

97/1

# Blyborough, Lincs. to Cottam, Notts. Pipeline

Report on the Archaeology  
Part 2: The Appendices

*Wessex Archaeology*

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*December 1997*

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## APPENDIX 1: GAZETEER OF ARCHAEOLOGICAL SITES

## Gazeteer of Archaeological Sites(for location of sites see Figs. 2 to 7)

### KEY TO LANDSCAPE ZONES

- 1 Lincoln Edge (limestone)
- 2 Trent Vale (claylands)
- 3 River Trent alluvial corridor / River Gravel

### KEY TO SITE TYPES

- HB Historic building or settlement
- L Landscape feature
- E Excavated archaeological site
- C Cropmark site
- AS Artefact scatter (fieldwalking data)
- F Isolated and/or unstratified find/s
- U Uncertain

### KEY TO IMPACT TYPE

- A Site outside working width
- B No impact observed
- C Site cut by pipe trench
- D Site disturbed by topsoil strip and cut by pipe trench

### KEY TO OBSERVED IMPACT

- SIGNIFICANCE
- 1 Major disturbance of deposits over large area
  - 2 Major disturbance of deposits in limited areas
  - 3 Minor disturbance of deposits in limited areas/ more substantial disturbance of minor archaeological deposits.
  - 4 No impact observed

Site No.	SMR/NMR Ref.	NGR (SK), Zone and Field	Period	Site Type	Description	Impact Type	Impact significance
C1	NMR 662931 Lincs SMR 50575	855 815 Zone 2 RDX 14	Roman	L	Roman road from York to Carlton. Margary 28a. (1973). The road linked Lincoln ( <i>Lindvm</i> ) with Doncatser ( <i>Danum</i> ).	B	4
C2	Lincs SMR 50928	9382 9273 Zone 1	Post medieval	HB	'Willoughton Mill' (a windmill) is depicted on the 1824 OS 1" map, and the 1769 Enclosure map.	B	4
C3	Lincs SMR 50942	9385 9279 Zone 1 Field 1.5	Saxon	F	A twisted piece of highly patinated bronzework (fieldwalking find) has been identified as the remains of an Anglo-Saxon bronze hanging bowl. A fragment of bronze buckle and an unidentifiable fragment are reported for the same area. These artefacts possibly mark the site of a high status burial. Ridgetop and edge sites are known to have been favoured for Saxon pagan burials.	B	4
C4	Lincs SMR 50945	9365 9289 Zone 1 Field 1.4	Prehistoric	F	An unpolished flint axe and flint sickle (fieldwalking finds).	A	4
C5	Lincs SMR 50959 53318, 50594	9400 9367 9397 9367 Zone 1 Field 1.2	?Prehistoric (Bronze Age elements)	C/AS	An extensive cropmark site The main element appears to be a series of multiple curvilinear ditches, possibly the remains of either a very large enclosure, or a long linear boundary (comparable to examples on the Yorkshire Wolds of Bronze Age date). A near rectilinear cropmark is also present, probably representing an enclosure. East of the linear ditches (outside of the study area) are further cropmarks, possibly the remains of a field system plus a pit alignment. Fieldwalking in the area has produced worked flint, including a few Early Bronze Age tanged and barbed arrowheads (cf. C12)..	B/D	4



