Bronze Age in the form of a number of round barrows, particularly on the higher ground around Cottingham Hill, and a cremation cemetery at the southern edge of the peninsula. The presence of mortuary activities and hoards within the marshy southern limits of the peninsula is interpreted as representing a landscape of ritual significance. Settlement sites are present from the Mid Bronze Age onwards and are characterised by field systems, holloways and enclosures.
- 4.4.5 Extensive evidence of Iron Age activity is recorded within the Study Area, particularly from the middle of the period, indicating a relatively densely occupied landscape. Features are predominantly recorded in the upland areas and include ditches, trackways and roundhouses. A very large defensive feature has also been recorded on the southern end of the Ebbsfleet Peninsula and within the Site which appears to coincide with a decrease in settlement activity within the area (Andrews *et al*, 2015). Further excavation of the site by the University of Leicester has recovered early Roman artefactual material strengthening the interpretation of the feature as being associated with Caesar's invasion of Britain in 54BC (University of Leicester, 2024).

4.5 Roman

- 4.5.1 Roman activity continues to be extensive within the area with the majority of activity being centred on the higher areas of the Ebbsfleet Peninsula. Features recorded include trackways, field systems, settlement remains and burials. The pattern of activity centred on higher ground within the Wantsum Channel is also borne out through the possible cremation cemetery at Boxlees Hill and the settlement and inhumations at Weatherlees Hill. It is highly possible that both sites were islands within the Wantsum during the Roman Period. It is also important to note the proximity of the important Roman fort of Richborough (*Rutupiae*) to the Site. Occupied from the initial invasion of AD43 to the end of the Roman period, the fort, which was located on an island or promontory within the Wantsum Channel, was a critical defensive location at the gateway to Roman Britain.

4.6 Medieval

- 4.6.1 Evidence for early medieval activity is far less frequent than the preceding Roman period, with the focus of activity appearing to be on the higher ground of the Isle of Thanet. Despite the lack of evidence, documentary evidence suggests that the importance of the area as an entry point to Britain continued through this period with both the earliest landing point of the Anglo Saxons in the mid-5th century and the arrival location of St Augustine in the 6th century both occurring in the vicinity of Pegwell Bay.



- 4.6.2 The archaeological evidence indicates that the Ebbsfleet Peninsula was principally used for agricultural processes in the medieval period with settlement focused further east at Minster and Monkton (Lawson and Killingray, 2004). Land use in the area varied from arable on the higher land of the peninsula to pasture on the lower lands of the Minster Marshes where the process of land reclamation within the Wantsum Channel had begun.

4.7 Post-medieval

- 4.7.1 As in the preceding medieval period, the area around the Ebbsfleet Peninsula appears to have remained largely agricultural in the post-medieval period. Features attesting to this use include sheep pens, a sheep wash, field systems and a stack stand for hay drying. The Tithe map for Minster (1840) also shows a largely agricultural landscape with field systems which largely follow those seen today. The pattern seen in earlier periods of arable farming on the higher ground and pastoral farming on the lower, reclaimed land persists through the post-medieval period.

4.8 Modern

- 4.8.1 The character of the modern assets within the area is largely defensive in nature, particularly relating to the Second World War. As in previous periods, the area around Pegwell Bay and Richborough presented a suitable landing point for an invasion from Europe and as such a large number of defensive features were installed including anti-tank defences, beach scaffolding, slit trenches, pillboxes and anti-seaplane obstacles. These were mainly sited in coastal areas, however, military works and drainage features were also recorded within the Ash Levels adjacent to the River Stour. Aside from these defensive assets, the landscape remained largely agricultural in nature.



5 Geoarchaeological Baseline

5.1 Introduction

- 5.1.1 The following section reviews the spatial and temporal distribution of key deposits both within the Scheme boundary and in the wider Wantsum Channel based on data obtained from the sources listed in Section 3. Despite the potential of a geoarchaeological approach for addressing questions surrounding the formation and development of the Wantsum Channel, only a small number of geoarchaeological investigations have been undertaken in the area. Three of the investigations which are of particular relevance to the Sea Link Scheme are discussed below.

5.2 Excavations at Weatherlees Hill Water Treatment Works

- 5.2.1 An archaeological investigation was undertaken in 1995 on the site of Weatherlees Hill Water Treatment Works (WTW) (Hearne *et al*, 1995) which is located adjacent to the Scheme, on the Ebbsfleet Peninsula. Excavations at the site revealed the presence of deposits with geoarchaeological and palaeoenvironmental potential which were subsequently analysed. Investigations were limited to the top 3m of the sequence due to the constraints of the development.
- 5.2.2 Geoarchaeological analysis of the deposits identified a changing depositional environment at the eastern entrance to the Wantsum Channel characterised by a progressive increase in marine influence over time. The earliest deposits encountered in the sequence were from a terrestrial environment on the margins of the channel. These were subsequently overlain by deposits which demonstrated greater marine influence. Pollen, land snails and diatoms recovered from this layer were all indicative of an upper salt marsh environment. Further marine influence is then seen in the overlying layer which is more consistent with a middle salt marsh environment. Two radiocarbon dates were obtained from the basal layers of the sequence which dated to the Neolithic and Bronze Age periods respectively suggesting an increase in marine influence from the late prehistoric period. However, the reliability of these dates has since been questioned (Long and Scaife, 1995) based on the possibility of the materials analysed having been reworked from earlier deposits.
- 5.2.3 Despite the lack of reliable dating, the work at Weatherlees Hill demonstrates the information that can be obtained from using a geoarchaeological approach to reconstruct depositional histories and site formation processes for the Wantsum and its environs.

5.3 The Richborough Connection Project

- 5.3.1 Investigations have also been undertaken in the area of the Wantsum Channel for the Richborough Connection Project (RCP). The archaeological mitigation strategy for this project included a large scale geoarchaeological investigation which aims to characterise and analyse the sedimentary sequences within the former Wantsum Channel (Archaeology South-East, 2020). This included a transect of 36 boreholes which followed the line of the channel from the Nethergong Penn Valley, roughly at the midpoint of the channel, to the eastern entrance to the channel near to Ebbsfleet.
- 5.3.2 The project is currently at the post-excavation stage with the results discussed below being those produced during the post-excavation assessment. Further work is planned to enable more detailed environmental analysis of key deposits to be undertaken. An enhanced programme of radiocarbon and optically stimulated luminescence (OSL) dating has also been proposed to further tighten the chronology of the channel developed during the initial phases of mitigation.
- 5.3.3 Due to the large scale of the borehole transect, it has been subdivided into smaller sections to aid interpretation. The section closest to the Site includes boreholes 52 to 60 and is called the Ash Levels section. The focus of this review will therefore be on this section, although it is



acknowledged that the results of the wider study will need to be incorporated into any further geoarchaeological investigations for Sea Link.

- 5.3.4 Most boreholes in the Ash Section contained a significant sand component leading to poor recovery. This differs to the preceding boreholes and demonstrates the increasing marine influence at this end of the channel. The exception was borehole 60 (BH60), located approximately 900m southeast of the proposed Sea Link converter station site, which contained far less sand and has been interpreted as representing either channel edge deposits or a small, sheltered estuary of the Wantsum Channel.
- 5.3.5 The undated basal layer of BH 60 shows evidence for reworking of the Thanet Sands. This is overlain by a peat layer which has been radiocarbon dated to the late Mesolithic. Pollen counts were generally low in this deposit; however, they did include lime (*Tilia* sp.) pollen which somewhat supports the proposed Mesolithic date. Diatoms were present in this deposit and were indicative of saltmarsh conditions.
- 5.3.6 The peat layer is overlain by undated organic silts which are interpreted as representing the development of 'brackish mudflats and saltmarsh at a location peripheral to the main Wantsum Channel'. The diatom assemblage showed a shift from benthic dominated assemblages to plankton dominated assemblages suggesting an increase in open marine water influence over time.
- 5.3.7 These are in turn overlain by more laminated silts indicative of more consistently waterlogged deposits. The environmental proxies within these silts suggest the beginnings of outer estuarine formation with further marine influence, a trend which increases over time. A medieval date has been assigned to these deposits through OSL dating. As there are only a limited number of dates from BH60 it is difficult to accurately reconstruct formation processes through time, however if the underlying organic silts are considered to be prehistoric in date, then it is possible that a significant period of erosion occurred in the intervening period. This is tentatively linked to the actions of coastal barriers such as the Deal and Stonar Spits at the time.
- 5.3.8 The chronology again requires clarification for the overlying post-medieval minerogenic deposits; however, they appear to suggest an environment of brackish mud flats and salt marsh followed by the final silting of the Wantsum. The uppermost deposits of the sequence are characterised by fine silts containing an outer estuarine microfauna but of very small individuals and juveniles washed in or redeposited by tides. Freshwater influence is also suggested at the top of the sequence.
- 5.3.9 In summary, the sequences recorded in the boreholes from the Ash Levels section of the Richborough Connection project demonstrate the complexity of formation processes at the eastern end of the Wantsum channel. They also demonstrate the value of geoarchaeological investigations in reconstructing this changing depositional environment.

