VikingCCS

Viking CCS Pipeline

Environmental Statement Volume IV – Appendix 8-2: Aerial Review and LiDAR

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Harbour Energy | AECOM

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Prepared by		Verified by		Approved by
AJ		CC		NM
Associate (Air Photo Services)		Director (Air Photo Services)		Heritage Technical Director (AECOM)

Prepared by:

Air Photo Services

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1 Assessment of Airborne Remote Sensing and Satellite Imagery Data for Archaeology

1.1 Introduction

1.1.1 This appendix of the Environment Statement (ES) presents the specialist assessment of airborne remote sensing and satellite imagery data over the DCO Site Boundary of the Viking Carbon Capture and Storage (Viking CCS) Pipeline (the "Proposed Development" and its immediate adjacent environs, in Humberside and Lincolnshire, UK.

1.1.2 The assessment includes consideration of historic and modern aerial photographs, visualised Light Detection and Ranging (LiDAR) data which are also known as Airborne Laser Scan (ALS) data, and satellite imagery and modern aerial imagery.

1.1.3 The airborne remote sensing and satellite imagery data analysis is interrelated with other environmental effects and so this chapter should be read in conjunction with the Viking CCS Environmental Statement, and in particular ES Volume II Chapter 8: Historic Environment (Application Document 6.2).

1.1.4 This chapter is supported by:

- **Figure 1**: Site Location**;**
- **Figure 2**: Historic England Aerial Photographs;
- **Figure 3**: Cambridge University Collection of Aerial Photography Aerial Photographs**;**
- **Figure 4**: National Mapping Programme Coverage**;** and
- **Figure 5**: Lidar Data Coverage.
- **Figure 6** Geology;
- **Figure 7** Soils;
- **Figure 8** Mapbook Index; and
- **Figure 9** Mapbook.

1.1.5 The Gazetteer of sites is presented in **Table 1**.

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520000 530000 540000 550000

410000 400000 390000

N

Grimsby Roads
Hawke Channel
Mouth of the River Humber
Immingham
Grimsby
Cleethorpes
Lincolnshire Wolds

1:125,000 @ A3

1 0.5 0 1 2 3 4 5 km

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PROJECT

Viking CCS Pipeline

LEGEND

DCO Site Boundary

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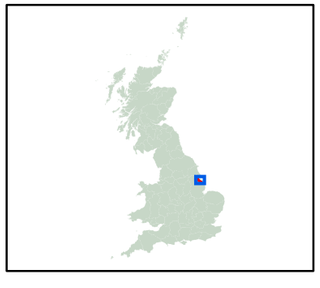

FIGURE TITLE

Figure 1
Viking CCS Pipeline Project Location

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_001_SiteLocation.mxd

1.2 Legislation, Policy, and Guidance

Legislation and Policies

1.2.1 The Legislation and Planning Policies which are relevant to this appendix are listed and discussed in detail in ES Volume II Chapter 8: Historic Environment (Application Document 6.2).

Guidance

1.2.2 The airborne remote sensing and satellite imagery data assessment has been carried out in accordance with standards set for LiDAR data visualisation and interpretation by Historic England (2018) (Ref 4), Bennett et al (2012) (Ref 1), and Štular et al (2012) (Ref 6) and Hesse (2010) (Ref 5) alongside Historic England National Mapping Programme (HE) (NMP) flexible standards for interpretation and mapping from aerial photographs and project standards developed by Air Photo Services Ltd to levels accepted by Local Authority heritage curators.

1.2.3 The standards set out by Evans (2019) (Ref 3) for the HE NMP Technical Standards Review were adhered to in the context of all data acquisition, processing, interpretation, and mapping.

1.3 Aim, objective, and scope of the assessment

Aim

1.3.1 The assessment aims to provide archaeological information by non-intrusive means to support ES Volume II Chapter 8 Historic Environment (Application Document 6.2).

Objective

1.3.2 The objective of this assessment is to provide information on the location and nature of buried, relict and upstanding archaeological and historic landscape features using airborne remote sensing and satellite imagery data.

Scope

1.3.3 The assessment scope covers all prehistoric and historic time periods, from earliest prehistory to modern times. It includes all areas of Medieval fields, regardless of condition, multi-period defensive features and Modern service trenches where visible.

1.3.4 It records all visible features which appear on aerial and satellite imagery at the times of capture as:

- Marks in growing crops over buried features;
- Marks in soil where buried features are visible on the ground surface;
- Relict and upstanding earthworks such as banks and ditches which are also visible as surface microtopography *via* visualised LiDAR data Digital terrain Models (DTMs);
- Buried and relict foundations;
- Upstanding structures and intact foundations; and
- Features which may affect the appearance of the sea in the intertidal zone and considers coastal erosion factors which are visible since the mid-20th century on historic aerial imagery.

1.3.5 It also considers the effect and visibility of geomorphological features which affect the appearance of the substrate and crops at times which may mask or partially mask archaeological features.

1.3.6 Features which have been built over since their recording from the air are noted and mapped.

1.3.7 The most recently observed condition of all features is noted in the Gazetteer of Sites in **Table 1**.

1.4 Sources of data which were analysed for the assessment

Historic England (HE) Archive

1.4.1 Paper based copies of all vertical, military oblique and specialist oblique aerial photos held at the HE Archive were examined in detail in the HE Public Search Room, by Air Photo Services Ltd in March and April 2023. The locations of these photos are shown on **Figure 2.** HE coversearch enquiry number 138509 which was undertaken in March 2023 provided access to:

- 66 specialist obliques taken between 1953 and 2000 by a variety of specialist aerial archaeological surveyors;
- 4 military obliques taken in 1940 and 1941 by the Royal Air Force (RAF); and
- Over 750 frames, including stereo pairs, of vertical aerial photos held as prints in the archive which were taken by the RAF, Fairey Surveys Ltd (FSL), Meridian Airmaps Ltd (MAL) and the Ordnance Survey (OS) between 1946 and 2000.

1.4.2 Modern digital specialist oblique aerial photographs were accessed *via* the HE Aerial Photo Explorer at: https://historicengland.org.uk/images-books/archive/collections/aerial-photos/

The Cambridge University Collection of Aerial Photography (CUCAP)

1.4.3 The CUCAP collection continues to be closed for digitisation, but a coversearch was obtained online at: [redacted]. The location of the CUCAP photos within the DCO Site Boundary and environs are shown on **Figure 3**. Some of these photos are available as copies in the HE Archive, and all were used as appropriate by the Lincolnshire National Mapping Programme (LNMP).

Lincolnshire National Mapping Programme (LNMP)

1.4.4 Royal Commission on the Historical Monuments of England (RCHME, now Historic England) LNMP covered the majority of the site boundary and environs as shown on **Figure 4**. The Inner Humber NMP is ongoing to date within a very small portion of the north of the site boundary near Immingham.

1.4.5 This assessment considers and presents raster format mapping data generated by the LNMP which were derived from the digitised versions of the hand drawn OS map quarter sheets which cover the DCO Site Boundary and the immediate environs.

1.4.6 Lincolnshire NMP was undertaken between 22 June 1992 and 1 December 1996 using hand drawn non-digital mapping. This project comprised full mapping with the exception of cropmarked eroded Medieval fields which it did not include.

1.4.7 The OS quarter sheet LNMP overlays which cover the DCO Site boundary and environs are available from HE as scanned raster format georeferenced files. These were uploaded to the project Geographic Information System (GIS) for comparison to the original aerial photograph sources and subsequent full enhancement and completion from the 27 years' worth of additional data which were collected after the LNMP project finished in 1996. The LNMP data are included in this assessment within a separate Shapefile.

1.4.8 The LNMP data are available for viewing only at:

https://historicLengland.org.uk/research/results/aerial-archaeology-mapping-explorer/

Online Aerial and Satellite-Derived Images

1.4.9 Since 1999, digital mosaics of multiple timelines of georeferenced aerial photographs have been uploaded to geoportals such as Google Earth and at Bing.com. The dates attributed to these images are not 100% assured or authenticated, but for heritage survey purposes this has no legal implication in this instance. They are available in real time as open-source imagery online, with some copyright requirements. The imagery may change when new sources are uploaded.

1.4.10 All available online aerial and satellite derived images which constitute the open-source mosaics of aerial imagery displayed on Google Earth and Bing.com/Maps (aerial and birds-eye if available) were consulted for this survey. All timelines available on these geoportals were systematically consulted and accessed between 1 and 30 April 2023. Following magnification, relevant images were captured at the highest resolution using the 'save-image' function in Google Earth Pro or a screen snipping tool. They were saved, labelled, and filed for geo-referencing.

1.4.11 Summer timelines at Google Earth were very helpful in the recording of cropmarked buried sites, particularly the cropmarked areas of eroded ridge and furrow which were not previously recorded by LNMP.

1.4.12 Airborne Laser Scan (ALS) data, otherwise known as Light Detection and Ranging (LiDAR) data are collected for multiple environmental and engineering survey purposes. The types and locations of ALS surveys are shown on **Figure 5**. These data were processed in accordance with standards set by Historic England (2018) (Ref 4) Bennett *et al* (2012) (Ref 1), Štular *et al* (2012) (Ref 6) and Hesse (2010) (Ref 5). An optimum LiDAR survey date for recovery of micro and macro topographic heritage data spans late November to mid-March in the northern hemisphere. This is when leaf canopy and vegetation are at their lowest and a higher proportion of bare earth is exposed in both woodland and open areas to ensure that the laser pulses reach and return to and from the ground in sufficient density to record topography to create an accurate and detailed DTM.

1.4.13 Aerial images displayed at Bing Maps was used in the same manner but with the limitations that there was a restricted single view timeline and less flexible image capture mechanisms. The Microsoft 'snipping tool' was used to capture the relevant images which generally were not as informative as the comprehensive timeline datasets at Google Earth.

1.5 Assumptions and limitations

Historic and modern aerial photographs

1.5.1 The assumption that aerial photographic survey and vertical and oblique aerial photographs show all features and will reveal a complete archaeological record in any given area is erroneous. This is due to many interactive survey, seasonal, environmental, meteorological and perception and interpretation issues which are set out below.

1.5.2 Interpretation of aerial photographs relies either on visual identification of the effect heritage assets have on crops and other vegetation, marks in soils, visible features or earthworks which are more visible at times of clear low light.

1.5.3 It is important to note that aerial photographs usually only show part of the horizontal and vertical extent of buried and upstanding features. Their capacity to reveal features as cropmarks, vegetation marks, soil marks or as the shadows cast by banks, ditches and walls, depends upon several environmental and agricultural factors prevalent at the time of the photographic survey. It is possible for many years' photography over one site to show nothing at all, and then during one instance of survey to reveal complex buried cropmark

features. The direction of light at the time of photography, with reference to shadows cast and crop or soil marked features highlighted, can also affect the visibility of features on aerial photographs. Unlike digitally processed LiDAR and other data, the azimuth of the sun cannot be changed on a conventional aerial photograph.

1.5.4 Past and present land use also presents limitations to visibility of features. A cropped arable regime of cereals often allows the formation of cropmarks, whereas grassland, unless seen in times of extreme moisture stress, can mask the appearance of buried features. The time of year is thus important in gaining maximum benefit from aerial photographic sorties. In winter, the low leaf index and lower light angle assists visibility of topographic and earthwork features. In summer, ripening crops, often from April through to harvest in July/August, may show differential marks over buried features. Dry conditions will often cause parching in grass, which will then reveal areas of former foundations as the grass dies over the harder less moisture retentive buried features.

1.5.5 Following harvest, weathering, and ploughing, marks in soil often show where buried archaeological deposits are being actively ploughed and brought to the surface.

1.5.6 In this area of Lincolnshire, the arable areas have been intensively eroded by ploughing. The areas of lighter shallow soils over well drained substrates are conducive to the formation of cropmarks over buried heritage assets. This also applies more marginally on heavier soil areas in times of greater soil moisture deficits.

1.5.7 In constructing a comprehensive interpretation of the archaeological landscape, it is essential to examine a range of photographs, taken under a variety of environmental conditions, as has been done in this case.

1.5.8 The aerial photographs taken in the 1940s often recorded extant landscapes which have been altered or carry evidence for pre-modern fields. These historic photos provide a starting point for the assessment of landscape change, in conjunction with the study of historic maps and modern aerial and satellite-derived imagery and LiDAR data.

1.5.9 The remit of past oblique aerial surveys, the survey areas chosen and the visibility of sites to the aerial archaeologist can often determine the content and coverage of oblique aerial photography. Observer led flights may be heavily biased and may miss features which were present but were not seen or recorded. This area has been surveyed carefully by aerial archaeologists and subject to detailed mapping by the LNMP, but some extensive additions and clarifications to former mapping and interpretations have been made as expected from post 1996 sources.

1.5.10 It is also important to note that the perception of the environment and expectation of what is to be found may often limit the air photo analyst’s mental ‘openness’ to features. This perception factor is mitigated by repeated examination of imagery taken in different years and under different conditions, and by teamwork between two or more interpreters checking the data. 'Photo fatigue' is also a factor in drop-off rates of discovery or perception of features. It is mitigated by alternating activities and personnel, checking interpretations with other team members, and taking adequate visual breaks.

Online aerial photographs and satellite-derived images

1.5.11 Google Earth regularly uploads new images and attributes some images with the name of the provider and a date of capture. These dates are not verified, but for archaeological survey this is not a legally essential element of the metadata. The issue with data derived from geoportals such as Google Earth is that they change and are added to; it is a dynamic collection of varied mosaiced dated images and varied resolutions of data derived from aerial photography and satellite imagery. During 2017-2018, Google began to capture its own data, and these layers are largely ‘unattributed’ in terms of provider. The main UK providers to Google Earth include Getmapping, Infoterra and Bluesky, The GeoInformation

Group, Maxar and CNES/Airbus. The mosaic 'cuts' where images have been blended together and captured in different seasons are readily apparent, often within the same 'timeline' data.

Aerial Imagery Limitations: Conclusion

1.5.12 Aerial photograph assessments are often based on sequences of historical imagery which provide a series of 'snapshots' of the landscape under different conditions. In contrast, LiDAR and multi-spectral data are typically gathered at a single or series of closely spaced points in time. Levelled features which are now only visible as cropmarks are not usually visible *via* LiDAR data unless they are recorded as substantially differing vegetation heights within a DSM, or the features causing the cropmarks are still extant as micro topographic differences in the ground surface.