<b>C6</b>	Lines SMR 50943	9385 9280 Zone 1 Field 1.5/1.6	Prehistoric	F	Worked flint of unknown quantity and type (fieldwalking finds).	B	4
<b>C7</b>	NMR 1033409 Lines SMR 50975	939 927 Zone 1 Field 1.5	Roman	F	A Romano-British greyware pot (fieldwalking find) north of Old Leys Lane, may be an outlier or chance discard associated with the extensive Roman site found at Willoughton Cliff.	B	4
<b>C8</b>	Lines SMR 50930	9370 9350 Zone 1 Field n/a (borders 1.2/1.3)	Unknown (Bronze Age)	C	A cropmark ring ditch is listed in the SMR. Three more were identified from aerial photographs (SK9393/15).	A	4
<b>C9</b>	Lines SMR 53312, 53313	9438 9402 9412 9407 Zone 1 Field 1.1	Roman	AS	Two artefact scatters. They could represent one site since the finds from each are of consistent date and type. The finds include building materials, oyster shell, grey ware, dalesware, colour coated wares, mortaria, and a single sherd of Samian. One late 4th century AD coin (Valens) was also found. The site appears to date to the 3rd and 4th centuries.	D	3
<b>C10</b>	Lines SMR 53314	9419 9429 Zone 1 Field 1.1	Bronze Age	F	A tang of a flint dagger is reported. The circumstances of recovery are unknown.	A	4
<b>C11</b>	Lines SMR 53315	9405 9375 Zone 1 Field 1.1	Post medieval	HB	This area is marked as Brick Kiln Close on the 1839 tithe award map, suggesting post-medieval brick making on the site. The 1886 1st ed. OS 1:2500 sheet shows extant buildings.	A	4
<b>C12</b>	Lines SMR 53316	9395 9373 Zone 1 Field 1.1/1.2	Undated	L	"The Blyborough/Willoughton parish boundary survives here as a pronounced ridge covered with blown sand and bracken, a rare survival of the warren land surface on this part of the Lincoln Cliff" (SMR entry). This boundary may could be medieval or earlier, and could preserve pre-medieval remains associated with the adjacent cropmarks (cf. C5).	D	3
<b>C13</b>	Lines SMR 53319	9405 9446 Zone 1 Field n/a (borders 0.1)	Medieval	L	Ridge and furrow field system which appears to extend further north than indicated on the SMR. The northern section is badly plough damaged. This area may also include earthworks associated with the avenue leading to Blyborough Hall.	A	4
<b>C14</b>	NMR 327123 Lines SMR 50977	9310 9187 Zone 2 Fiel 4.2	Early Iron Age	U	An Early Iron Age site is marked by F.T. Baker (1949). A pencilled note by ALF Rivet indicates the site is of some importance, "the better of the Willoughton Iron Age sites" (SMR). No details of the site are known. It may be concealed in the small strip of woods (cf. C17), or more likely, be associated with cropmark site C26.	B	4
<b>C15</b>	NMR 327144 Lines SMR 50988, 50989	9301 9168 9308 9142 Zone 2 Field 4.2	Roman	AS	Two artefact scatters of Roman material, including in both cases 3rd and 4th century AD pottery (fieldwalking finds). It is likely from the proximity and contemporaneity of these scatters that they represent the same farm complex. cf. C26.	B	4



<b>C16</b>		9420 9400 Zone 1 Field 1.1	Unknown	L	On the 1839 tithe map the field at this point is divided into numerous small plots, possibly indicative of cottages along or near the road.	A	4
<b>C17</b>		9315 9175 Zone 2 Field 4.1/4.2	Unknown	L	A relict trackway from Willoughton to Hemswell, part of a road/track running parallel to Middle St. (the Jurassic Way, C21), but at the foot of the Limestone Ridge. It runs from village centre to village centre, usually past the church. As such it is likely to be contemporaneous with the villages (i.e. probably early medieval). Such trackways often preserve relict earthworks or other pre-medieval features. They may also preserve pre-modern soil surfaces which have otherwise been ploughed away.	B	4
<b>C18</b>		9340 9180 Zone 1 Field 3.3	Post-medieval	L	A pit or quarry is shown at this location from cartographic sources. No further information is available.	B	4
<b>C19</b>		9050 8870 Zone 2 Field n/a (borders 6.7/6.8)	Unknown	L	Harpwell Wood has the potential to contain preserved earthworks or other remains of pre-modern date, as shown by other studies in the Trent Vale, such as Styrrup Hall Farm.	A	4
<b>C20</b>		9030 8670 Zone 2 Field n/a (borders 8.1)	Unknown	L	Heaton's Wood has the potential to contain preserved earthworks or other remains of pre-modern date, as shown by other studies in the Trent Vale, such as Styrrup Hall Farm.	A	4
<b>C21</b>	NMR 1035165	9340 9160 to 9420 9520 Zone 1 RDX4	Prehistoric to Modern	L	Middle Street originates as the prehistoric Jurassic Way. It runs along the Lincoln Edge and is part of the Great North Road, running from Salisbury Plain to the Humber.	B	4
<b>C22</b>	NMR 508993; 324942	8180 7980 Zone 3 Field n/a (borders 16.6)	Medieval	HB	Cottam village. The village lies partially within the study area. The modern village lies west of Town St which marks the boundary between the gravels (to the west) and the alluvium, and which in post medieval times marked the flood high water line (Drainage Map, 1769). There is no indication that there were ever any buildings east of Town St., although the 1st ed. OS maps show the strip between York St. and Seymour Drain divided into narrow plots. Within the village Holy Trinity Church is a listed building (8183 8007) and the railway station is listed on the NMR. The former contains an extant Norman doorway.	A	4
<b>C23</b>		9430 9440 to 9430 9500 Zone 1 Field 0.1	Unknown	C	A large area of cropmarks, the majority suggestive of post-medieval field boundaries. Two subcircular feature are also present and may be ring ditches. A linear feature leads east from the northern of the two circular features to. An oval feature at the southern end of this complex may be a modern pond. Two poorly defined linear features may represent former courses of Middle St.	B	4