5.4 Geoarchaeological Investigation for the Sea Link Scheme Kent Section

- 5.4.1 A programme of trial trenching was undertaken for the Sea Link Scheme (Stantec-Oxford Archaeology 2024) within the area proposed for the permanent works associated with the cable route and the area of the converter station and temporary works areas required for construction compounds and access. The evaluation identified sequences of geoarchaeological interest warranting further investigation. Deeper test pits were therefore dug within seven of the trenches with geoarchaeological potential with the aim of examining the lithostratigraphic sequences along the wetland edge between the Minster Marshes and the Ebbsfleet peninsula. Sequences typical of wetland edge environments were recorded in all test pits, with those within the lower lying marshes being characterised by deep sequences of clayey alluvium intercalated with stabilisation horizons (former soils). These differed to the sequences on the higher ground of the Ebbsfleet Peninsula which were characterised by thin sequences of colluvium (hillwash) and/or head deposits.



- 5.4.2 Trenches 91 and 92 both contained potential channel deposits with sharp, irregular and undulating lower contact boundaries interpreted as representing channel cutting within an erosive environment on the Ebbsfleet Peninsula. The channel fills were homogenous and unstratified in nature indicating formation through low-energy gradual alluvial silting after the initial higher energy cut and scour. This channel is considered to have archaeological significance due to its potential as a routeway between the Wantsum Channel and the large defensive ditch 90m east which is thought to date to the Roman conquest of Britian.
- 5.4.3 A bulk sample of the channel fill has been taken, along with three monolith samples, to enable more detailed analysis to be undertaken. This includes the identification of materials suitable for radiocarbon dating with the aim of providing a date for the period in which the channel was active. This will then feed into the results of the wider programme of geoarchaeological investigation proposed in this assessment.
- 5.4.4 The Stantec-Oxford Archaeology (2024) report also summarises the archaeological and geoarchaeological findings from wider work in the area including Ebbsfleet Lane Pipeline (Andrews et al 2009) and East Kent Access Road (Andrews et al 2015).



6 Review of Geotechnical Data

6.1 Introduction

- 6.1.1 Ground investigation works have been undertaken separately to inform the design constraints for the Sea Link Scheme (Structural Soils, 2024). This included 13 cable percussion boreholes ranging in depth from 1.20m to 32m and a further five cable percussion boreholes which were extended by rotary drilling. These were between 26m and 41m deep. The data from these boreholes has been used in conjunction with records from the BGS GeoIndex Onshore Tool to produce six transects across the Site (Figures 4 – 6), the aim of which is to characterise the deposits present across the site in order to assess their potential and significance. It is noted that the boreholes, having been taken for geotechnical purposes do not have the same focus or resolution in description needed for detailed geoarchaeological interpretation, however they have proved capable of providing useful information on depths and types of key strata which will help to guide future targeted work.

6.2 Methodology

- 6.2.1 The cross sections (Figures 5 and 6) were produced using Civil3D in conjunction with geological data obtained via the OpenGround interface plugin. Borehole data and geological information were imported directly from OpenGround. Plans showing borehole locations, section transects, and other contextual site details were prepared using AutoCAD (ACAD). Civil3D was used to generate and visualize the cross-sections based on the borehole data along the selected transect lines.
- 6.2.2 The location of the transects has been determined by the availability of borehole data and the research aims of the assessment. Longsection 1 (Figure 5) runs on a northeast to southwest alignment through the proposed converter station site and up onto the higher ground where the cable route will be located. The aim of this transect is to characterise the changing nature of the sequences from the higher ground, down into the body of the channel. This will help to assess the extent of deposits with geoarchaeological potential both within the channel and at its margins.
- 6.2.3 Sections 1 to 5 (Figure 6) are focused on the proposed converter station site and have been created with the aim of assessing the extent of any channel fill deposits, identifying any potential stabilisation horizons and mapping any variations in depth across the channel, particularly the presence of any (as yet unknown) islands/ previously raised ground suited to human exploitation or settlement.

6.3 Exclusions and Limitations

- 6.3.1 Boreholes were excluded from the geological sections if they were deemed too far from the selected section lines to provide meaningful data. Generally, boreholes within 100m of the transect lines were included, while those beyond this threshold were excluded to maintain section accuracy.
- 6.3.2 Cone Penetration Test (CPT) data was not used in the development of the geological sections. Although CPTs provide information on tip resistance, sleeve friction, and pore pressure, they do not consistently provide reliable lithological details to interpret the encountered material. CPT results are primarily used to assess parameters such as soil strength, relative density, shear strength, and consolidation characteristics, but the available data lacked sufficient resolution for lithology determination.
- 6.3.3 Trial pit data was only included when directly associated with a nearby borehole. Isolated trial pits were excluded due to their typically shallow investigation depths, which were deemed insufficient for providing the level of subsurface detail required for geological section construction in this case.



- 6.3.4 Potential organic horizons were identified but material described as only "slightly organic" in the logs was excluded. This was to maintain a focus on more clearly organic-rich layers and those subject to periods of stabilisation and past soil formation processes that have raised archaeological/ geoarchaeological potential. Examples of descriptions excluded from those defined as organic horizons include:
- "Firm brown silty clay with rootlets and decaying organic matter."
 - "Firm grey slightly sandy organic clay."
 - "Soft bluish-grey clayey silt with abundant semi-rotten organic material and rare shell fragments."
 - "Frequent organic wood fibres and rootlets present."
- 6.3.5 Where logs did not designate a geological formation to the material encountered, a review of the stratum descriptions across the available boreholes was conducted to designate a geological formation to the material to ensure consistency across the sections. The interpretation of geological sections was supplemented with regional geological mapping and stratigraphic data from the British Geological Survey (BGS) to ensure the sections aligned with expected subsurface conditions in the area. This included validation of identified lithologies against published descriptions for the region
- 6.3.6 It is important to note that the geological sections shown in Figures 5 and 6 represent a simplified interpretation of subsurface conditions based on available data. Interpolation between boreholes introduces an element of uncertainty, particularly in areas with sparse data. Additionally, the resolution of the sections is limited by the density and quality of borehole information.

6.4 Newhaven and Seaford Chalk Formations

- 6.4.1 Chalk bedrock is recorded as the basal deposit in a number of boreholes primarily to the east of the Site, in the golf course, and to the south of the Site, in historic boreholes within and around the Weatherlees Hill Wastewater Treatment Works (Plate 3). This is recorded as Newhaven Chalk Formation overlying Seaford Chalk Formation at greater depths.
- 6.4.2 Chalk is recorded in three boreholes (BH204, BH501 and REDP-BH-8) within the Site. The top of the Chalk is at -25.51 aOD (27m below ground level) at the eastern most of these (BH5021), rising to -16.71 aOD (24m below ground level) in the centre of the Site (BH204) and rising further still to -6.96 (9.97m below ground level) at the eastern boundary of the Site (REDP-BH-8). The Chalk in the boreholes to the east of the golf course is at a similar level to that recorded in REDP-BH-8.

6.5 Thanet Formation

- 6.5.1 The Thanet Formation is present in the lower sequence for all boreholes, overlying the chalk where reached. The top of the Thanet Formation is between 6.99 and -8.01 m aOD (0.30m and 9.50m below current ground level) and directly overlies the Chalk or is still apparent at the base of the boreholes where Chalk was not encountered (i.e still present to a depth of between -7.50 and -24.13m aOD (15.45 and 25.45m below current ground level)). Where the full sequence of the Thanet Formation was present in BH204 it was 23.7m thick. The Thanet Formation is equally thick in the boreholes recovered in the western part of the Site but in the eastern part of the Site, and to the east of the Site in the golf course, the solid Chalk geology is overlain by a relatively thin layer of Thanet Formation, between 0.80m and 2.93m thick. This is indicative of the change in topographical position into the edge of the Isle of Thanet.
- 6.5.2 In the convertor station area, the top of the Thanet Formation is around -3.64 to -8.01m aOD (5.00 to 9.50m below ground level). On the higher ground the boreholes circled in green on Plate 4 found Thanet Formation directly below the topsoil.