1.5.13 The limitations of these data sources are appreciated and considered during survey and use of multiple data sources. Multiple times of survey increases the discovery rate and certainty of interpretation from all airborne data sources when they are examined concurrently.

LiDAR Data

1.5.14 Whilst of excellent high resolution, sometimes LiDAR data are not gathered at an optimal time for specific heritage survey purposes, as they are provided to serve the needs of multi-disciplinary surveys. A lower resolution survey captured during the winter months very often provides more data due to the lack of intervening vegetation which prevents sufficient laser points from reaching the ground surface. A low density of vegetation and leaf canopy is essential to the effectiveness of LiDAR survey in that it ensures maximum penetration of light signals to the ground surface in vegetated areas.

1.5.15 The LiDAR data are, however, of assistance in recording some micro and more macro topographic features which may indicate relict or extant archaeological features and historic landscapes. They were used over the survey area in multiple visualisations alongside the aerial photographs and satellite image data. LiDAR data are best interpreted and used in conjunction with modern and historic aerial photographs and maps to provide ground truth information, and this was achieved in this survey.

1.5.16 For LiDAR data captured during 'leaf/crop on' conditions, less data is recorded due to foliage and vegetation masking the route of the laser. Similarly, areas of water will absorb the laser giving no returned points.

1.5.17 The majority of the NLP LiDAR data were collected between October 2022 and March 2023, with varied dates for smaller surveys.

1.5.18 When the point cloud is processed into a DTM, reduced ground coverage results in a simplified geometry surface interpolated from the few available data points which can obstruct features of interest.

1.5.19 The horizontal cell resolution of LiDAR data can also influence the detection rates of archaeological features. This can occur where the spacing of point measurements is sufficiently wide to conceal or reduce the visibility of small archaeological features. This may have affected this assessment in areas where LiDAR data were gathered at 2m, 1m and 50cm resolutions as opposed to the more detailed 25cm resolution data. It is also important to note that LiDAR visualisation techniques are continually developing and advancing. The multiple visualisations now applied to DSM and DTM data *via* the RVT used for this survey are effective in heritage interpretation. Hillshade, and particularly fixed-direction Hillshade, visualisations do not show the correct position of the actual features, only the position of their virtual 'shadows' on the ground. It is thus important to use multiple visualisations of LiDAR data to ensure accurate positioning of recorded features and optimise the results.

Lincolnshire Historic Environment Record (LHER) data

1.5.20 These data were uploaded to the project GIS to provide concordance data for the assessment and included some mapping from aerial photographs provided by Alison Deegan in the northern part of the site and its environs.

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

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520000 530000 540000 550000

410000

400000

390000

N

Grimsby Roads

Hawke Channel

Mouth of the River Humber

Immingham

Grimsby

Cleethorpes

Humberston

New Waltham

Louth

Lincolnshire Wolds

1:125,000 @ A3

1 0.5 0 1 2 3 4 5 km

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LEGEND

- DCO Site Boundary
- Military Oblique Aerial Photographs
- Oblique Aerial Photographs
- Vertical Aerial Photographs

NOTES:

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FIGURE TITLE

Figure 2
Historic England Aerial Photographs

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

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520000 530000 540000 550000

410000 400000 390000

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Grimsby Roads
Hawke Channel
Mouth of the River Humber
Immingham
Grimsby
Cleethorpes
Louth
Lincolnshire Wolds

1:125,000 @ A3

1 0.5 0 1 2 3 4 5 km

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LEGEND

- DCO Site Boundary
- Cambridge University Collection of Aerial Photography Aerial Photographs

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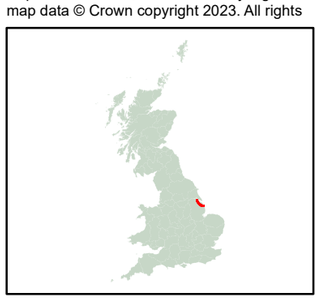

FIGURE TITLE

Figure 3
Cambridge University Collection of Aerial Photography Aerial Photographs

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

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N

Grimsby Roads

Hawke Channel

Mouth of the River Humber

Lincolnshire Wolds

1:125,000 @ A3

1 0.5 0 1 2 3 4 5 km

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LEGEND

- DCO Site Boundary
- Inner Humber NMP
- Lincolnshire NMP

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FIGURE TITLE

Figure 4
National Mapping Programme Coverage

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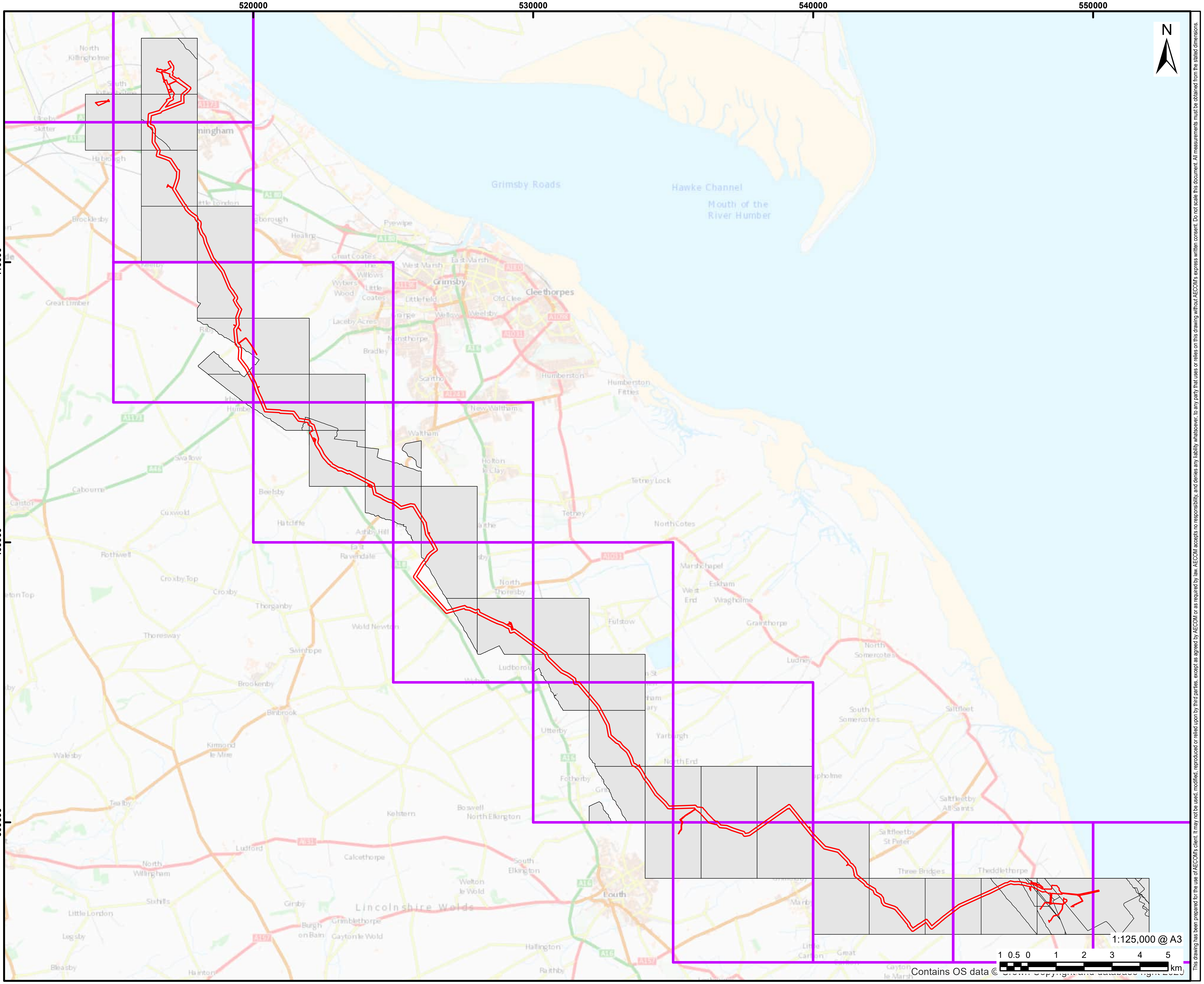

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LEGEND

- DCO Site Boundary
- Environment Agency Lidar Coverage
- National Lidar Programme Coverage

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FIGURE TITLE

Figure 5
Lidar data coverage

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

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1.6 Assessment Methodology

Overview

1.6.1 In this location, the LNMP data are detailed and accurate, but were completed 27 years ago to a more limited standard and required checking and updating to modern sources.

1.6.2 The LNMP data were closely consulted and are presented as an integral part of this assessment.

1.6.3 All photos, satellite images and LiDAR data visualisations were examined and mapped where needed to update the LNMP at a level compatible with a 1:2500 scale OS digital base map.

1.6.4 Aerial photographs were closely examined by eye on screen and as paper copies as appropriate which were photographed at high resolution. Vertical aerial photos were examined with the aid of a mirror stereoscope where appropriate, or in detail on screen when consulted as digital files.

1.6.5 Layers from the final drawing have been used to prepare the illustration for this report and are provided digitally for import to a GIS, in Esri Shapefile format.

1.6.6 LiDAR data were downloaded, visualised, and imported to QGIS and ArcGIS for interpretation and comparison to the LNMP, all airborne and satellite remote sensing data sources and the LHER.

1.7 Baseline Conditions and Study Area

Environment

1.7.1 The nature of the environment has a complex effect on both the preservation and visibility of both buried and upstanding features when recorded from the air. Many factors combine to influence very marked seasonal and temporal limitations to visibility of cropmarks, soil marks, earthworks and relict or past buildings and foundations. Land use, agricultural regimes, weather, geology, and soil types are all major contributing factors to the visibility of heritage assets from airborne and satellite-derived sources when assessing buried features which show as marks in crops, grass and soil.

1.7.2 The nature of the environment, soils, geology, and the archaeological baseline is detailed in ES Volume II Chapter 8 Historic Environment (Application Document 6.2).

Topography and Land Use

1.7.3 The DCO Site Boundary traverse level and undulating land, which is predominately laid to arable agriculture, which is conducive to the formation of cropmarks in conditions of moderate to severe soil moisture deficit (SMD) over buried ditches, walls, residual banks, and compacted surfaces. Some areas in the north of the Study Area are now bult over by modern industrial developments.

Geology and soils

1.7.4 The geological substrates and soils, (Cranfield University 2023, British Geological Survey (BGS) 2023), which are shown on **Figure 6** and **7.** These geologies comprise a mixture of well drained substrates and some more waterlogged areas. Most of the route however is conducive to the formation of crop marks, visibility of earthworks and foundations and marks in soils over buried features.

Statutorily Protected Heritage Assets

1.7.5 No Scheduled Monuments lie within the boundary of the DCO Site Boundary. A Scheduled earthwork Civil War fort (1642-52) is recorded in the National Heritage List for England as NHLE1007735 and as APS_33 in this assessment. This feature lies 160m to the west of the boundary of the DCO Site Boundary. APS_10 is a settlement site which contains a Scheduled moated site at North Cockerington, NHLE1004988. The Scheduled area lies outside and 400m to the northwest of the DCO Site Boundary.

1.7.6 No protected parks and gardens or battlefields lie within the boundary of the DCO Site Boundary. This assessment did not consider Listed Buildings unless there were associated landscape or relict features which were relevant to study from airborne remote sensing sources, which there were not.

Previously Recorded Heritage Assets

1.7.7 The baseline heritage assets are discussed in detail in ES Volume II Chapter 8 Historic Environment (Application Document 6.2) and indicate the potential for buried pre-medieval settlement remains, including possible funerary features, access ways, large areas of eroded Medieval fields and some medieval settlements on the periphery of the DCO Site Boundary, post-Medieval and modern field boundaries and some relict and removed modern defensive World War II features nearer to the Coast. The LHER and LNMP data were taken into close consideration when recording heritage assets for this assessment.

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548000 549000 550000

388000 387000 386000

N

Theddlethorpe St Helen
Haven Cottage
Crook Bank
Crook Bank Farmhouse
Orchard House
Ashleigh Farm
Threeways
Suddles Cottage
Autumn Cottage
Meers Bank
Heading Drain
Kent Ave
Quebec Rd
Links Ave
Mablethorpe Rd
Suddales Drain
Lluvia D-Or
The Anchorage
A1031
A1104

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100 50 0 100 200 300 400 500 Meters

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LEGEND

- DCO Site Boundary
- Chalk and chalky drift
- Chalky drift and chalk
- Chalky till
- Dune sand and marine shingle
- Glaciofluvial drift
- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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FIGURE TITLE

Figure 6
Geology
Page 01 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

545000
546000
547000
388000
387000
386000
N
Low Farm
Highbridge
Theddlethorpe All Saints
Railway Farm
Grove Rd
Little Dams
Country View
Engine Drain
Neves Farm
Silver Street Farm
Silver St
Rotten Row
Gayton le Marsh Grange
Will Row
High Gate
Highgate Farm
Middle Farm
Healey La
States Farm
Park Farm
Helen House Farm
1:10,000 @ A3
100 50 0 100 200 300 400 500
Meters
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Filename: Z:\Projects\2023\223 03 01 Viking CCS\905 GIS\Mapbook\223_03_01_VikingCCS_006_Geology.mxd
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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
- Chalky drift and chalk
- Chalky till
- Dune sand and marine shingle
- Glaciofluvial drift
- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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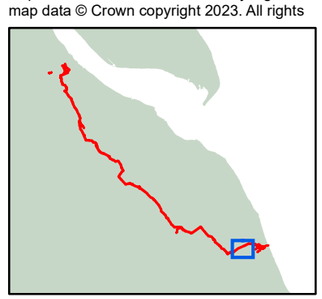