<b>C24</b>	Lincs. SMR 50354	938 917 Zone 1 Field 3.1/3.2	Roman, ?multi-period	C/E	A cropmark complex including rectilinear and curvilinear elements. The configuration suggests the cropmarks may represent more than one period of occupation. Some of the cropmarks appear to be associated with a multi-ditch linear feature which coincides with the Willoughton-Hemswell parish boundary (outside the study area).	C	2
<b>C25</b>		935 925 Zone 1 Field 2.1	Unknown	C	Cropmarks on both sides of Old Leys Lane. Wholly south of the lane are series of parallel field boundaries. A major NW-SE linear feature appears to represent the continuation of Hollowgate Hill and probably represents a former trackway from Willoughton to Caenby Corner. Other rectilinear field boundaries alongside the track are visible outside. Finds of Saxon and Roman materials in the vicinity of the trackway suggest that it may be of considerable antiquity (cf. C3, C6, C7)..	B	4
<b>C26</b>		9280 9170 Zone 2 Field 4.2	Unknown	C	A cropmark complex north of Hemswell, much of it linear field boundaries associated with the existing field systems. Of more significance is a small cluster of rectilinear marks (SK 9290 9174) which may be enclosures of a much earlier date, possibly associated with the Roman site (C15) or Iron Age site (C14) nearby.	C	3
<b>C27</b>		9180 8995 Zone 2 Field n/a (borders 6.2)	Unknown	C	Possible enclosures or a small part of a field system is marked on the RCHME cropmark map.	A	4
<b>C28</b>	Lincs. SMR 51010	9084 8853 Zone 2 Field 6.7	Unknown	C	The SMR records a rectangular or square ditched cropmark enclosure at this location. The aerial photographs viewed during the desk based assessment suggest that it may be a round enclosure (SK9188/1).	A	4
<b>C29</b>		8870 8460 Zone 2 Field n/a	Medieval	L	Ridge and furrow in the vicinity of Carisbrooke.	A	4
<b>C30</b>	Lincs. SMR 52492	8520 8190 Zone 2 Field 13.7	Medieval	L/C	Ridge and furrow in the vicinity of Marton Grange, plus a former boundary. The latter appears to be associated with a former woodland shown on the 1st ed. OS map.	A	4
<b>C31</b>	Lincs SMR	9250 9130 Zone 2 Field 4.4	Medieval	L	Extensive ridge and furrow surrounding Hemswell. (Only those areas where it falls within the study area are shown)..	D	3
<b>C32</b>		925 917 Zone 2 Field 3.2/3.3	Medieval	L	The Willoughton-Hemswell parish boundary. Parish boundaries are often indicative of, or based on, pre-Christian political or administrative boundaries, ownership patterns, or landscape features..	D	4
<b>C33</b>		923 904 Zone 2 RDX6	Medieval	L	The Hemswell-Harpswell parish boundary (Harpswell Lane).	B	4
<b>C34</b>		9050 8800 Zone 2	Medieval	L	Boundaries associated with the parishes of Harpswell, Heapham, Upton, Kexby and Glentworth.	D	4