- 6.5.3 The RCP boreholes indicated reworking of the Thanet Formation but did not provide a date for this event. The nature, timing and processes involved in the contact between the Thanet Formation and (significantly more recent) overlying silts should be clarified through further geoarchaeological investigations in the area.

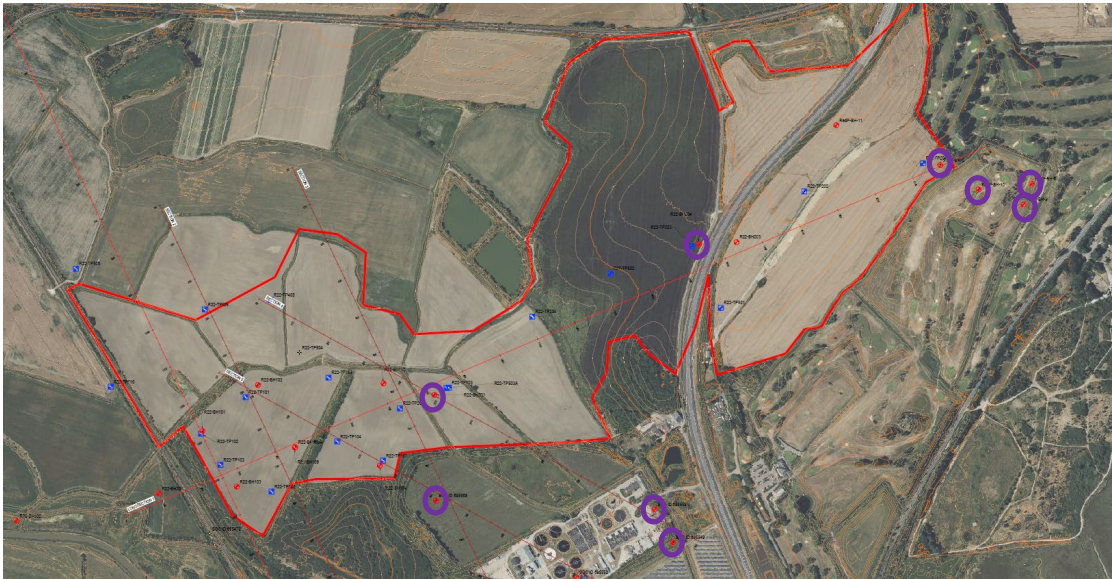


Plate 3: Plan of boreholes and transects. Thanet Formation was record as the basal fill except those circled in purple where chalk was recorded.



Plate 4: Plan of boreholes and transects. Thanet Formation was record directly below the topsoil in the boreholes circled in green.

6.6 Fine grained minerogenic deposits

- 6.6.1 Fine grained minerogenic deposits dominate the Quaternary age sequence within the Site and can be summarised as follows:
- The clayey silts and silts are described in the GI logs as tidal flats. The description is consistent with BGS descriptions for the area. However, it should be noted that the term is also likely to have been applied to the alluvial deposits arising from and filling the Wantsum channel and any other palaeochannel deposits within the Site.

- Fine grained minerogenic deposits are present in all boreholes within the convertor station site – as would be expected within the Wantsum channel. Similar deposits are also recorded in the eastern part of the Site (REDP-BH-8) and those to the east of the Site in the golf course, perhaps indicating the presence of tidal flat deposits which would be consistent with the location of this area adjacent to Pegwell Bay.
- No information can be gleaned from the borehole logs on the nature of the contact between the Thanet Formation and more recent (Quaternary age) alluvium and/or tidal flat deposits. In the Stantec-Oxford Archaeology test pits (see below) the contact was recorded as sharp, irregular and undulating, interpreted as representing channel cutting within an erosive environment on the Ebbsfleet Peninsula. This was on the channel edge and seems to relate to the smaller palaeochannel rather than the main body of the Wantsum. LiDAR on Figure 3 shows the approximate edge of the channel and the former palaeochannels that flowed into the Wantsum.
- The deposits in the western part of the Site within the channel are laterally consistent across the channel profile with the boreholes circled in blue on Plate 5 all exhibiting a similar thickness and depth. The top of this deposit is recorded between 0.96m - 1.23m aOD (between 0.25m and 0.4m below ground level). The top of the alluvium was recorded at 1.86m aOD (0.9m below ground level) in Borehole 502, which is the furthest west and further into the former channel, but this is below modern made ground, potentially indicating some previous truncation at this location. The sequence described for Borehole 204 and REDP-BH-11, to the east and adjacent to the A256, contained no alluvium, with the Thanet Formation rising up and the modern soil profile lying directly on top of the Thanet Formation (see Plate 4). Clearly there was significantly less Holocene channel influence, erosion and deposition across this area and a transition to no fluvial/ estuarine influence somewhere between the two locations, but the location and nature of that transition and any edge sequences of interest requires clarification given the distance between Borehole 501 and 204.
- Alluvium/ tidal flat deposits reappear in some of the boreholes further to the east, as circled in orange in the Plate 6. The proximity of BH 203 (with alluvium/ tidal flat deposits) to BH 204 (which has no alluvium/ tidal flat deposits) is of interest and indicates the presence of a second palaeochannel or overbank flooding around a topographic barrier (rising chalk/ chalk not cut by channel) or represent tidal flat deposits of a former coastline. It is noted that although the GI logs do sometimes separate the fine grained minerogenic layers on the basis of lithology and/ or inclusions, the descriptions are not detailed enough or geoarchaeologically focussed to be able to provide more nuanced interpretation of changing process, channel influence and periods of stabilisation over time as was possible for the RCP borehole 60 and further targeted investigation is warranted.



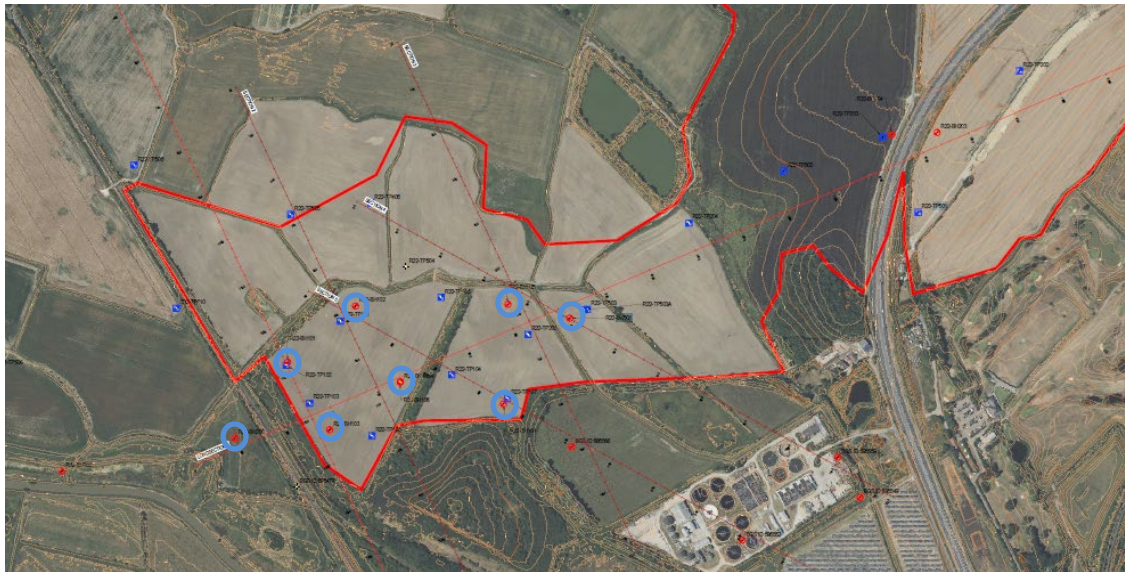


Plate 5: Plan of boreholes and transects. Those circled in blue are laterally consistent and all exhibit similar thickness and depth.



Plate 6: Plan of boreholes and transects. Alluvium/ Tidal Flat Deposits were identified in those boreholes circled in orange.