FIGURE TITLE

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Geology
Page 02 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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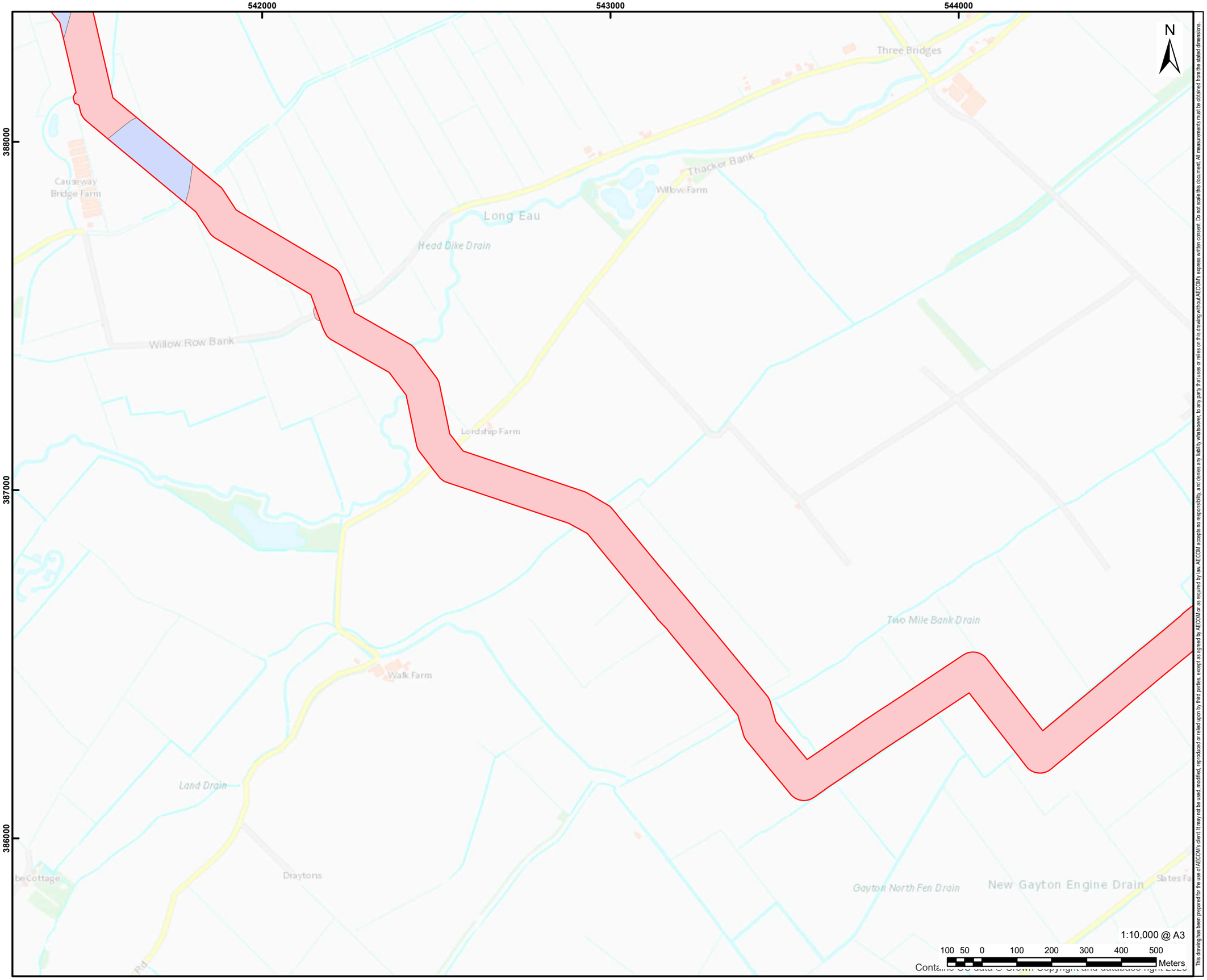
Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_006_Geology.mxd

542000 543000 544000

388000

387000

386000



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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
- Chalky drift and chalk
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- Reddish till

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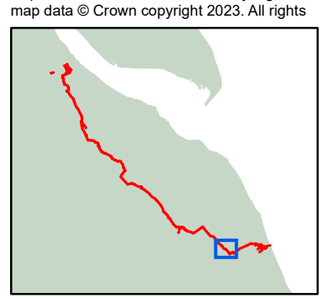

FIGURE TITLE

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Geology
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

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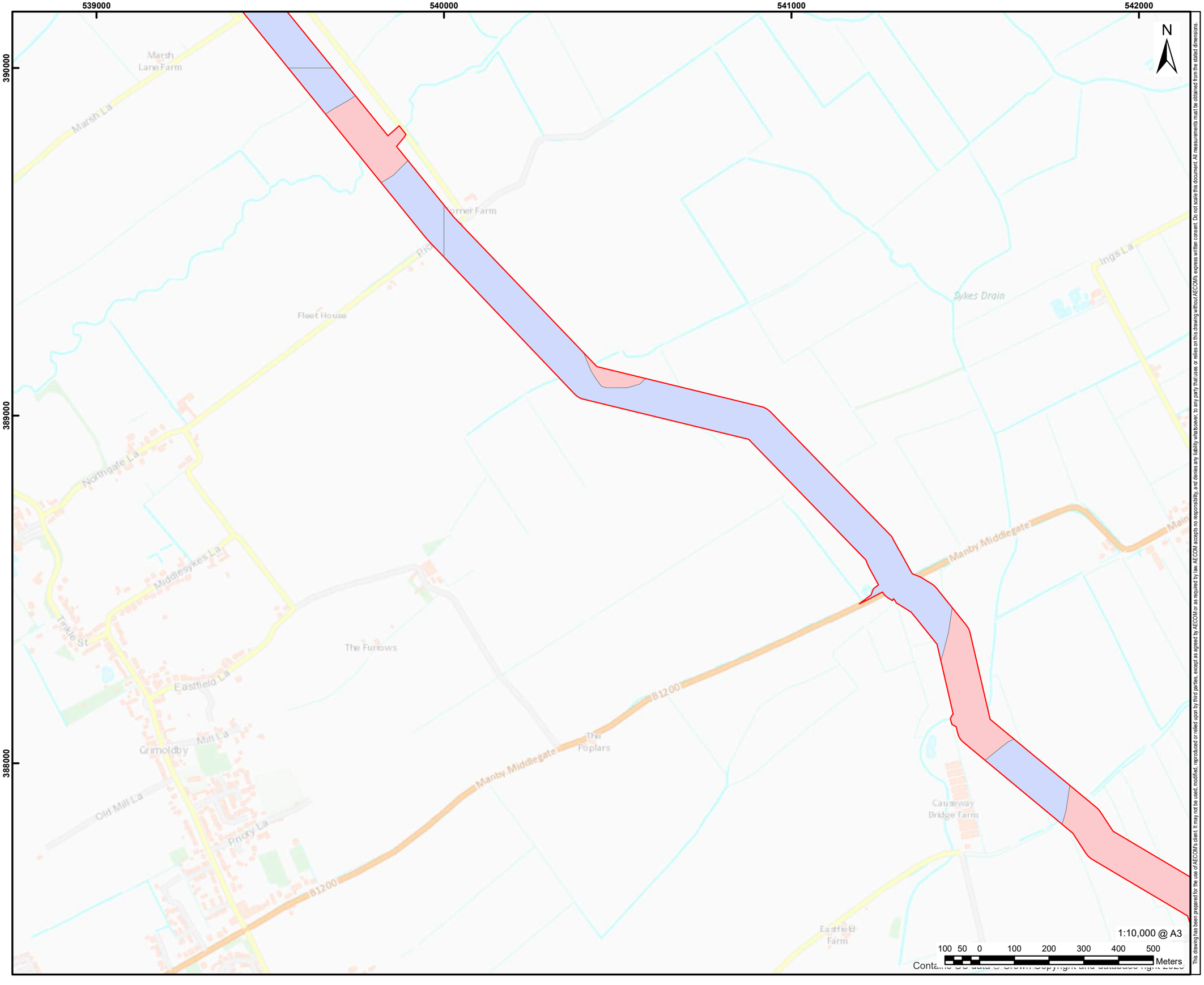
539000 540000 541000 542000

390000

389000

388000



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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
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- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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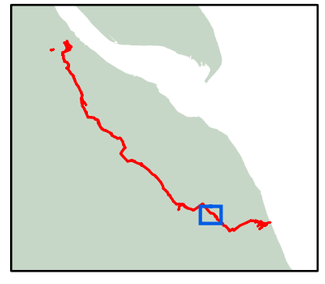

FIGURE TITLE

Figure 6
Geology
Page 04 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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537000 538000 539000

391000 390000 389000

House Chapel La North Cockerington Tossey La Red Leas Red Leas Cottages Lock Rd Meadow La Green Dike Back La Ashlea School La Cedar Cottages Drain Highfield House Marsh Lane Farm Red Leas La Marsh La Louth Rd Mill Hill Way Field View Fleet House Pedar La Chapel La South Cockerington South View La St Leonard's La Northgate La Ash Holt

N

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
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- Glaciofluvial drift
- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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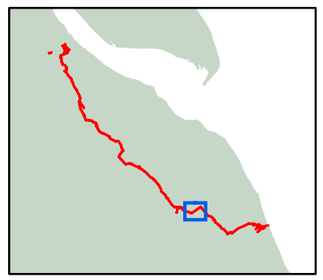

FIGURE TITLE

Figure 6
Geology
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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535000 536000 537000

391000

390000

N

Yarburgh Rd
Highbridge Rd
Abbey Rd
High St
Alvingham
Church La
Lock Rd
Lock Farm
Maple Lodge
Chapel La
Meadow La
The Lodge
River Lud
School La
Cedar Cottage
Highfield House
Sewage Works Cottages
Keddington Corner Farm
Rushmoor Country Park
Louth Rd

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
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- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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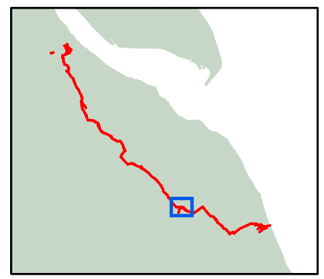

FIGURE TITLE

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Geology
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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532000 533000 534000 535000

393000 392000 391000

N

Oak Plantation
Gowt Plantation
The Old School House
Yew Tree Cottage
Ings
Grange Farm
Square Plan
Nut Tree Farm
Yarburgh Beck
Westfield Rd
King St
Yarburgh
North End
Little Beck Farm
The Belt
Little Grimsby
St Edith's Church

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
- Chalky drift and chalk
- Chalky till
- Dune sand and marine shingle
- Glaciofluvial drift
- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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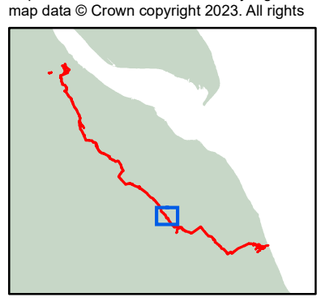

FIGURE TITLE

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Geology
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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531000 532000 533000

396000 395000 394000

N

Ludborough
Bonscaupe
Beckwood House
Southfield Farm
Greenshires
Pear Tree La
Pear Tree Farm
Westfield House
Hutton's La
Chequers Farm
A16
Main Rd
Chapel La
Grange La
Holy Well La
Grove Farm
Oak Plantation
The Gowt

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
- Chalky drift and chalk
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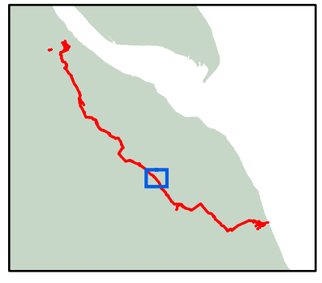

FIGURE TITLE

Figure 6
Geology
Page 08 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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528000 529000 530000 531000

397000

396000

N

Black Leg Drain
Micklemore Flower Farm
A16
Autby House
Little Autby Wood
Damwells Farm
Cold Harbour
Westfield Farm
Ludborough
Station Rd
Livesey Rd
A16
The View
Wyham

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
- Chalky drift and chalk
- Chalky till
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- Glaciofluvial drift
- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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FIGURE TITLE

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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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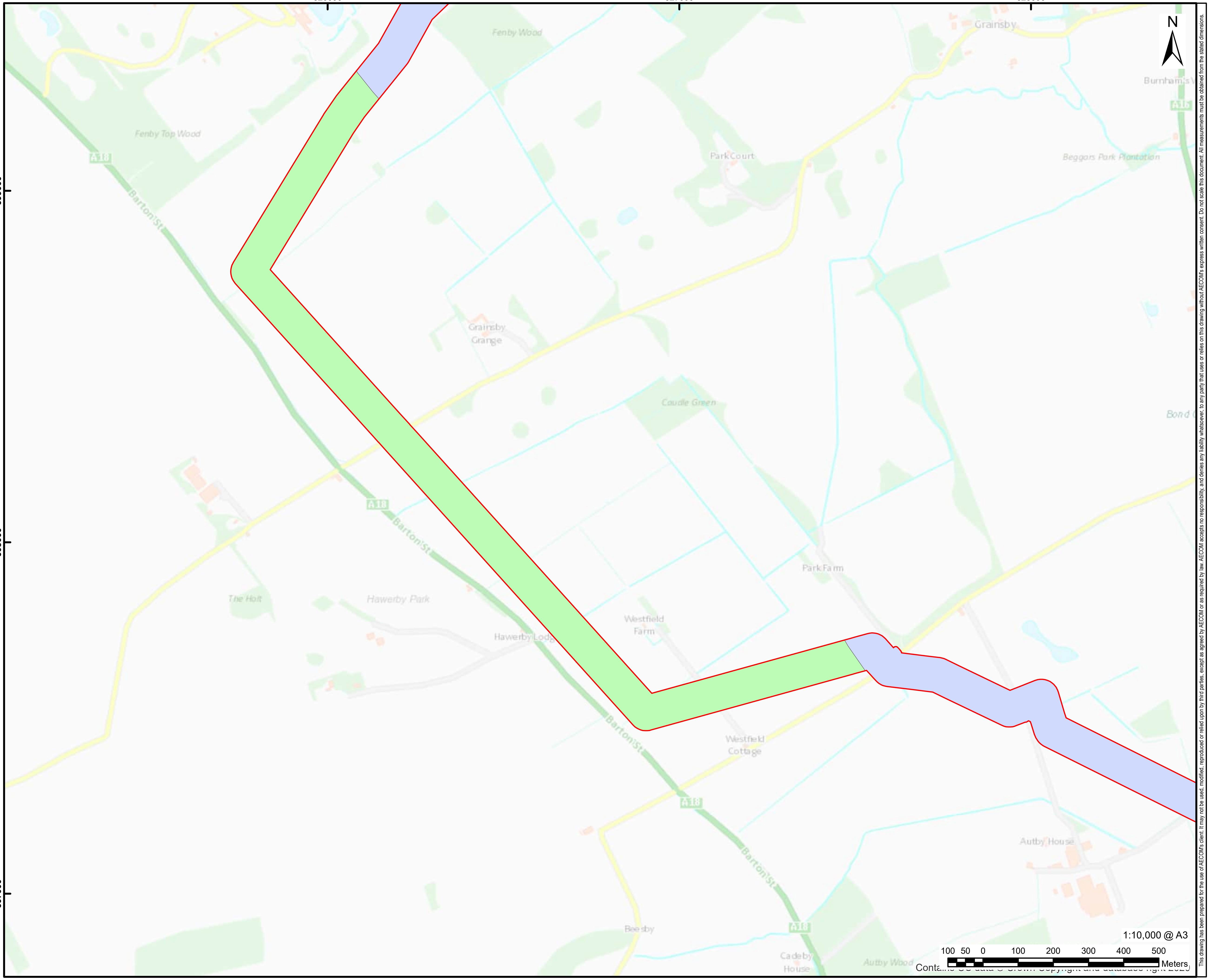