C35		8900 8530 Zone 2	Medieval	L	The Kexby-Willingham parish boundary.	D	4
C36		8740 8315 Zone 2 RDX13	Medieval	L	The Willingham-Stow parish boundary..	D	3
C37		8620 8220 Zone 2 Field 13.5	Medieval	L	The Stow-Marton parish boundary.	D	4
C 38		8520 8108 Zone 2 Field 14.3/14.4	Medieval	L	The Marton-Brampton parish boundary.	D	4
C39		8200 7976 Zone 3 Field 16.6	Medieval	L	The Cottam-Lancham parish boundary.	D	4
C40		8185 7965 Zone 3 Cottam Power Station	Medieval +	L	Seymour Drain is of historic interest as one of the earliest drains in the area, predating 1769. It has been suggested that Seymour Drain is a palaeochannel of the Trent, cut off by meander processes, and gradually converted to a land drain (Challis 1990). The pipeline intersects the line of Seymour Drain SE of Floss House Farm.	B	4
C41	Lincs SMR 52496	8435 8095 Zone 2 Field n/a (borders 14.6)	Medieval +	IIB	Brampton Grange. The place name element "grange" is normally related to monastic or ecclesiastical ownership of a farm.	A	4
C42	Lincs SMR 53786	8440 8070 Zone 2 Field n/a (borders 14.6)	Post- medieval ?	L	Bunkers Hills Warren. Place-name evidence. Possible warren - date and extent unknown	A	4
C43		8400 8070 Zone 2 Field 14.7/15.1	Undated	C	Cropmark complex west of Brampton Grange. The nature and date of the marks is unclear. (RCHM(E) ref. SK8380/1, 1946. Badly smeared by 1981).	D	3
C44	Lincs SMR 52488	8400 8090 Zone 2 Field n/a (borders 15.1)	Undated	L	Earthwork dyke, probably representing a post-medieval flood defence	A	4
C45		Zone 2 Field n/a (borders 14.5/14.4)	?Roman	L	Boundary feature considered to be possible Roman road..	B	4



C46		82950 87250 Zone 2 Field 13.1	Roman	E	The watching brief identified a number of Roman features in the cutting of the pipe trench. Limited investigations revealed the remains of Roman boundary ditches, pits and other agricultural features (possible threshing and winnowing floors).	D	2
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## **APPENDIX 2: GEOPHYSICAL SURVEY BY GEOQUEST**



GEOPHYSICAL SURVEY OF FIVE SITES  
ON THE ROUTE OF THE BLYBOROUGH  
(LINGS.) TO COTTAM (NOTTS.)  
GAS PIPELINE

A programme of research carried out  
on behalf of

Wessex Archaeology

by

GeoQuest Associates

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## 1 INTRODUCTION

- 1.1 This report presents the results of detailed geophysical surveys of five selected sites on the route of the proposed Blyborough (Lincs.) to Cottam (Notts.) gas pipeline. The aim of the study was to provide further information concerning subsoil archaeological features prior to the construction of the pipeline.
- 1.2 The research was carried out by GeoQuest Associates on behalf of the Trust for Wessex Archaeology Ltd, acting as archaeological consultants to Penspen Ltd. The geophysical field survey was carried out between 28th April and 7th May, 1997.

## 2 THE SURVEY AREAS

- 2.1 Four of the five sites investigated are situated within a N-S aligned corridor immediately east of the B1398 road between Hemswell and Blyborough. The fifth site surveyed is located about 0.7km north of Hemswell to the west of the B1398. These areas were selected for geophysical survey on the basis of a desk-based assessment that identified cropmark and landscape features, artifact scatters and isolated objects which highlighted the potential for archaeological features surviving in the subsoil.
- 2.2 *Site 5* (SK 940936), NE of Willhoughton Manor was positioned to investigate a rectangular enclosure with other curvilinear and linear features identified from aerial photographs.
- 2.3 *Site 9* (SK 942941) is situated east of the junction of Westbeck Lane and Middle Street and coincides with the site of potential Roman buildings identified from a surface spread of artefacts which include ceramic building material.
- 2.4 *Site 23* (SK 942944) East of Blyborough Hall, is the site of a small oval enclosure (possible long barrow) and other linear features identified from aerial photographs.
- 2.5 *Site 24* (SK 936919), SW of Patchett's Cliff. This site was located to investigate a series of rectilinear enclosures contiguous with a triple ditch system and other sub-circular features. In a second stage of investigation the survey of this site was extended north to meet the lane to Patchett's Cliff in order to trace the extension of archaeological features revealed by the initial geophysical survey.
- 2.6 *Site 26* (SK 929917), North of Hemswell. The survey area forms the southern part of a rectilinear enclosure and linear features of possible Iron Age and Romano-British date as suggested by finds of pottery in the immediate vicinity.