6.7 Stabilisation horizons

6.7.1 Presence/ absence of stabilisation horizons i.e. those with evidence of lack of submergence and start of soil formation/ weathering process such as marshland peat formation and soil horizons have been a particular focus in examination of the GI borehole logs and the following is noted:

- Generally, there is a lack of information on substantial organic inclusions and horizons within the borehole data. To a degree this is expected to be a facet of data/ descriptive resolution and lack of focus on soil features such as structure and bioturbation rather than a true absence. The purposive geoarchaeological work reported by Stantec-Oxford Archaeology (2024) for instance identified clayey alluvium intercalated with stabilisation horizons and the RCP (Archaeology South-East, 2020) reported thin layers of land snail



rich deposits within the alluvium, seemingly *in-situ*. These were interpreted as possibly representing episodes of stabilisation and terrestrialisation within the dominantly floodplain/mudflat environment. Absence across the wider area covered by the GI borehole survey is therefore unlikely. However, it is expected that substantial bodies of peat in particular would have been described if present and it can be assumed these are therefore absent in the borehole locations. However, RCP BH60 included a humified peat layer at approximately 6.95-7.55m aOD close to the Site, demonstrating survival is possible in the area, potentially in isolated pockets unaffected by later channel activity and scour

- The presence of fine organic material was noted in some boreholes and have been marked on the sections (Figures 5 and 6) where relevant. There is no clear pattern to presence other than the majority occur within the top 5m and may therefore relate to recent establishment of deeply rooted taxa such as reeds and grasses. Again, resolution and lack of geoarchaeological descriptors are likely to factor and further investigation is required.

6.8 Made Ground

6.8.1 Modern disturbance in the area is represented by made ground, with or without a modern soil profile and can be summarised as follows:

- Deep deposits of made ground (between 1.7m and 9.8m deep) are recorded in boreholes to the east of the Site, in the golf course, overlying alluvium/ tidal flat deposits and are likely to be associated with reclamation / landscaping associated with creation of the golf course.
- Three other boreholes within the Site and to the west recorded relatively thin layers of made ground (between 0.3m and 0.9m deep) above alluvium/ tidal flat deposits and are likely to represent land reclamation/ stabilisation or previous truncation.
- The archaeological DBA (AECOM, forthcoming) suggests past use of the area has been dominantly agricultural and these findings and general lack/ shallow disturbance (excluding the golf course) supports that. The Holocene sequences are therefore demonstrably largely intact and undisturbed by modern activity.

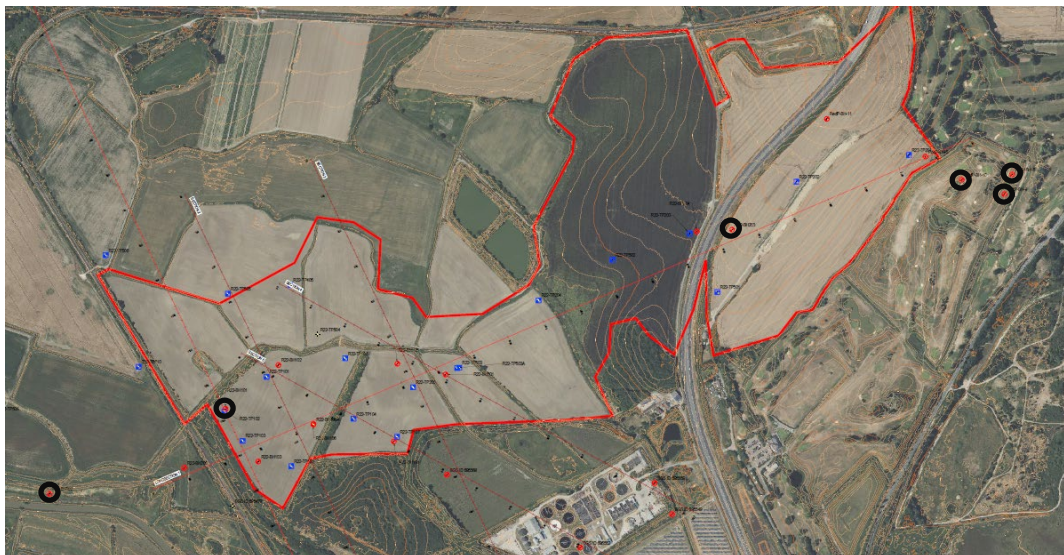


Plate 7: Plan of boreholes and transects. Made ground was identified in those boreholes circled in black.

7 Statement of Significance

7.1 Introduction

- 7.1.1 The following section sets out the geoarchaeological and palaeoenvironmental potential of the Site and the potential significance of any known, and as yet unknown, deposits and sequences. Questions from the local research framework that these deposits and sequences could contribute towards are also set out. Archaeological potential and significance are briefly touched on but are fully considered within the Archaeological Desk Based Assessment (AECOM, forthcoming).

7.2 Stratigraphic Sequences (Known and Potential)

- 7.2.1 The fine grained minerogenic deposits described above dominate the sedimentary sequence within the Site and relate predominately to activity of the known Wantsum channel. The history of the channel, and its importance for human activity in the region including navigation make it of particular interest. There is the potential for quaternary deposits within the Site to increase our knowledge and understanding of past sea level changes, environmental conditions and the formation, use and disuse (due to silting up and reclamation) of the channel. These deposits also have the potential to provide information on the character and use of the surrounding landscape throughout history.
- 7.2.2 The information gleaned from the GI borehole survey shows the presence of deep waterlogged sequences capable of preserving both organic archaeological remains and palaeoenvironmental indicators of a changing landscape and human activity within it. The resolution and lack of geoarchaeological focus in description means that the presence of ephemeral organic and other stasis horizons indicative of former marsh and land surfaces (and so of raised archaeological/ geoarchaeological interest) cannot be identified nor ruled out at depth, although such layers have been identified within the upper sequence during trenching and elsewhere locally (including for the RCP). There may also be important archaeological remains within the minerogenic sediments with the possibility of trackways, jetties, and boats being present.
- 7.2.3 The potential significance of any such layers cannot as yet be fully gauged using the currently available data but it is suggested the deposits and paleoenvironmental contents could be of up to regional significance and there is a low chance of higher value (nationally significant) archaeological remains to be preserved within these deposits within the Site. Variability in terms of presence, preservation, value and depth of both key deposits and remains is to be expected and where impact will be substantial and at depth (for example the converter station), further focussed investigation is required.

7.3 Local Research Frameworks

- 7.3.1 The South East Research Framework (SERF) aims to identify key gaps in the current knowledge about the South East's historic environment and produce a research agenda and strategy which addresses these areas. The sequences within the Site have potential to contribute to many of these research questions and themes including:
- Understanding of the onset of flooding in the lower reaches of river valleys and the nature of the landscape transformation resulting from this transgression
 - Determining the nature and speed of inundation of the landscapes during the early Holocene
 - Timing of early Holocene pine expansion
 - Timing of early Holocene hazel expansion and investigation into potential links with Mesolithic activity



Sea Link – Geoarchaeological Desk-Based Assessment

- Can the 8.2 ka event be confidently identified in palaeoenvironmental sequences in south-east England and what relationship does this have with the Early-to-Mid-Holocene vegetation transition?
- How do the region's palaeoenvironmental records relate to the landscape archaeological record?
- The potential for targeted prospective survey of valley edge, flood plain and periglacial landforms to recover further palaeoenvironmental sequences and establish derived regional models for environmental change
- Plotting sea level change in the Southeast over time
- Plotting coastal change over time, based on sea level change
- Development of maritime settlements in relation to each other and to sea level and coastal change
- Development of harbours and landing places in relation sea level and coastal change and development of maritime settlements
- Use of geoarchaeology for landscape investigation
- Maximising the potential of palaeoenvironmental studies from the Anglo-Saxon period by targeting gaps in off-site sequences and by dating existing sequences more closely
- The reclamation of wetlands: the methods used, the resultant field patterns and management systems and the impact on the population and economy of the area
- Determining the basic character of the Roman landscape using pollen and soil samples (The Roman landscape is poorly understood in terms of vegetation and coastline)



8 Statement of Effect

8.1 Introduction

- 8.1.1 This section assesses how the Scheme will impact on important stratigraphic sequences using the available design and construction information. It is important to note that the design of the Scheme has not yet been finalised.