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
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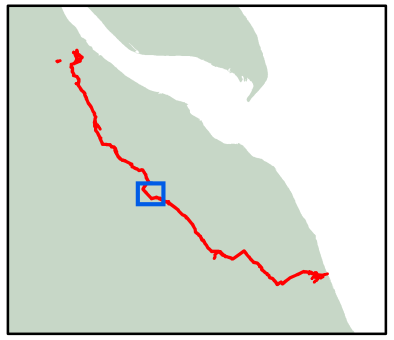

FIGURE TITLE

Figure 6
Geology
Page 10 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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525000 526000 527000

401000

400000

N

Waithe Beck
Waithe La
Hillside Farm
Moorhouse Farm
Ashby Hill - B1203
Shaws Farm
Ashby La
Bratton House Farm
Ceda Cottage
Ashby cum Fenby
Chapel La
Third La
Main Rd
Ash Holt
Ashby Hill
Grainsby View
A18
Thoroughfare
Thoroughfare Farm
Barton's St
Mount Gate Plantation
Ten Acres
Avenue Plantation
Fenby Wood
Fenby Top Wood

1:10,000 @ A3

100 50 0 100 200 300 400 500
Meters

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

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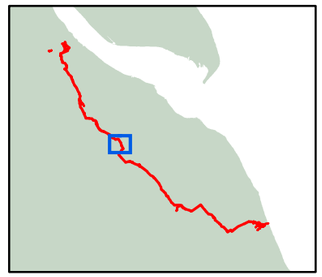

FIGURE TITLE

Figure 6
Geology
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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522000 523000 524000 525000

403000

402000

N

Glebe Farm Cottage
Mount Pleasant West
Old Main Rd
Barnoldby le Beck
Main Rd
Waltham Rd
Bradley Rd
Willow Park
Muirfield
Oakfield La
Barnoldby le Beck Park
Cherry Cobb La
Barton St
Wickster House
Top Farm
A18
The Old Farm
Oak Plantation
Moorhouse Farm
B1203

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
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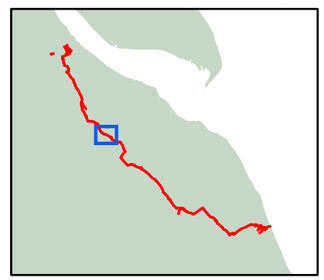

FIGURE TITLE

Figure 6
Geology
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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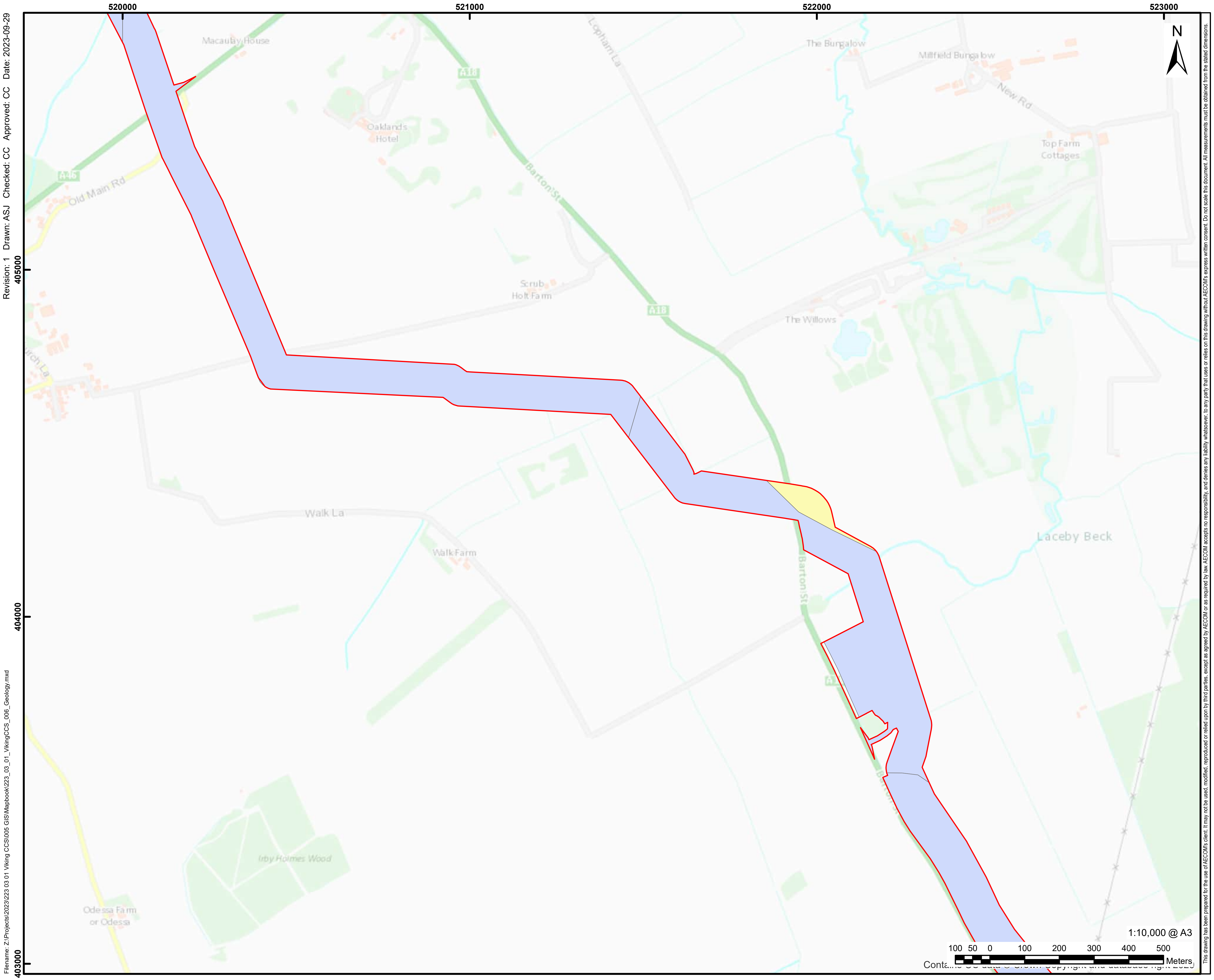

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
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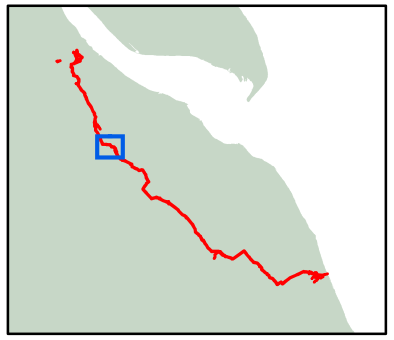

FIGURE TITLE

Figure 6
Geology
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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518000
519000
520000
521000
408000
407000
406000

N

Nooking La
Aylesby
Main Rd
Aylesby La
Aylesby Rd
Beach Holt La
Riby
Church Hill
Riby Rd
Riby Park Cottages
Riby Park
Hermitage Wood
Aylesby Park
Church La
Temple La
Butt La
Blyth Way
Cooper La
Gibraltar La
The Old Vicarage
Barton House
Barton St
Charles Ave
Kerr Crescent
Yews La
Grimsby Rd
Washing Dales Farm
The Crofts
Rush Hills Covert
Macaulay House
Oaklands Hotel
A15
A1173

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
- Chalky drift and chalk
- Chalky till
- Dune sand and marine shingle
- Glaciofluvial drift
- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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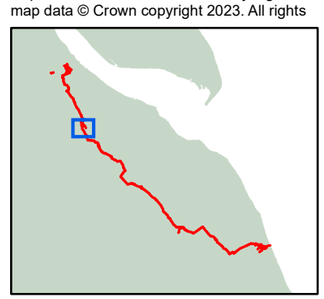

FIGURE TITLE

Figure 6
Geology
Page 14 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_006_Geology.mxd

518000 519000 520000

410000 409000 408000

N

A1173 Riby Rd Healing Covert Wells Farm The Georgian House Wells Rd Wells Cottages Suddle Wood Hunger Hill Wood Linders Farm Riby Dene Barton St The Laurels Foremans Cottage A16 Riby Rd The Lindens Barton St A1173

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
- Chalky drift and chalk
- Chalky till
- Dune sand and marine shingle
- Glaciofluvial drift
- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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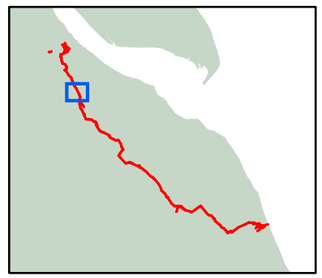

FIGURE TITLE

Figure 6
Geology
Page 15 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_006_Geology.mxd

517000 518000 519000

412000 411000 410000

N

Roxton Farm
Mathew Ford Way
B1210
Stallingborough Rd
Little London
Keelby Rd
A1173
North Beck Drain
Church La
Fiveacres
Wood View
Greenlands Farm
Granville Farm
Newstead Farm
Top Farm House
Mill Farmhouse
Riby Rd

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
- Chalky drift and chalk
- Chalky till
- Dune sand and marine shingle
- Glaciofluvial drift
- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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FIGURE TITLE

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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_006_Geology.mxd

516000 517000 518000

414000 413000 412000

N

Immingham

Alden Close

Sonia Crest

Bluestone La

Brocklesby Ave

Margaret St

Pilgrim Ave

Jersey Ct

Immingham Rd

Church Farm

B1210

The Old School House

Luxmore Farm

Habrough Rd

A180

Stallingborough Rd

Immingham Grange

Foxhole Wood

Gatehouse Farm

Roxton Farm

1:10,000 @ A3

100 50 0 100 200 300 400 500

Meters

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
- Chalky drift and chalk
- Chalky till
- Dune sand and marine shingle
- Glaciofluvial drift
- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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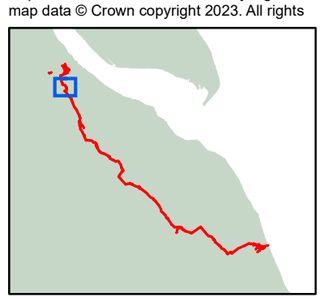

FIGURE TITLE

Figure 6
Geology
Page 17 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_006_Geology.mxd

515000 516000 517000

417000 416000 415000

N

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Chalk and chalky drift
- Chalky drift and chalk
- Chalky till
- Dune sand and marine shingle
- Glaciofluvial drift
- Glaciofluvial sand and gravel
- Marine alluvium
- Reddish till

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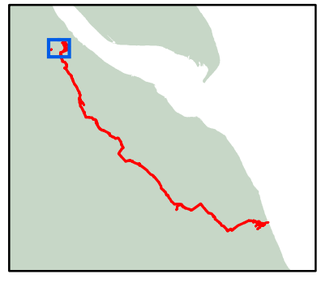

FIGURE TITLE

Figure 6
Geology
Page 18 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

548000 549000 550000

388000 387000 386000

N

Theddlethorpe St Helen
Haven Cottage
Crook Bank
Crook Bank Farmhouse
Cote House
Orchard House
Ashleigh Farm
A1031
Threeways
Farm
Rotten Row
Suddles Cottage
Mablethorpe Rd
Autumn Cottage
Suddales Drain
Lluvia D-Or
The Anchorage
Kent Ave
North Farm
Meers Bank
Heading Drain
Links Ave
Quebec Rd
Fairway

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
- NEWMARKET 1
- SALINE 1
- SALOP
- SWAFFHAM PRIOR
- Sandwich
- WALLASEA 2

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FIGURE TITLE

Figure 7
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

545000 546000 547000

388000

387000

386000

N

Low Farm
Highbridge
Theddlethorpe All Saints
Railway Farm
Grove Rd
Little Dams
Country View
Neves Farm
Silver Street Farm
Silver St
Rotten Row
Gayton le Marsh Grange
High Gate
Highgate Farm
Will Row
Middle Farm
Slates Farm
Healey La
Park Farm
Helen House Farm

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
- NEWMARKET 1
- SALINE 1
- SALOP
- SWAFFHAM PRIOR
- Sandwich
- WALLASEA 2

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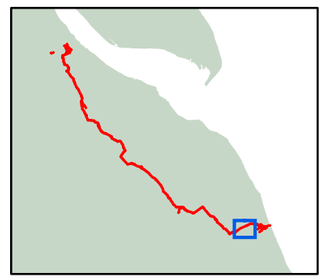

FIGURE TITLE

Figure 7
Soils
Page 02 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_007_Soils.mxd

542000 543000 544000

388000 387000 386000

N

Three Bridges
Thacker Bank
Willow Farm
Causeway Bridge Farm
Long Eau
Head Dike Drain
Willow Row Bank
Lordship Farm
Walk Farm
Two Mile Bank Drain
Land Drain
Draytons
Gayton North Fen Drain
New Gayton Engine Drain

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
- NEWMARKET 1
- SALINE 1
- SALOP
- SWAFFHAM PRIOR
- Sandwich
- WALLASEA 2

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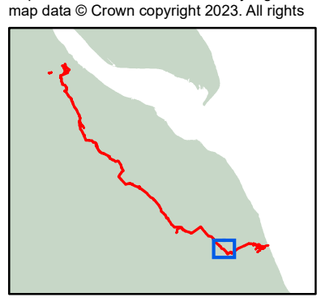