## 3 LANDUSE, TOPOGRAPHY AND GEOLOGY



- 3.1 The solid geology in each of the study areas comprises Jurassic limestones which are obscured by deposits of drift and alluvium. There are no rock outcrops in any of the five areas examined. The sites are generally level or gently undulating.
- 3.2 The survey areas are situated on arable land which bore developing crops at the time of survey: cereal (Sites 5 and 26), beans (Site 9), potatoes (Site 23) and a root crop (Site 24).
- 3.3 Overhead high voltage power lines traversed the survey areas at Sites 5 and 9.

## 4 THE GEOPHYSICAL SURVEY

- 4.1 The geophysical survey was undertaken on behalf of Wessex Archaeology Ltd in accordance with a Brief prepared by Andrew J Lawson. The Project Brief specified geomagnetic survey of each of the five areas at a resolution of 1.0x0.25m, with subsequent interpolation of data onto a 0.25x0.25m grid.
- 4.2 The primary aim of the geophysical surveys was to record any subsoil features that might be of archaeological interest and to compare the findings with the results of the desk study.
- 4.3 Previous research has shown that in the majority of cases a significant magnetic susceptibility contrast exists between the undisturbed subsoil and the fill of cut features such as ditches and pits, as well as between the subsoil and stone features such as foundations and tracks. The main processes at work appear to be iron oxide production in the plough soil, due to repeated burning, with further enrichment after burial as a result of microbial activity fueled by organic material. Geomagnetic surveying should therefore be an appropriate and rapid technique for locating buried archaeological features in this instance.
- 4.4 The geophysical survey was carried out in gridded units of 20x20m which were located with respect to permanent landscape features using tapes and an optical square to an estimated accuracy of 0.5m. The geomagnetic survey was carried out by one team using a Geoscan FM36 fluxgate gradiometer fitted with an ST1 sample trigger and utilising the zig-zag traverse scheme described in Appendix A.
- 4.5 Data were downloaded on site into a portable graphics computer for storage, quality control and initial interpretation. These data were subsequently transferred to a laboratory computer for final processing and archiving.

## 5 DATA PROCESSING

- 5.1 The GeoQuest InSite® software program was used to process the geophysical data and produce continuous tone grey-scale images of the raw data in each area, at scales of 1:1000 and 1:2500. These results are shown in Figures 2 and 3 on plans derived from digital map files

supplied by Wessex Archaeology. A convention is used that shows positive magnetic anomalies as dark grey and negative magnetic anomalies as light grey. Figure 2 includes keys which relates the grey scale intensities to anomaly values in nano Tesla per metre. These keys also apply to the images presented in Figure 3.

5.2 The following basic processing steps were applied to the data:

*Removal of striping artifacts* in the images caused by alternating changes in level between zig-zag traverses.

*Removal of Random 'Spikes'* present in the data due to small ferrous objects or fired stone on or near the ground surface. This process replaces spikes with the mean of near-neighbours.

*Correction for apparent shear* in strong geomagnetic anomalies surveyed by zig-zag traversing.

*Correction for drift* in magnetometer calibration with time.

*Adjustment of grid mean values* to achieve an optimum match along the lines of contact between data grids.

*Interpolation of the data*, using a bilinear function, to generate a regular mesh of values at 0.25 x 0.25m intervals.

5.3 The geophysical images were printed on a Hewlett Packard HP650C Designjet plotter with 256 grey shades and 600 dpi resolution. A sigmoid function was used to map the data to printed grey tones since this provides a measure of contrast equalisation. Appendix B provides more information about data processing and itemises the algorithms that were applied to produce the grey-scale images in Figures 2 and 3.