8.2 Proposed Development

- 8.2.1 There are multiple elements required for the proposed Scheme in order to fulfil its aim of reinforcing the transmission network between Suffolk and Kent.
- 8.2.2 A 2km HVDC cable route is planned from the joint transition bay to the converter station. This will require the excavation of a trench with a minimum width of 2.3m within a larger stripped easement of approximately 40m, which includes the temporary haul road. The depth of the cable trench will be approximately 1.5m.
- 8.2.3 Initial ground investigation works have shown the fine grained minerogenic deposits within the proposed site of the converter station to be of insufficient strength to support standard foundations. The design requirement will therefore be for bored and cased piles into the Thanet Beds at a depth of approximately 15-25m. The spacing between piles is anticipated to be small.
- 8.2.4 The Scheme also includes the replacement of approximately 2.2km of existing HVAC overhead lines. An additional 1km of overhead lines will also be constructed to enable the connection of the converter station to the existing Richborough to Canterbury overhead lines. Any new pylons are likely to be installed on piled foundations of a similar depth to those proposed for the converter station.
- 8.2.5 The Scheme is likely to involve intrusive landscaping, the details of which are not yet available. This could include, but is not limited to, tree planting, screening mounds, attenuation basins and flood defence barriers.
- 8.2.6 Additional groundworks will also be required for the ancillary features associated with construction such as site compounds and haul roads, including that required for transportation of piling equipment to the converter station. Although the detailed designs for these features are not yet available, a recommendation has been made for the use of a capping layer across the site for general areas and roads.
- 8.2.7 All scheme elements within the former channel have some potential to impact upon the uppermost portion of the Holocene age sedimentary sequence (and palaeoenvironmental remains within it) and superficial archaeological remains. Standard archaeological mitigation on any archaeological remains or deposits of raised potential, up to 2m below current ground level, such as peat beds would be feasible. No such remains or deposits were recorded in evaluation trenching to 0.9m, (Stantec-Oxford Archaeology 2024), however several scheme elements will require excavation to c.2m, so there is a gap in understanding on the potential of deposits at 1-2m depth. The converter station element is expected to have an impact on deeply buried waterlogged deposits and remains due to the closely spaced and deep piles required. Here standard archaeological mitigation would be problematic given the depth and saturated nature of potential deposits of raised palaeoenvironmental or archaeological interest.

8.3 Scale and Significance of Impact

- 8.3.1 Although the detailed design is not yet available, it is clear therefore that the proposed works have the potential to impact sequences and deposits of interest in the region of the converter station where the piling is likely to be of a depth and density sufficient to equate to total loss of



in-situ geoarchaeological and palaeoenvironmental evidence in that footprint. The potential for impact on archaeological remains or deposits of raised potential such as peat beds across the wider scheme is lower given the absence of remains recorded within the top 0.9m of the sequence during evaluation trenching (Stantec-Oxford Archaeology 2024) but further investigation of deposits at 1-2m depth is required. The lack of previous development and modern disturbance other than shallow agricultural impacts on the Site increases the likelihood of these deposits remaining intact. It is also likely that any organic remains (if present) would have survived well in these deposits and would be removed by construction of deeper elements of the Scheme.

- 8.3.2 In addition to the impacts identified above, it is also important to consider the hydrological implications of piled foundations. The proposed location for the convertor station is within low lying ground within the former channel of the Wantsum, therefore increasing the possibility of there being conditions conducive to the preservation of waterlogged archaeological remains and paleoenvironmental indicators. The Historic England guidance document on Piling and Archaeology (HEAG270) highlights the lack of conclusive evidence around the chemical impact of pile concrete on such deposits. Depending on the local hydrological conditions and the nature of any waterlogged deposits, there may be potential for leaching of pile grout/concrete which may have a local impact on the groundwater.
- 8.3.3 Changes to local hydrology may also occur depending on the types of piles used. This could lead to dewatering of previously waterlogged deposits resulting in the loss of palaeoenvironmental indicators, such as plant macrofossils and pollen grains, which are preserved in anoxic conditions. The extent of such effects cannot be quantified based on the information currently available but could be extensive in terms of reach and magnitude given the intensity and scale of piling for the Scheme.
- 8.3.4 It is worth noting that the Wantsum channel and associated deposits are extensive and that while the proposed works will have localised impacts which require mitigation, those impacted deposits represent a small proportion of the available material. Much of the seemingly heterogenous sedimentary sequence would remain and therefore offer future opportunities to study the palaeoenvironmental context.



9 Recommendations for Further Work

9.1 Introduction

- 9.1.1 This section outlines measures suitable for mitigating the loss of stratigraphic sequences and deposits within the Site which have the potential to enhance our understanding of past landscape change through geoarchaeological and palaeoenvironmental analysis.

9.2 Recommendations for further work

- 9.2.1 The results of this assessment have clearly demonstrated that works associated with the Sea Link Scheme have the potential to impact stratigraphic sequences which hold high geoarchaeological and palaeoenvironmental potential in the footprint of the converter station. Data obtained from geotechnical boreholes has provided an indication as to the nature and extent of deposits across the Site as a whole, but is not sufficient to address the questions posed in a geoarchaeological study. On the basis of this, a purposive geoarchaeological borehole study is recommended, with a focus on the converter station and any other deep (below 1m) construction impacts.
- 9.2.2 This study should be designed to investigate site formation processes across the channel, including at its edges, and should be of sufficient scale to enable 3D modelling and predictive mapping of high potential strata to be undertaken.
- 9.2.3 A key aim of this study should be the recovery of palaeoenvironmental remains, which are expected to survive well in the alluvial channel deposits. This should include, but is not limited to, pollen, charcoal, plant macrofossils, microfauna, molluscs, foraminifera and diatoms, the latter of which are particularly important when reconstructing past marine and coastal environments.
- 9.2.4 The recovery of materials suitable for radiocarbon or OSL dating should also form an integral part of the study. As discussed previously in this assessment, the chronology of the formation and evolution of the Wantsum is surprisingly poorly understood, with much reliance being placed on the information held in documentary sources rather than being based on the results of scientific dating methods. This survey therefore presents the opportunity to develop a chronology for this part of the Wantsum to better understand its development in relation to its wider archaeological context.
- 9.2.5 In order to explore further the potential for preservation of archaeological remains at depth within the area of piling for the converter station, consideration should also be made of the viability of undertaking targeted electrical resistivity tomography (ERT) and/ or ground penetrating radar (GPR) geophysical survey within the proposed footprint. These systems are capable of identifying changes between layers and types of material e.g. between alluvium and wood and to a greater depth than achieved using magnetometer geophysical survey. However, it should be noted that the depth, clay content and heavily waterlogged nature of the deposits may mask features and limit the interpretation.
- 9.2.6 Although a strategy for further investigation has been proposed here, the full scope for any further investigations should be determined in agreement with the Principal Archaeological Officer at Kent Council and the Historic England Science Advisor.



10 Conclusion

- 10.1.1 This assessment has included a review of a comprehensive range of available sources, in accordance with key industry guidance, to identify the known and potential sequences and deposits with geoarchaeological potential located within the Site and its environs which may be affected by the Scheme.
- 10.1.2 The landscape of the Kent coastline has undergone significant change throughout the Holocene, knowledge of which is critical to our understanding of past human activity in the region. The formation and evolution of the Wantsum Channel is of particular interest to northeastern Kent where it once separated the Isle of Thanet from the mainland and formed an important routeway between the Thames Estuary and the English Channel. From the Roman period onwards the extent of the channel declined through a process of natural silting exacerbated by land reclamation processes.
- 10.1.3 Mapping and interpretation of borehole records from the route of the Sea Link Scheme has demonstrated the presence of intact sedimentary sequences which have the potential to provide a record of the evolution of the Wantsum Channel and to contain deposits suitable for the preservation of archaeological artefacts and palaeoenvironmental indicators.
- 10.1.4 The construction of the cable route which runs from the transition bay to the converter station is likely to result in the loss of deposits to a depth of approximately 2m. These deposits include key transitional sequences at the channel margin. The greatest depth and intensity of impact will occur on deposits within the site of the converter station which will be installed using closely spaced piled foundations. The density of the piles is of a scale equivalent to total loss of intact sedimentary sequences within its footprint. These sequences have raised geoarchaeological potential and as such should be investigated appropriately in advance of any intrusive groundworks.
- 10.1.5 The proposed strategy for further investigation includes targeted ERT and/ or GPR geophysical survey within the converter station footprint and a purposive geoarchaeological borehole study which can be used to produce a more detailed deposit model for the Site. This will also allow for higher resolution analysis of the stratigraphic sequences enabling the identification of key transitional deposits and stabilisation horizons. Scientific dating of these events can be used to provide a chronology for landscape change within this part of the Wantsum, something which is currently poorly understood. Environmental analyses including pollen, plant macrofossils, molluscs, diatoms and foraminifera should also be used as part of a multi-proxy approach to reconstructing geomorphological and environmental change in the area. The role of natural and anthropogenic influences on this change can also be addressed through the work.