FIGURE TITLE

Figure 7
Soils
Page 03 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_007_Soils.mxd

539000 540000 541000 542000

390000

389000

388000

N

Marsh Lane Farm
Marsh La
Fleet House
Sykes Drain
Ings La
Northgate La
Middlesykes La
Tinkle St
Eastfield La
Grimoldby
Mill La
Old Mill La
Pinchy La
The Furrows
The Poplars
Manby Middlegate
B1200
Causeway Bridge Farm
Eastfield Farm

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
- NEWMARKET 1
- SALINE 1
- SALOP
- SWAFFHAM PRIOR
- Sandwich
- WALLASEA 2

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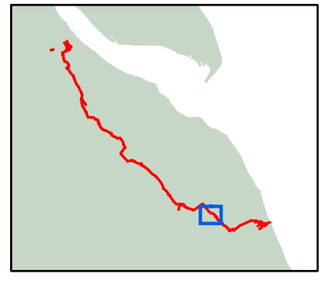

FIGURE TITLE

Figure 7
Soils
Page 04 of 18

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_007_Soils.mxd

537000 538000 539000

391000 390000 389000

N

House
Chapel La
North Cockerington
Lock Rd
Meadow La
Green Dike
Back La
Ashlea
School La
Cedar Cottages
Highfield House
Tossey La
Red Leas
Red Leas Cottages
Drain
Marsh Lane Farm
Marsh La
Red Leas La
Louth Rd
Hill Hill Way
Field View
Fleet House
Pedlar La
Chapel La
South Cockerington
South View La
St Leonard's La
Ash Holt
Northgate La

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
- NEWMARKET 1
- SALINE 1
- SALOP
- SWAFFHAM PRIOR
- Sandwich
- WALLASEA 2

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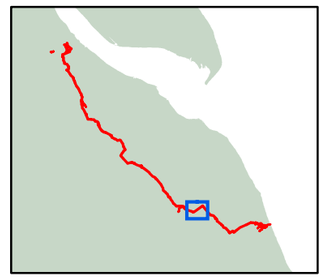

FIGURE TITLE

Figure 7
Soils
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_007_Soils.mxd

535000 536000 537000

391000

390000

N

Yarburgh Rd
Highbridge Rd
Abbey Rd
Alvingham
High St
Church La
Lock Rd
Lock Farm
Maple Lodge
Chapel La
Meadow La
The Lodge
River Lud
School La
Cedar Cottage
Highfield House
Sewage Works Cottages
Keddington Corner Farm
Rushmoor Country Park
Louth Rd

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
- NEWMARKET 1
- SALINE 1
- SALOP
- SWAFFHAM PRIOR
- Sandwich
- WALLASEA 2

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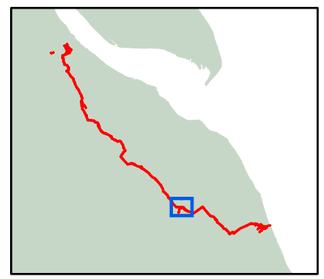

FIGURE TITLE

Figure 7
Soils
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_007_Soils.mxd

532000 533000 534000 535000

393000 392000 391000

N

Oak Plantation
Gowt Plantation
The Old School House
Yew Tree Cottage
Ings
King St
Yarburgh
Grange Farm
Square Plan
Nut Tree Farm
Yarburgh Beck
Westfield Rd
North End
The Belt
Little Beck Farm
Little Grimsby
St Edith's Church
Farm

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
- NEWMARKET 1
- SALINE 1
- SALOP
- SWAFFHAM PRIOR
- Sandwich
- WALLASEA 2

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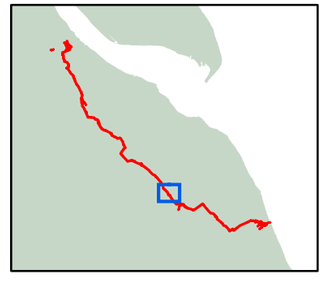

FIGURE TITLE

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Soils
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

Filename: Z:\Projects\2023\223 03 01 Viking CCS\005 GIS\Mapbook\223_03_01_VikingCCS_007_Soils.mxd

531000 532000 533000

396000 395000 394000

N

Ludborough
Bonscaupe
Beckwood House
Southfield Farm
Greenshires
Pear Tree La
Pear Tree Farm
Westfield House
Hutton's La
Chequers Farm
A16
Main Rd
Chapel La
Grange La
Holy Well La
Grove Farm
Oak Plantation
The Gowt

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
- NEWMARKET 1
- SALINE 1
- SALOP
- SWAFFHAM PRIOR
- Sandwich
- WALLASEA 2

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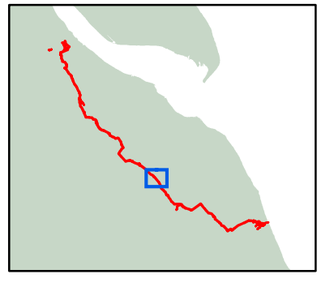

FIGURE TITLE

Figure 7
Soils
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

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528000 529000 530000 531000

397000

396000

N

Black Leg Drain
Micklemore Flower Farm
A16
Autby House
Little Autby Wood
Damwells Farm
Cold Harbour
Westfield Farm
Ludborough
Station Rd
Livesey Rd
A16
The View
Wyham

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
- NEWMARKET 1
- SALINE 1
- SALOP
- SWAFFHAM PRIOR
- Sandwich
- WALLASEA 2

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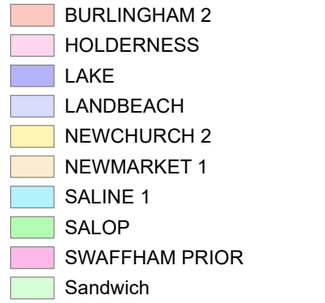

FIGURE TITLE

Figure 7
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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

526000 527000 528000

399000

398000

397000

N

Fenby Wood
Grainsby
Fenby Top Wood
A18
Barton St
ParkCourt
Beggars Park Plantation
Grainsby Grange
Caudle Green
Park Farm
The Holt
Hawerby Park
Hawerby Lodge
Westfield Farm
Westfield Cottage
Autby House
Autby Wood
Beesby
Cadeby House

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
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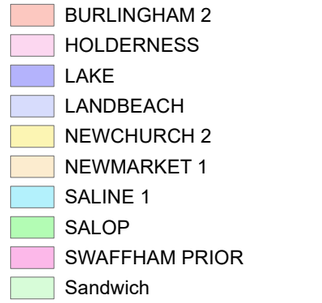

FIGURE TITLE

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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

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525000 526000 527000

401000

400000

N

Waithe Beck
Waithe La
Hillside Farm
Moorhouse Farm
Ashby Hill - B1203
Shaws Farm
Ashby La
Bratton House Farm
Ceda Cottage
Ashby cum Fenby
Chapel La
Third La
Main Rd
Ash Holt
Ashby Hill
Grainsby View
A18
Thoroughfare
Thoroughfare Farm
Barton's St
Mount Gate Plantation
Ten Acres
Avenue Plantation
Fenby Wood
Fenby Top Wood

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
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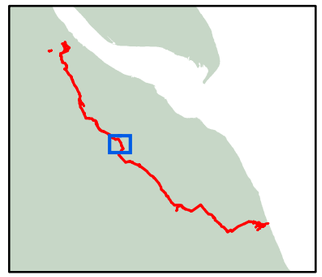

FIGURE TITLE

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522000 523000 524000 525000

403000

402000

N

Glebe Farm Cottage
Mount Pleasant West
Bradley Rd
Willow Park
Muirfield
Oakfield La
Waltham Rd
Old Main Rd
Barnoldby le Beck
Main Rd
Barnoldby le Beck Park
Cherry Cobb La
Barton St
Wickster House
Top Farm
A18
Waithe
Moorhouse Farm
The Old Farm
Oak Plantation
Hills
B1208

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
- NEWMARKET 1
- SALINE 1
- SALOP
- SWAFFHAM PRIOR
- Sandwich
- WALLASEA 2

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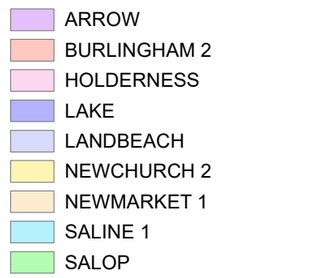

FIGURE TITLE

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ISSUE PURPOSE

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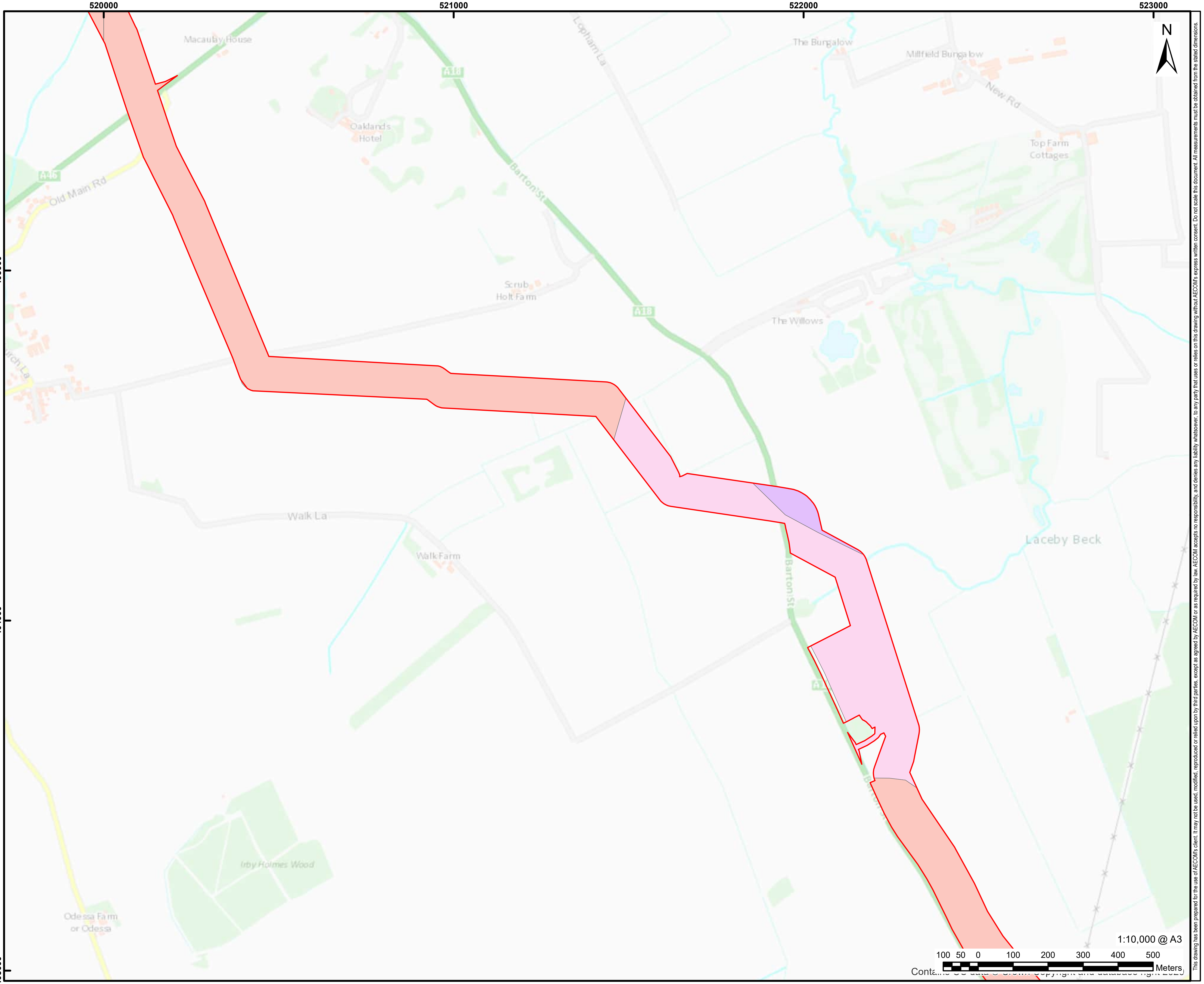

VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- ARROW
- BURLINGHAM 2
- HOLDERNESS
- LAKE
- LANDBEACH
- NEWCHURCH 2
- NEWMARKET 1
- SALINE 1
- SALOP
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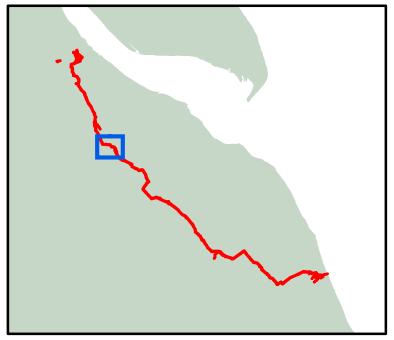

FIGURE TITLE

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ISSUE PURPOSE

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518000 519000 520000 521000

408000 407000 406000

N

Nooking La
Aylesby
Main Rd
Aylesby La
Aylesby Rd
Beach Holt La
Butt La
Blyth Way
Church La
Temple La
Aylesby Park
Riby
Church Hill
Riby Rd
Riby Park Cottages
Riby Park
Hermitage Wood
Cooper La
Gibraltar La
Charles Ave
Keith Crescent
The Old Vicarage
A18
Barton St
Barton House
Washing Dales Farm
Yews La
Grimsby Rd
The Crofts
A46
Rush Hills Covert
Macaulay House
Oaklands Hotel

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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PROJECT

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LEGEND

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- BURLINGHAM 2
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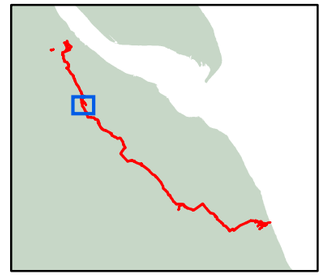

FIGURE TITLE

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518000 519000 520000

410000 409000 408000

N

A1173 Riby Rd Healing Covert Wells Farm The Georgian House Wells Rd Wells Cottages Suddle Wood Hunger Hill Wood Lindens Farm Foremans Cottage Riby Dene Barton St The Laurels A16 Riby Rd The Lindens Barton St A1173