11 References

AECOM. Forthcoming. Sea Link. Volume 6. Environmental Statement. *Cultural Heritage Desk Based Assessment*. Unpublished Client Report

Andrews, P, Egging Dinwiddy, K, Ellis, C, Hutcheson, A, Phillpotts, C, Powell, AB & Schuster, J 2009, *Kentish Sites and Sites of Kent: a miscellany of four archaeological sites*. vol. 24, Wessex Archaeology, Salisbury.

Andrews, P., Booth, P., Fitzpatrick, A. P., & Walsh, K. 2015. *Digging at the Gateway*. Oxford: Oxford Archaeology and Wessex Archaeology.

Archaeology South-East. 2020. *A Geoarchaeological Borehole Transect from the National Grid (Richborough Connection Project) Development Consent Order 2017 (as amended). A Post-Excavation Assessment and Updated Project Design Report*. Client report reference 2019110.

British Geological Survey, BGS. 2024. BGS Geology Viewer. Available at: <https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/> (Accessed 17/10/2024)

Department for Energy Security and Net Zero (2024) Overarching National Policy Statement for Energy (EN-1). Available at <https://assets.publishing.service.gov.uk/media/65bbf6dc709fe1000f637052/overarching-nps-for-energy-en1.pdf>

Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2019) *Planning Policy Guidance – Historic environment*. Available at <https://www.gov.uk/guidance/conserving-and-enhancing-the-historic-environment>

Devoy, R.J.N. 1979. Flandrian Sea-level changes and vegetation history of the lower Thames Estuary. *Philosophical Transactions of the Royal Society of London* B285, 335-407

Dowker, G., 1897. On the landing place of St. Augustine. *Archaeologia Cantiana* 22, 123-143

Dowsett, A, Margretts, A, Hill, T, Krawiec, K, Bates, M, Whittaker, J, Allison, E, Walker, T, Toms, P, Neveu, E, and Blinkhorn, E. Forthcoming, 13000 years of natural & human-induced landscape change in the Wantsum Channel, Kent,

French, C. 2015. *A Handbook of Geoarchaeological Approaches for Investigating Landscapes and Settlement Sites*. Studying Scientific Archaeology 1. Oxford: Oxbow Books

Hardman, F.W. and Stebbing, W.P.D. 1940, Stonar and the Wantsum Channel - Part 1 – Physiographical. *Archaeologia Cantiana* 55, 62-80

Hardman, F.W. and Stebbing, W.P.D. 1941, Stonar and the Wantsum Channel - Part 2 – Historical. *Archaeologia Cantiana* 55, 62-80

Hasted, E. 1800. *The History and Topographical Survey of the County of Kent*. (2nd edn) Canterbury: W Bristow

Heame, C., Perkins, D.R.J, and Andrews, R. 1995. The Sandwich Bay Wastewater Treatment Scheme Archaeological Project 1992-94, *Archaeologia Cantiana* 115, 239-354

Historic England. 2018. *Accessing Environment Agency LiDAR Tiles from the Web* [Online] Available at <https://historicengland.org.uk/content/docs/research/using-ea-lidar-data-pdf/> (Accessed 01/10/2024)

Historic England. 2011. *Environmental Archaeology: A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (second edition)*. Available at <https://historicengland.org.uk/images-books/publications/geoarchaeology-earth-sciences-to-understand-archaeological-record/> (Accessed 01/10/2024)



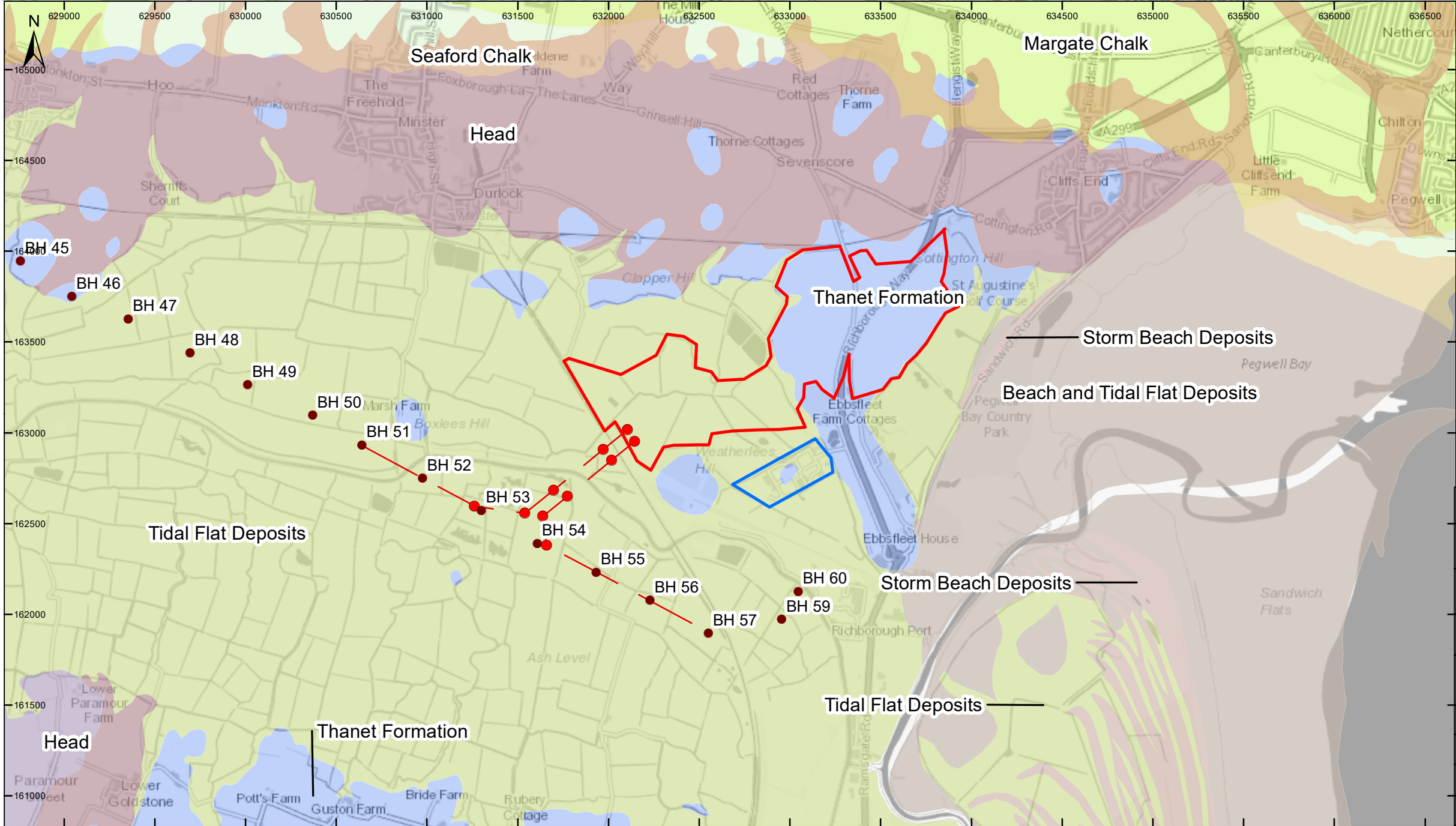
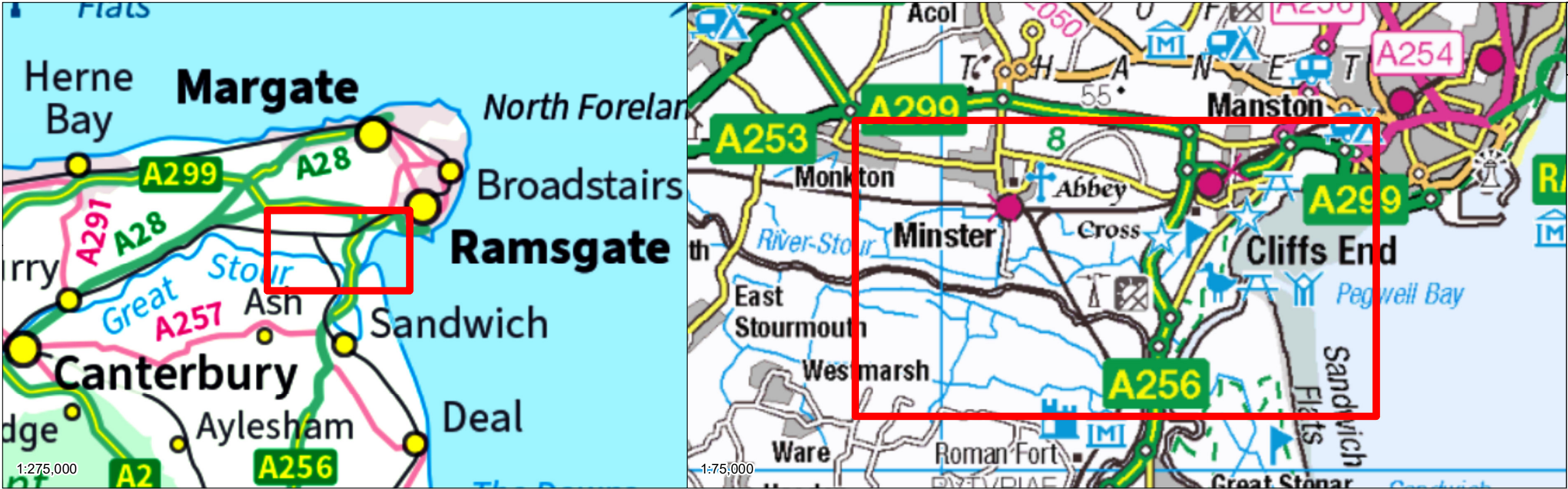
Sea Link – Geoarchaeological Desk-Based Assessment

- Historic England. 2015. *Geoarchaeology: Using Earth Sciences to Understand the Archaeological Record*. HEAG067. Available at <https://historicengland.org.uk/images-books/publications/geoarchaeology-earth-sciences-to-understand-archaeological-record/> (Accessed 01/10/2024)
- Historic England. 2019. *Piling and Archaeology: Guidance and Good Practice*. HEAG270. Available at <https://historicengland.org.uk/images-books/publications/piling-and-archaeology/heag270-piling-and-archaeology/> (Accessed 01/10/2024)
- Historic England. 2020. *Deposit Modelling and Archaeology: Guidance for Mapping Buried Deposits*. HEAG272. Available at <https://historicengland.org.uk/images-books/publications/deposit-modelling-and-archaeology/> (Accessed 01/10/2024)
- Hubbard, R. J. 2021. Thanet Anticline's shifting shorelines: two millenia of change. Available at [Thanet Anticline's shifting shorelines: two millenia of change – Deposits \(depositsmag.com\)](https://depositsmag.com/Thanet-Anticline-s-shifting-shorelines-two-millenia-of-change/) (Accessed 17/10/2024)
- Lawson, T. and Killingray, D. (eds). 2004. *An Historic Atlas of Kent*. Chichester: Phillimore & Co.
- Long, A.J. and Scaife, R.G. Radiocarbon dates from Weatherlees Hill WTW- Implications for relative sea-level movements, in Hearne, C., Perkins, D.R.J. & Andrews, P. 1995. The Sandwich Bay Wastewater Treatment Scheme Archaeological Project, 1992-1994. *Archaeologia Cantiana*, 115, 320-322.
- Ministry of Housing Communities and Local Government. 2023. *National Planning Policy Framework*. Available at <https://www.gov.uk/government/publications/national-planning-policy-framework--2>
- Moody, G. 2008. *The Isle of Thanet*. Stroud: Tempus Publishing
- Perkins, D. R. J. 2007. The long demise of the Wantsum sea channel. *Archaeologia Cantiana* vol 127
- QUEST. 2016. Proposed Biomass Combined Heat and Power Plant, Discovery Park Sandwich, Kent. *Geoarchaeological Desk-Based Assessment*. Unpublished Client Report
- Rippon, S. 2000. *The Transformation of Coastal Wetlands*. Oxford: Oxford University Press
- Stantec-Oxford Archaeology, 2024. *Sea Link Scheme – Kent Section. Archaeological Evaluation Report*. Unpublished client report. Report ref XKTSLK24.
- Structural Soils, 2024. *Sea Link Feed – Kent Onshore Cable Link. Factual report on preliminary ground investigations*. Unpublished client report
- University of Leicester. 2004. In the Footsteps of Ceasar. Available at: <https://le.ac.uk/archaeology/research/big-antiquity/in-the-footsteps-of-caesar>. (Accessed 17/10/2024)
- Williams, J. H. (ed) 2007. *The Archaeology of Kent to AD 800*. Woodbridge: The Boydell Press and Kent County Council



Appendix A Figures

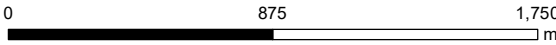




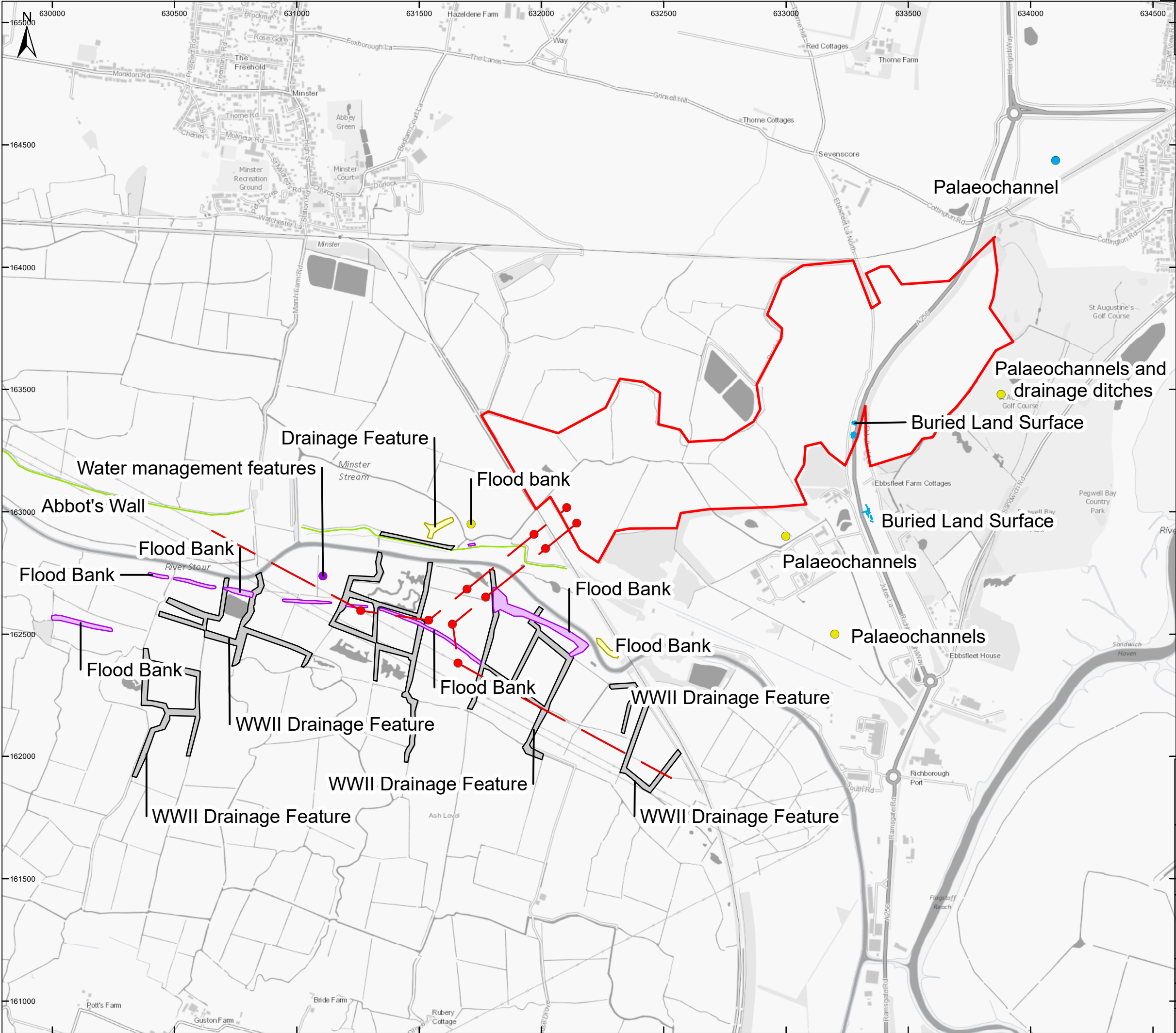
- Study Area
- New overhead lines
- New pylons
- Weatherlees Hill Water Treatment Works
- Richborough Connection Project Boreholes

Contains OS data © Crown Copyright and database right 2020
Contains OS data © Crown Copyright and database right 2022.