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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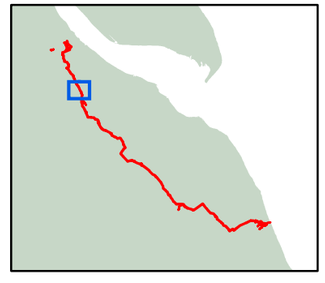

FIGURE TITLE

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517000 518000 519000

412000 411000 410000

N

Roxton Farm
Mathew Ford Way
B1210
Stallingborough Rd
Little London
Keelby Rd
A1173
North Beck Drain
Church La
Fiveacres
Wood View
Greenlands Farm
Granville Farm
Newstead Farm
Top Farm House
Mill Farmhouse
Riby Rd

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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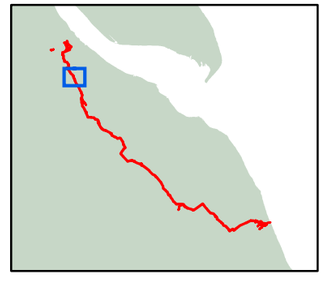

FIGURE TITLE

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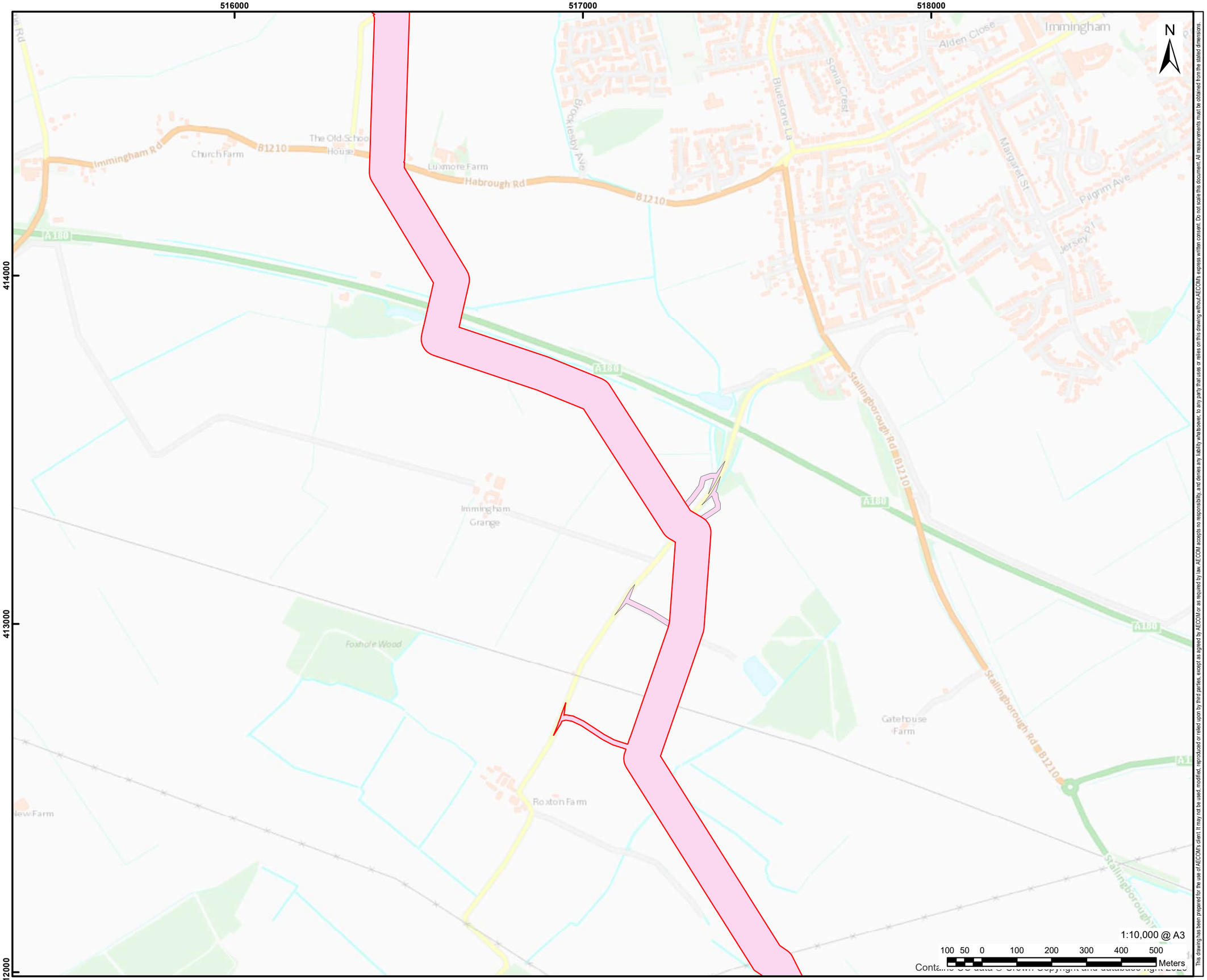
516000 517000 518000

414000 413000 412000



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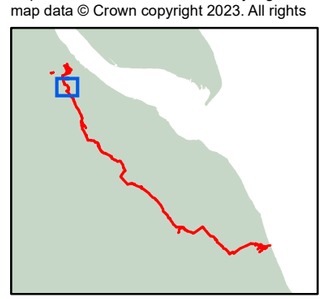

FIGURE TITLE

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ISSUE PURPOSE

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515000 516000 517000

417000 416000 415000

N

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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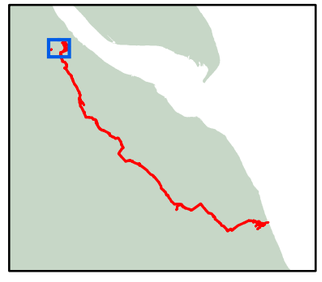

FIGURE TITLE

Figure 7
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ISSUE PURPOSE

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1.8 Results of the Assessment

1.8.1 This assessment has recorded a range of archaeological sites and landscapes within the DCO Site Boundary and the immediate environs which date from the prehistoric to Post-Medieval periods. These features are predominantly recorded as marks in growing crops, which indicate the position of eroded buried ditches and walls or hard surfaces beneath the ground. Visualised LiDAR data indicate that there are some areas of microtopographic preservation, but the underlying earlier strata of archaeological deposits are mainly heavily plough eroded or in the north of the DCO Site Boundary are built over in parts.

1.8.2 Medieval and Post-Medieval field systems and post-enclosure field boundaries are largely ploughed out within the site areas by modern mechanised farming. These features are visible as some marks in crops and as wide areas of eroded microtopographic earthworks which are visible on examination of visualised LiDAR data. The areas of ridge and furrow are shown, and also contained some embanked headlands to the strip fields which are also eroded.

1.8.3 The assessment identified 53 individual sites or landscape areas which are summarised in **Table 1**. The majority of the recorded sites lie within the boundary of the DCO Site Boundary, but the following eight sites lie adjacent to or up to 200m outside the boundary of the DCO Site Boundary:

- APS_02 Roman to Medieval settlement site and field system remains immediately adjacent to the DCO Site Boundary;
- APS_03 Former WWII anti-glider ditch 80m southeast of the DCO Site Boundary;
- APS_07 Possible remains of a WWII defensive building on beach 200m north of the Draft Order Limits;
- APS_10 Medieval settlement, and ditches at North Cockerington immediately adjacent to the DCO Site Boundary. A Scheduled moated site (NHLE1004988) lies 400m to the northeast of the DCO Site Boundary;
- APS_33 Scheduled Civil War Fort NHLE 1007735 160m to the west of the DCO Site Boundary;
- APS_45 Eroded Medieval fields (ridge and furrow) adjacent to the DCO Site Boundary; and
- APS_51 A former Iron Age/Roman settlement, which is now built over, adjacent to and partially within the DCO Site Boundary.

1.8.4 These features are recorded to provide landscape context and continuity when assessing the linear DCO Site Boundary boundary polygon. Associated features may extend into the DCO Site Boundary from these foci of buried archaeological features. The remaining 43 recorded heritage assets lie within the site area boundaries.

1.8.5 All recorded features are illustrated in a heritage mapbook on **Figure 8** and **Figure 9.**

1.8.6 **Table 1** details all the heritage assets which were recorded for this assessment.

Table 1: Heritage Assets Recorded During This Assessment

APS_Site	Mapbook page, Figure 9	Within the boundary of the DCO Site Boundary	Asset type	Associated features	Latest observed condition	Period	MonUID	Comment	Easting	Northing	NGR
APS_01	02, 03	Yes and adjacent	Anti-glider Ditch	Field Boundary	Removed	Modern (WWII)	NA	WWII Anti-glider ditches visible as structures in the 1940s. No longer present.	544394	386530	TA 443 865
APS_02	3	Immediately adjacent but not visible within the DCO Site Boundary	Settlement	Field System, Ridge and Furrow	Cropmark	Roman-Medieval	MLI42821 MLI87322	Settlement site visible as cropmarked ditches with later and associated Ridge and Furrow.	542776	386553	TA 427 865
APS_03	1	No, 80m southwest of the DCO Site Boundary	Anti-glider Ditch	Structure	Removed	WWII	NA	WWII Anti-glider ditches visible as structures in the 1940s. No longer present.	549520	386694	TA 495 866
APS_04	3	Yes and adjacent	Field Boundary		Cropmark	Medieval / Post Medieval	NA	Post Medieval field boundary visible while extant on historic aerial photographs and currently visible as cropmarks on satellite imagery.	542757	387023	TA 427 870
APS_05	01, 02	Yes and adjacent	Ridge and Furrow	Anti-glider Ditch	Earthwork	Medieval / Post Medieval	MLI80939	Areas of Medieval / Post Medieval Ridge and Furrow were visible as earthworks on historic aerial photographs. The area has since been eroded by ploughing and no visible earthworks remain within the Draft Order Limits at this site. . The Anti-glider Ditches have been removed and backfilled following the end of WWII.	548343	387208	TA 483 872
APS_06	01, 02	Yes and adjacent	Ridge and Furrow	Field Boundary, Anti-glider Ditches	Microtopography and eroded features	Medieval / Post Medieval, Modern (WWII)	MLI80943 MLI80946 MLI88213 (Anti-Aircraft Obstructions) MLI88214 (Toft earthworks)	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Some medieval fields remain as microtopographic earthworks which are visible via visualised LiDAR data within the Draft Order Limits. Other areas are visible as marks in soil and grass on modern aerial images and r are now wholly eroded. These areas of eroded and marginally extant earthworks are differentiated in the accompanying mapping and GIS database and geometry. The WWII anti-glider ditches are now removed and backfilled.	546643	387513	TA 466 875
APS_07	1	No, 200m north of the DCO Site Boundary	Structure		Removed	Modern (WWII)	NA	Buildings which were formerly located on the beach. These may have been WWII defensive structures and are now removed or destroyed by erosion.	549649	387800	TA 496 878

APS_Site	Mapbook page, Figure 9	Within the boundary of the DCO Site Boundary	Asset type	Associated features	Latest observed condition	Period	MonUID	Comment	Easting	Northing	NGR
APS_08	03, 04, 05	Yes and adjacent	Ridge and Furrow	Enclosure	Cropmark	Medieval / Post Medieval	MLI88026 MLI88025 (Enclosure)	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery. Possible enclosure visible as cropmark.	540144	389243	TA 401 892
APS_09	05, 06	Yes and adjacent	Ridge and Furrow	Field Boundary	Cropmark	Medieval / Post Medieval	MLI87881 MLI87883 MLI87887	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	536766	389871	TA 367 898
APS_10	5	Immediately adjacent but not visible within the DCO Site Boundary. NHLE1004988 400m NW of the DCO Site Boundary	Settlement	Ridge and Furrow	Cropmark	Medieval / Post Medieval	MLI42854 MLI43595 MLI83365 NHLE1004988	Settlement of North Cockerington with Scheduled Moated site (NHLE 1004988) and ditches visible as earthworks on historic aerial photographs and now visible as cropmarks with residual microtopography. These are the outfields to the adjacent Medieval village.	537700	390011	TA 377 900
APS_11	6	Yes and adjacent	Banjo Enclosure		Cropmark	Iron Age	NA	Possible 'Banjo' enclosure which may have been used in the Iron Age for stock corralling, visible as cropmarks on oblique aerial photographs.	536124	390124	TA 361 901
APS_12	6	Ridge and furrow, yes. Barrow, no (210m to north of DCO Site Boundary)	Ridge and Furrow	Funerary site	Cropmark	Medieval / Post Medieval	MLI98757 MLI82192 (Barrow)	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery. Possible cropmarked round barrow recorded on HER visible on satellite imagery, 210m to the north and outside of the Draft Order Limits.	535450	390382	TA 354 903
APS_13	6	Yes, partially and adjacent	Rectilinear Enclosure		Cropmark	Prehistoric	NA	Rectilinear enclosure visible as cropmarks on aerial photographs.	536046	390542	TA 360 905
APS_14	6	Yes, partially and adjacent	Field Boundary		Cropmark	Medieval / Post Medieval	NA	Post Medieval field boundary visible while extant on historic aerial photographs and currently visible as cropmarks on satellite imagery.	534434	390929	TA 344 909
APS_15	7	Yes, partially and adjacent	Ridge and Furrow		Cropmark	Medieval / Post Medieval	NA	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	533448	392315	TA 334 923
APS_16	07, 08	Yes, partially and adjacent	Ridge and Furrow	Field Boundary	Cropmark	Medieval / Post Medieval	NA	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	532327	393915	TA 323 939

APS_Site	Mapbook page, Figure 9	Within the boundary of the DCO Site Boundary	Asset type	Associated features	Latest observed condition	Period	MonUID	Comment	Easting	Northing	NGR
APS_17	08, 09	Yes	Enclosure		Cropmark	Prehistoric	NA	Cropmarked enclosure visible on aerial photographs.	530613	395787	TA 306 957
APS_18	08, 09	Yes	Ridge and Furrow		Cropmark	Medieval / Post Medieval	NA	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	530098	396182	TA 300 961
APS_19	9	Yes	Enclosure		Cropmark	Prehistoric	NA	Cropmarked enclosure visible on aerial photographs.	530061	396312	TA 300 963
APS_20	9	Yes	Enclosure	Field Boundary	Cropmark	Undated	NA	Area of cropmarked enclosures and Medieval / Post Medieval field boundaries.	529382	396884	TA 293 968
APS_21	9	Yes, partially and adjacent	Enclosure		Cropmark	Prehistoric	NA	Cropmarked enclosure visible on aerial photographs.	528908	397144	TA 289 971
APS_22	09, 10	Yes	Ridge and Furrow		Cropmark	Medieval / Post Medieval	MLI41208 MLI41209	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	528108	397271	TA 281 972
APS_23	10, 11	Yes	Ridge and Furrow		Cropmark	Medieval / Post Medieval	MLI98650 MLI98651 MNL2224	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	526159	398779	TA 261 987
APS_24	11	Yes and adjacent	Ridge and Furrow		Cropmark	Medieval / Post Medieval	NA	Post Medieval field boundary visible while extant on historic aerial photographs and no longer visible on LiDAR or satellite imagery.	526518	399855	TA 265 998
APS_25	11	Yes and adjacent	Ridge and Furrow	Ditch	Cropmark	Medieval / Post Medieval	NA	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	526343	400134	TA 263 001
APS_26	11	Yes	Field Boundary		Cropmark	Medieval / Post Medieval	NA	Post Medieval field boundary visible while extant on historic aerial photographs and currently visible as cropmarks on satellite imagery.	526187	400466	TA 261 004
APS_27	11	Yes and adjacent	Ridge and Furrow	Field Boundary	Cropmark	Medieval / Post Medieval	MNL2224	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	525911	401025	TA 259 010
APS_28	11, 12	Yes and adjacent	Ridge and Furrow	Field Boundary	Cropmark	Medieval / Post Medieval	MNL2224	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	524698	401584	TA 246 015

APS_Site	Mapbook page, Figure 9	Within the boundary of the DCO Site Boundary	Asset type	Associated features	Latest observed condition	Period	MonUID	Comment	Easting	Northing	NGR
APS_29	12	Yes and adjacent	Field Boundary		Cropmark	Medieval / Post Medieval	NA	Post Medieval field boundary visible while extant on historic aerial photographs and currently visible as cropmarks on satellite imagery.	523919	402378	TA 239 023
APS_30	12	Yes	Ridge and Furrow	Field Boundary	Cropmark	Medieval / Post Medieval	MNL1588 MNL2224 MNL2228	Medieval / Post Medieval Ridge and Furrow, part of Barnoldby le Beck Park, visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	523076	402629	TA 230 026
APS_31	12, 13	Yes	Ridge and Furrow		Cropmark	Medieval / Post Medieval	NA	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks.	522299	403163	TA 222 031
APS_32	13	Yes	Ridge and Furrow		Microtopography	Medieval / Post Medieval	MNL2237	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as microtopographic earthworks.	521782	404172	TA 217 041
APS_33	13	No, 160m to west of DCO Site Boundary	Fort		Earthwork	Post Medieval (Civil War)	NHLE 1007735	Extant Scheduled Civil War (1642-1652) fort which lies 160m to the west and outside of the Draft Order Limits boundary.			
APS_Site	Mapbook page, Figure 9	Within the boundary of the DCO Site Boundary	Asset type	Associated features	Latest observed condition	Period	MonUID	Comment	Easting	Northing	NGR
APS_34	14	Yes	Ridge and Furrow		Cropmark	Medieval / Post Medieval	MNL2225	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	519629	406623	TA 196 066
APS_35	14	Yes and adjacent	Extraction	Former Ridge and Furrow	Reinstated Land	Post Medieval/Modern	MNL1565	Former ridge and furrow, now removed by 20th century extraction and tipping and now partly within highway boundary.	519993	406834	TA 199 068
APS_36	13, 14, 15, 16	Yes and adjacent	Service		Cropmark	Modern	NA	Modern service put in prior to 1992. Visible as cropmarks and residual microtopographic earthworks.	519598	407504	TA 195 075
APS_37	15	Just outside boundary. Possible 'leat' lies within DCO Site Boundary	Possible Moated Site or natural feature	Ridge and Furrow	Earthwork	Undated	NA	Possible Moated Site visible on aerial photographs. The possible moat lies just outside the Draft Order Limits, the 'leat' within the Draft Order Limits. The outline of the water area is mapped by the OS. Further checking required to establish nature of this site which could be a natural feature.	519494	408183	TA 194 081

APS_Site	Mapbook page, Figure 9	Within the boundary of the DCO Site Boundary	Asset type	Associated features	Latest observed condition	Period	MonUID	Comment	Easting	Northing	NGR
APS_38	15	Yes	Ridge and Furrow		Cropmark	Medieval / Post Medieval	NA	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	519184	408802	TA 191 088
APS_39	15	Yes	Field Boundary		Cropmark	Medieval / Post Medieval	NA	Post Medieval field boundary visible while extant on historic aerial photographs and currently visible as cropmarks on satellite imagery.	518962	409255	TA 189 092
APS_40	15, 16	Yes	Ridge and Furrow		Levelled	Medieval / Post Medieval		Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Levelled.	518697	409810	TA 186 098
APS_41	15, 16	Yes	Ridge and Furrow		Cropmark	Medieval / Post Medieval	MNL2235	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	518266	410561	TA 182 105
APS_42	15, 16, 17	Outside of and adjacent to the east of the DCO Site Boundary, crosses DCO Site Boundary at coordinates 517261,412826	Service		Cropmark	Modern		Modern service installed during or just prior to 2017.	518239	411286	TA 182 112
APS_43	16	Yes	Ridge and Furrow		Earthwork	Medieval / Post Medieval		Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Areas remain earthwork.	517992	411552	TA 179 115
APS_44	17	Immediately adjacent to the DCO Site Boundary, which follow the route of a modern track at this site and may be coincident with further underlying archaeological features.	Settlement	Ridge and Furrow, Crofts and Tofts, Moat	Cropmark	Medieval / Post Medieval	MNL286 MNL2238 MNL288	Earthworks at the settlement in Roxton are visible on historic aerial photographs. Currently visible as cropmarks on satellite imagery. Mapped by the OS. There is a strong possibility that features will exist below and within the Draft Order limits and modern track at this site.	516918	412681	TA 169 126

APS_Site	Mapbook page, Figure 9	Within the boundary of the DCO Site Boundary	Asset type	Associated features	Latest observed condition	Period	MonUID	Comment	Easting	Northing	NGR
APS_45	17	Outside but immediately adjacent to the east of the DCO Site Boundary	Ridge and Furrow		Cropmark	Medieval / Post Medieval		Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	517692	413382	TA 176 133
APS_46	17	Outside and immediately adjacent to the east of the DCO Site Boundary	Road		Cropmark	Modern		Former line of road visible as cropmark.	516957	413884	TA 169 138
APS_47	17, 18	Yes	Ridge and Furrow		Cropmark	Medieval / Post Medieval	MNL2238 MNL2234	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Currently visible as cropmarks on satellite imagery.	516324	414774	TA 163 147
APS_48	18	Yes, partially and under an area of modern woodland	Ridge and Furrow		Earthwork	Medieval / Post Medieval		Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs and as eroded features via visualised LiDAR data. The visible area within the draft order Limits lies beneath modern deciduous woodland which is visible on the latest timeline at Google Earth and is likely destroyed by this planting regime.	516733	415259	TA 167 152
APS_49	18	Yes, partially	Ridge and Furrow	Enclosures, ditches	Eroded and previously stripped and disturbed	Medieval / Post Medieval	MLS10748	East-west aligned Ridge and Furrow was visible as earthworks on historic aerial photographs and is now eroded and entirely removed within the Draft Order limits. These ridges and furrows may have concealed underlying deposits which may be associated with the prehistoric, Roman, and later sites in this area. The area within the Draft Order Limits has been soil stripped and worked by machinery since 2019, with one area of defined digging and some bunding of substrate. Machine marks are prevalent and may conceal the presence of underlying features. The working and re-vegetation of this area is documented on recent aerial images displayed at Google Earth. The soil working is likely to have been associated with installation of visible drainage features which	514541	415693	TA 145 156

APS_Site	Mapbook page, Figure 9	Within the boundary of the DCO Site Boundary	Asset type	Associated features	Latest observed condition	Period	MonUID	Comment	Easting	Northing	NGR
								showed in the base soil and now as vegetation marks in this site within the Draft Order Limits. These works were completed with planning permission for the installation of field drainage to support the construction of the Hornsea Project One onshore export cable route as detailed at https://apps.northlincs.gov.uk/application/pa-2019-1680 .			
APS_50	18	Yes	Ditch		Eroded	Undated		Ditch visible on historic aerial photographs, no longer present on satellite imagery or LiDAR data. Type and date unknown.	517674	416040	TA 176 160
APS_51	18	Immediately adjacent to the DCO Site Boundary	Settlement	Ridge and Furrow	Built Over	Iron Age / Roman	MLS19771, MLS21321 & MLS20078	Iron Age / Roman settlement site visible on aerial photographs while being excavated and is now built over.	516760	417122	TA 167 171
APS_52	18	150m to the west and outside of the DCO Site Boundary	Ridge and Furrow	Enclosure	Built Over	Unknown, Medieval/Post Medieval	MLS20104, MLS21321, MLS20078	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. Overlies a cropmarked ditched enclosure. These features were mapped by Alison Deegan in 2009 and are now built over.	516149	416694	TA 161 166
APS_53	18	Yes	Ridge and Furrow		Built over	Medieval/Post Medieval	MLS20104	Medieval / Post Medieval Ridge and Furrow visible as earthworks on historic aerial photographs. mapped by Alison Deegan in 2009, now built over.	517069	416510	TA 170 165

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Mapbook Page Index
- Site Extents

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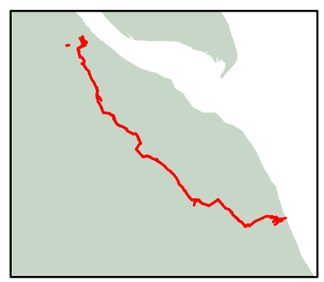

FIGURE TITLE

Figure 8
Index to Map book

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Eroded Ridge and Furrow
- Anti Glider Ditch
- Field Boundary
- Structure
- Lincolnshire NMP

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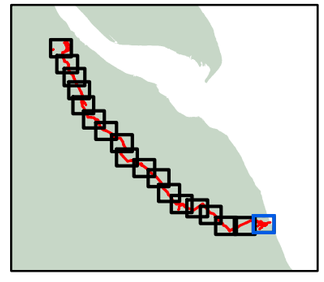

FIGURE TITLE

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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Extant Ridge and Furrow
- Eroded Ridge and Furrow
- Anti Glider Ditch
- Ditch
- Field Boundary
- Lincolnshire NMP

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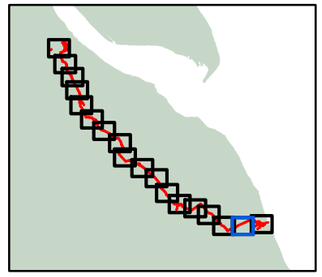

FIGURE TITLE

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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Eroded Ridge and Furrow
- Anti Glider Ditch
- Ditch
- Field Boundary
- Lincolnshire NMP

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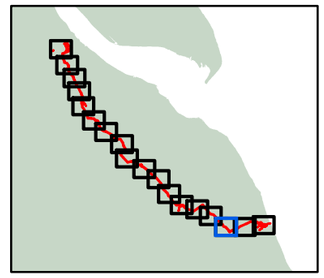

FIGURE TITLE

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

DCO Site Boundary

Site Extents

Asset_Type

Eroded Ridge and Furrow

Enclosure

Field Boundary

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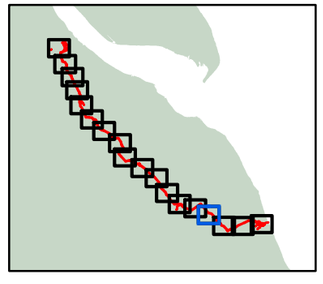

FIGURE TITLE

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ISSUE PURPOSE

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VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Extant Ridge and Furrow
- Eroded Ridge and Furrow
- Enclosure
- Field Boundary
- Headland
- Scheduled Monuments
- Lincolnshire NMP

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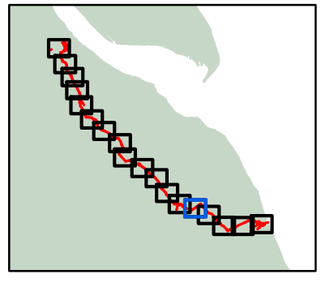

FIGURE TITLE

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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Extant Ridge and Furrow
- Eroded Ridge and Furrow
- Barrow
- Ditch
- Enclosure
- Field Boundary
- Headland

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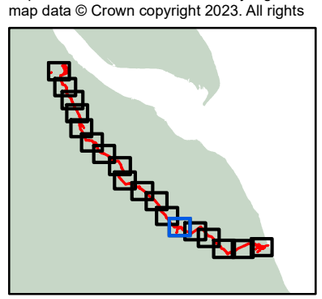

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Extant Ridge and Furrow
- Eroded Ridge and Furrow
- Field Boundary

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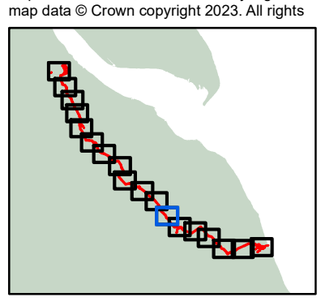