SEA LINK
Site Location and Geology



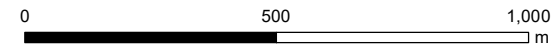
1:25,000 @ A3	16/01/2025
Drawn: VR	Checked: CB
Figure: 1	Rev B



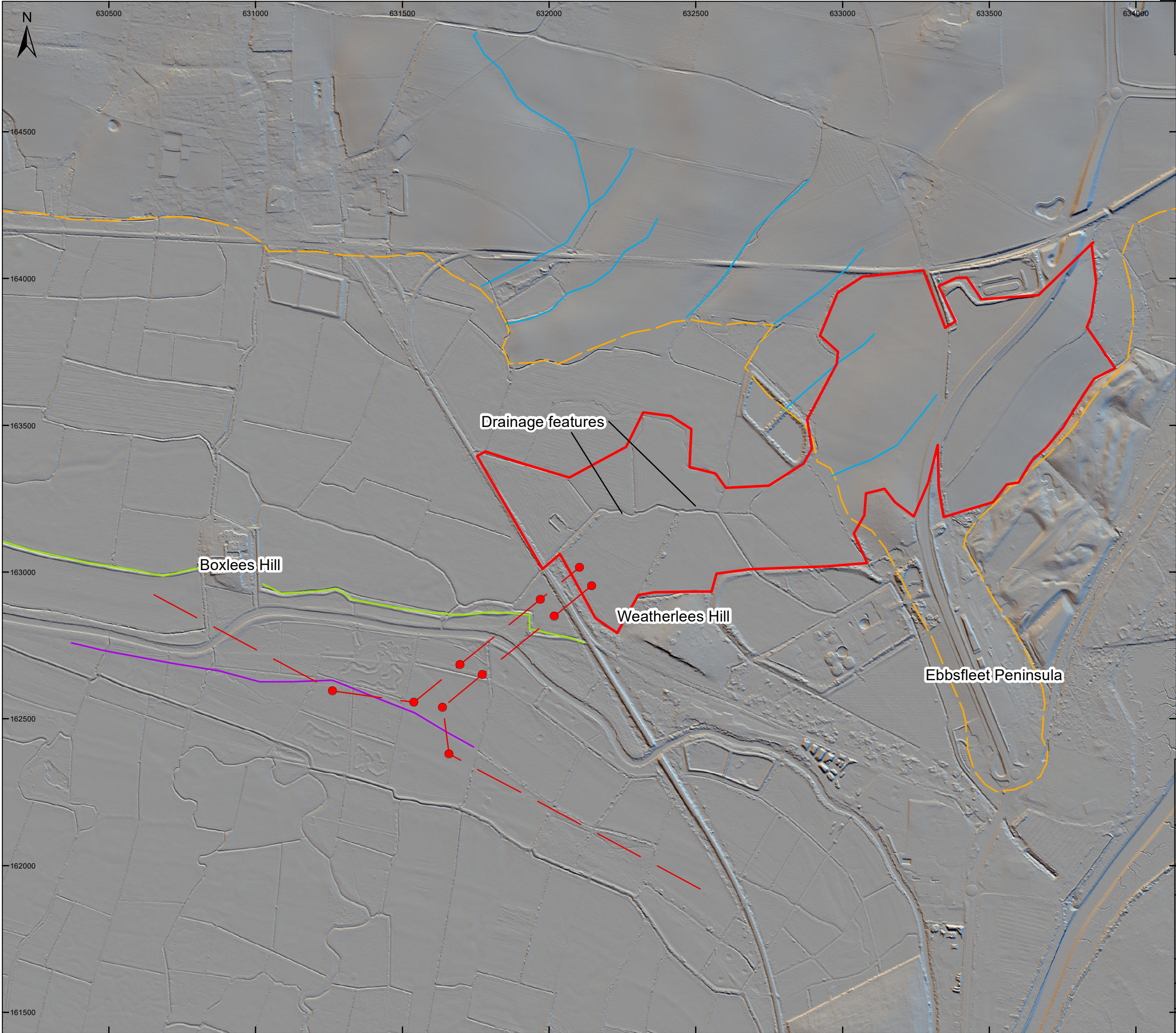
- Study Area
- New Overhead Lines
- New Pylons
- Non-Designated Heritage Assets**
 - Prehistoric
 - Medieval to Post Medieval
 - Modern
 - Unknown
- Prehistoric
- Medieval to Post Medieval
- Unknown
- Medieval

Contains OS data © Crown Copyright and database right 2020.
Contains Kent Historic Environment Record data obtained from Kent County Council

SEA LINK
Non-Designated Heritage Assets



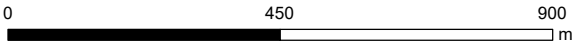
1:15,000 @ A3	Date: 27/11/2024
Drawn: VR	Checked: CB
Figure: 2	Rev A



-  Study Area
-  Sea Link New Pylons
-  Sea Link New Overhead Lines
-  Abbot's Wall Flood Bank (medieval)
-  Channel Margin
-  Flood Bank (post-medieval)
-  Palaeochannel

Contains OS data © Crown Copyright and database right 2020.
Contains public sector information licensed under the Open Government Licence v3.0

SEA LINK
LiDAR



1:12,500 @ A3	Date: 16/01/2025
Drawn: VR	Checked: CB
Figure: 3	Rev B



Notes:

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

Issue Status

This document is suitable only for the purpose noted above. Use of this document for any other purpose is not permitted.

Stantec

Stantec UK Limited
Reading
Caversham Bridge House, Waterman Place, Reading,
Berkshire RG1 3EN
Tel: +44 1189 500 761
www.stantec.com/uk

Copyright Reserved

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing. Any error or omission shall be reported to Stantec, without delay. The Contractor shall design and construct the works in full compliance with the design and drawings. The Contractor shall design and construct the works in full compliance with the design and drawings. The Contractor shall design and construct the works in full compliance with the design and drawings.

Client/Project:
NGET - SEA LINK

DC
Dwn

VR
Dgn

CB
Chkd

2024.11.22
YYYY.MM.DD

Title
Location of transects

Project No.
331201545

Scale
1:25,000

Revision
1

Drawing No.
Figure 4

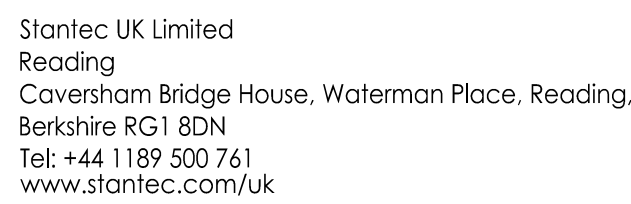
Drawn by: J. Smith (J.Smith@stantec.com) Date: 2024.11.22
Checked by: J. Smith (J.Smith@stantec.com) Date: 2024.11.22
Designed by: J. Smith (J.Smith@stantec.com) Date: 2024.11.22
Reviewed by: J. Smith (J.Smith@stantec.com) Date: 2024.11.22
Approved by: J. Smith (J.Smith@stantec.com) Date: 2024.11.22



-  Topsoil
 Made Ground
 Alluvium
 Thanet Formation
 Thanet Formation Base Bed Member Bullhead Bed
 Newhaven Chalk Formation
 Seaford Chalk Formation
 Presence of Organic Material Noted
 ? — Base of Superficial Deposit

NOTE: The position of any existing public or private sewers, utility services, apparatus shown on this drawing is believed to be correct, but no warranty to this effect is implied. Other such plant or apparatus may also be present but not shown. Contractor is therefore advised to undertake their own investigation where the position of any existing sewers, services, plant or apparatus may affect their operations.

This document is suitable only for the purpose noted above.
Use of this document for any other purpose is not permitted.



Copyright Reserved

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing - any errors or omissions shall be reported to Slantec without delay.

The Copyrights to all designs and drawings are the property of Slantec. Reproduction or use for any purpose other than that authorized by Slantec is forbidden.

NGET - SEA LINK

DC	VR	CB	2024.11.22
Dwn	Dsgn.	Chkd.	YYYY.MM.DD

Project No.
331201545

Scale
1: H 1:2500. V 1:500

Revision	Drawing No.
1	Figure 6

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152
nationalgrid.com