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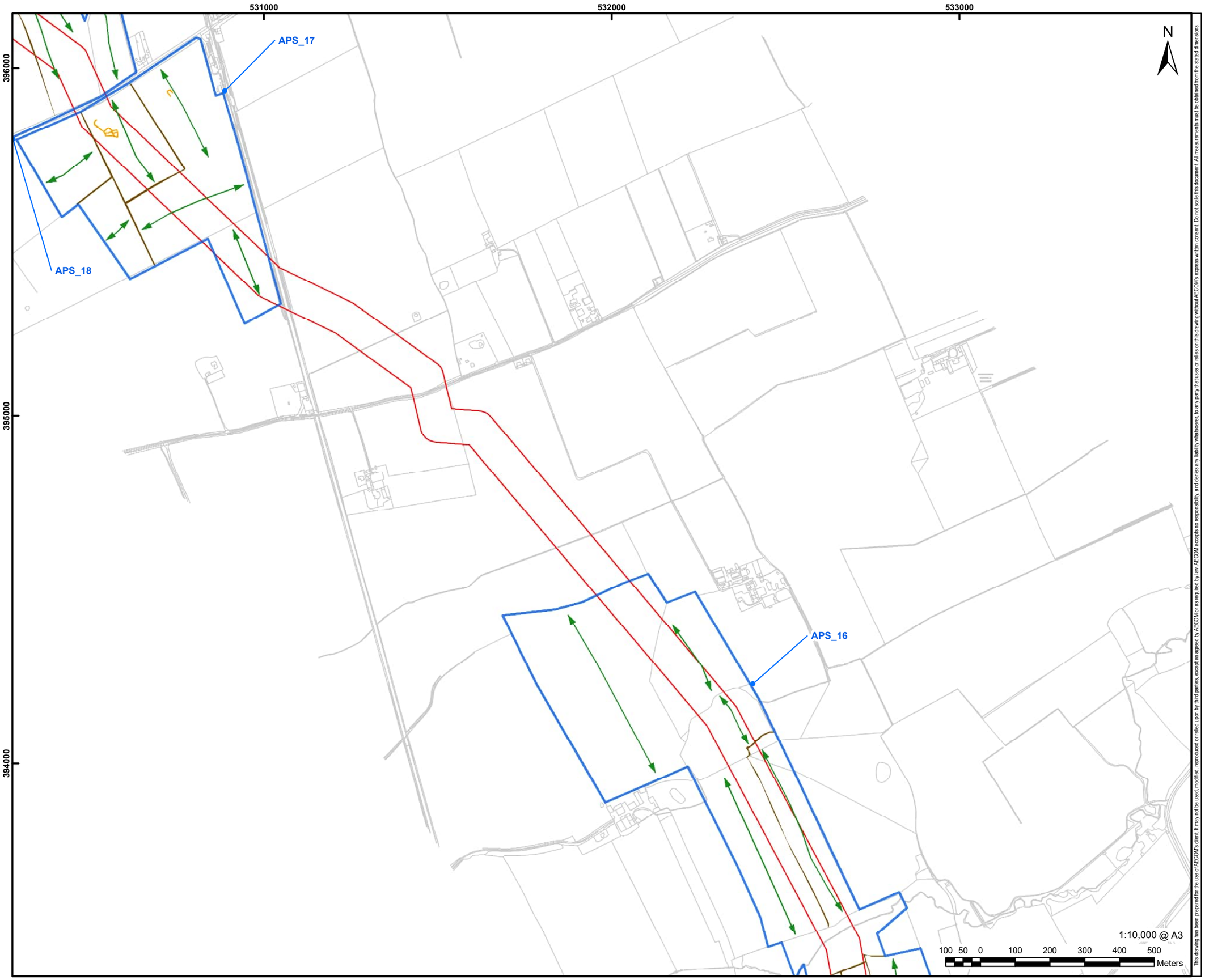

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Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Eroded Ridge and Furrow
- Ditch
- Field Boundary

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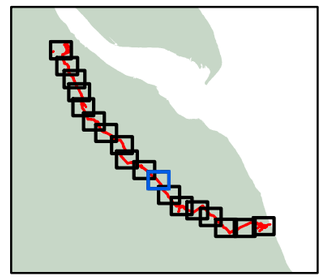

FIGURE TITLE

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ISSUE PURPOSE

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PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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APS_19
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APS_17
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Meters

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LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Eroded Ridge and Furrow
- Ditch
- Enclosure
- Field Boundary
- Headland
- Mining
- Lincolnshire NMP

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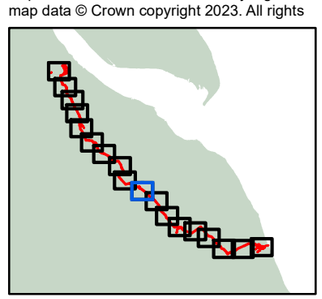

FIGURE TITLE

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ISSUE PURPOSE

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PROJECT NUMBER / REFERENCE

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397000
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APS_22
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Meters

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Extant Ridge and Furrow
- Eroded Ridge and Furrow
- Ditch
- Field Boundary
- Headland
- Lincolnshire NMP

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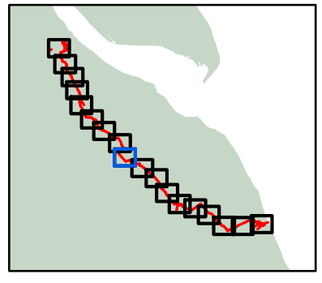

FIGURE TITLE

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526000

527000

401000

400000

APS_28

APS_27

APS_26

APS_25

APS_24

APS_23

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LEGEND

DCO Site Boundary

Site Extents

Asset_Type

Extant Ridge and Furrow

Eroded Ridge and Furrow

Field Boundary

Lincolnshire NMP

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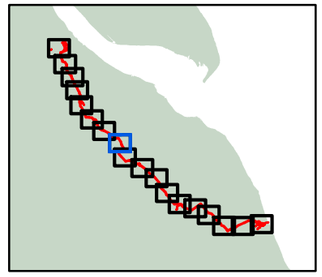

FIGURE TITLE

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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230929_ES_1-2

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APS_29
APS_28

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Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

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LEGEND

DCO Site Boundary

Site Extents

Asset_Type

Eroded Ridge and Furrow

Field Boundary

Headland

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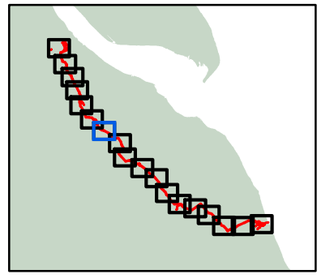

FIGURE TITLE

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ISSUE PURPOSE

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PROJECT NUMBER / REFERENCE

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Revision: 1 Drawn: ASJ Checked: CC Approved: CC Date: 2023-09-29

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Eroded Ridge and Furrow
- Field Boundary
- Modern Service
- Scheduled Monuments
- Lincolnshire NMP

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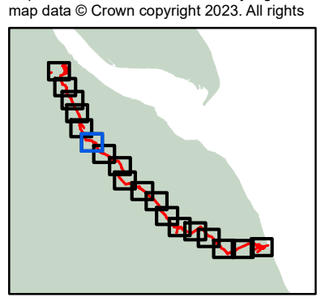

FIGURE TITLE

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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

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518000
519000
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521000
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APS_34
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LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Eroded Ridge and Furrow
- Field Boundary
- Mining
- Modern Service

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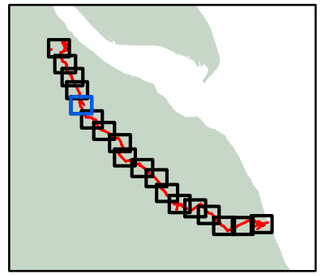

FIGURE TITLE

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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

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APS_41

APS_40

APS_42

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APS_39

APS_38

APS_37

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100 50 0 100 200 300 400 500

Meters

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Eroded Ridge and Furrow
- Field Boundary
- Headland
- Leat
- Moated Site
- Modern Service

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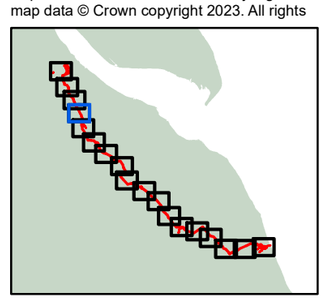

FIGURE TITLE

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ISSUE PURPOSE

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PROJECT NUMBER / REFERENCE

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APS_43

APS_42

APS_41

APS_41

APS_41

APS_41

APS_40

APS_36

N

1:10,000 @ A3

100 50 0 100 200 300 400 500 Meters

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PROJECT

Viking CCS Pipeline

LEGEND

DCO Site Boundary

Site Extents

Asset_Type

Eroded Ridge and Furrow

Modern Service

Lincolnshire NMP

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ISSUE PURPOSE

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LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Eroded Ridge and Furrow
- Field Boundary
- Road
- Lincolnshire NMP

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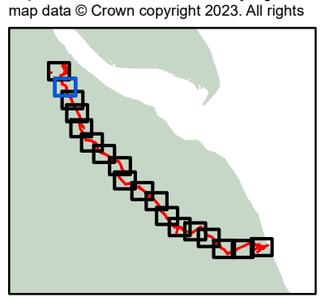

FIGURE TITLE

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ISSUE PURPOSE

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APS_47

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Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Site Extents

Asset_Type

- Extant Ridge and Furrow
- Eroded Ridge and Furrow
- Ditch
- Drainage Ditch
- Field Boundary
- Mining
- Inner Humber NMP

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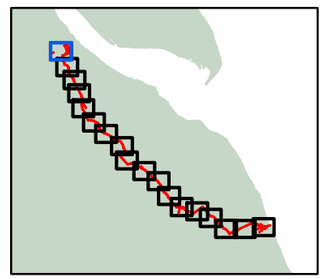

FIGURE TITLE

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ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

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1.9 Discussion

1.9.1 Within the DCO Site Boundary, the assessment identified cropmarked eroded heritage assets which are likely to date to the Prehistoric or Roman periods, although some remain undated or generally dated to the prehistoric periods prior to intrusive investigations.

1.9.2 APS_11 is a cropmarked potential ‘banjo’ shaped ditched enclosure which may have been a typical Iron Age stock corralling site within a rural landscape settlement and agricultural setting. The eastern part of the ditches is traversed by the DCO Site Boundary and are likely overlain by eroded traces of Medieval ridge and furrow (APS_09) to the south of the river Ludd and northwest of Highfield Farm.

1.9.3 A rectilinear cropmarked ditched enclosure is also recorded to the North of the River Ludd between Louth Canal and Alvingham Road nearby to APS_11 at APS_13. The DCO Site Boundary traverse the southwest corner of the enclosure and a possibly associated buried ditch is visible within the DCO Site Boundary to the south of the enclosure.

1.9.4 APS_17 is a cropmarked ditched enclosure with some residual microtopographic elements, which is traversed by the DCO Site Boundary to the east of Ludborough and south of Station Road to the west of the Lincolnshire Wolds Railway. APS_18 is a further focus of buried enclosures and ditches to the north of APS-17 and the east of the A16 bypass around Ludborough. Whilst the visible enclosures lie outside of the DCO Site Boundary, ditches lie within and there is potential for further features in this area. The enclosures and ditches are overlain by eroded ridge and furrow indicative of medieval outfield areas. APS_20 and APS_21 are similar cropmarked enclosures and ditches which are again overlain by the eroded remains of Medieval fields. These fields are likely to have been the outfields to the Medieval Village of Autby (ML41208, outside and to the west of the DCO Site Boundary). APS_22 includes some buried ditches which are traversed by the DCO Site Boundary and may be associated with the area of Autby House and Park at ML41209.

1.9.5 The LHER indicates a Romano British field system and vineyard (ML41207) which is not visible on the airborne remote sensing data and other nearby heritage assets which indicate the potential for prehistoric – Roman sites in this area.

1.9.6 An earlier settlement site, APS_51, is now built over by Immingham Power Station, just outside and adjacent to the northern terminus of the DCO Site Boundary.

1.10 Summary

The assessment results

1.10.1 Features which lie within the DCO Site Boundary indicate a varied archaeological landscape which comprises some areas of buried likely prehistoric or Roman settlement enclosures and agricultural features. Later established Medieval field systems are peripheral to settlements and moated sites which lie outside the Draft Order Limits. The Post-Medieval landscape comprises post-enclosure field boundaries within the Draft Order Limits and a Civil war fort, to the west and outside of the DCO Site Boundary. Near to the North Sea coast, the southwest part of the DCO Site Boundary traverses an area of former WWII hinterland anti-glider defensive trenches which are infilled and visible as marks in crops and bare soil over their former cut elements which formed linear divisions in fields to prevent gliders landing in the event of a seaborne invasion.

1.10.2 Fifty-three individual features or landscapes dating to the prehistoric, Roman, Medieval, Post-Medieval and Modern periods have been identified and mapped. Some of these features have been previously identified and mapped in detail by the LNMP. This assessment has augmented and added to these LNMP data from post 1996 aerial and satellite images and visualised LiDAR data.

Limitations and considerations

1.10.3 It is likely that the below-ground archaeological deposits which cause the marks in crops are more extensive, both horizontally and vertically, than shown *via* the aerial imagery. Absence of cropmark evidence does not necessarily indicate an absence of archaeological deposits in apparently blank areas or those which underlie an extensive Modern and Medieval relict landscape.

1.10.4 The separation of dating into specific periods of prehistory and history can only be confirmed by ground-based or documentary analyses, but some dating evidence for sites is proposed by the LHER evidence from intrusive or documentary survey and the LNMP and this assessment by observation of morphological characteristics of cropmarked sites.

1.10.5 From an aerial perspective, this landscape may be analysed in a ‘living’ manner as one which developed over time and contains many multi-period elements. These will be more deeply stratified and extensive below the ground than is apparent in the results of the survey. The remains visible as cropmarks are all likely to have been impacted by agricultural cultivation, to some degree, and retain minimal or no micro-topographic features visible on the ground surface within the DCO Site Boundary.

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Ref 1 *Bennett, R. Welham, K. Hill, R.A. & Ford, A (2012).* 'A Comparison of visualisation techniques for models created from airborne laser scanned data' in Archaeological Prospection 19. PP. 41-48.

Ref 2 *Cranfield University (2023).*Soils data accessed March 2023 available at [redacted]

Ref 3 *Evans, S. (2019).* Historic England Aerial Investigation and mapping (formerly national mapping programme) Standards Technical Review Historic England research report Series 46-2019 Accessed April 2023 Available at: HistoricEnglandAerialInvestigationandMapping(formerlyNationalMappingProgramme)StandardsTechnicalReview

Ref 4 *Historic England (2018).* Using Airborne Lidar in Archaeological Survey: The Light Fantastic. Swindon. Historic England. Accessed April 2023 Available at: HistoricEngland.org.uk/research/methods/airborne-remote-sensing/lidar/

Ref 5 *Hesse, R (2010).* 'LiDAR-derived Local Relief Models - a new tool for archaeological prospection' in Archaeological Prospection 2.

Ref 6 *Štular, B. Kokalj, Ž. Oštir, K. Nuninger, L (2012).* 'Visualisation of LiDAR – derived relief models for detection of archaeological features' in Journal of Archaeological Science 39. PP. 3354-3360.

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