## 6 DISCUSSION OF RESULTS

### 6.1 Key to Figures

6.1.1 A number of significant anomalies have been detected in the data and these are presented on a 1:2000 geophysical interpretation plan using coded colours and patterns (Figure 4). The following types of anomaly have been distinguished:

- |              |  |
|--------------|--|
| <b>Green</b> | Significant regions of anomalously high magnetic field gradient which might be associated with high susceptibility, soil-filled structures such as <i>pits</i> and <i>ditches</i> .            |
| <b>Blue</b>  | Areas of anomalously low magnetic field gradient, corresponding to features of low magnetic susceptibility, such as concentrations of sedimentary rock <i>rubble</i> and <i>field drains</i> . |



**Red** Strong *dipolar magnetic anomalies* (paired negative-positive) which may reflect recent *bonfires* or dumps of material with very high susceptibility. Smaller examples are almost certainly due to near-surface iron objects such as *horseshoes* and have been ignored in the subsequent archaeological interpretation.

6.1.2 A 1:2000 archaeological interpretation plan is presented in Figure 6.

## 6.2 Site 5

6.2.1 The geophysical terrain in this area was remarkably smooth with the major anomalies arising from deposits of ferrous debris near the western and eastern margins of the survey area.

6.2.2 Two very weak and diffuse positive magnetic lineations have been detected which are aligned parallel to the field boundary forming the northern limit of the survey area. These anomalies have been tentatively identified as the ditches d1 and d2 in Figure 5 but may reflect field drains.

6.2.3 No further geophysical anomalies of archaeological interest have been identified in this study area. In particular, no geophysical evidence has been found in support of the cropmark features seen in aerial photographs.

## 6.3 Site 9

6.3.1 This area is characterised by a dense pattern of E-W trending, positive and negative magnetic lineations which almost certainly reflect a set of field drains and/or a magnetic susceptibility texture created by ploughing in this direction.

6.3.2 A weak and intermittent, curvilinear positive magnetic lineation has been detected within the southern half of the survey area. The form of this anomaly is consistent with the remains of a poorly-preserved ditch (d3).

6.3.3 No further geophysical anomalies of archaeological interest have been identified in this study area.

## 6.4 Site 23

6.4.1 The major geophysical feature in this area comprises a zone of intense magnetisation in a position corresponding to the oval cropmark trace. The strength of the anomaly suggests the presence of surface ferrous debris although the existence of fired material at this position (of possible archaeological interest) cannot be ruled out.

6.4.2 The survey has detected a weak and fragmentary positive magnetic lineation, with E-W orientation, traversing the southern third of this survey area. This feature has been tentatively identified as ditch d4 in Figure 5.

- 6.4.3 The geophysical survey has provided no evidence for additional features of archaeological interest in this study area.

## 6.5 Site 24

- 6.5.1 The major geophysical anomalies in this study area comprise compact clusters of intense magnetic dipoles which almost certainly represent dumps of ferrous debris or brick rubble.
- 6.5.2 A set of distinct, positive magnetic lineations have been located in the southern block of survey and almost certainly correspond to silted ditches that survive in the subsoil. These have been labelled d10, d11 and d12 in Figure 5. From an examination of the present survey extent these ditches do not appear to form a coherent pattern such as a field system or enclosure. Ditch d11 may correlate with a linear cropmark feature.
- 6.5.3 Of particular archaeological interest is the discovery of strong linear and curvilinear positive anomalies in the northern block of survey which provide good evidence for a set of ditches (d5 to d9; Figure 5). Ditch d5 appears to form part of an enclosure with minimum dimensions of 100x30m that extends north and east beyond the survey area.
- 6.5.4 An E-W oriented texture and set of lineations in the northern survey block almost certainly reflects a set of land drains and subsoil disturbance due to ploughing.

## 6.6 Site 26

- 6.6.1 A compact zone of dipolar magnetic anomalies in the central part of this area probably represents a dump of ferrous debris or brick rubble.
- 6.6.2 A weak and diffuse positive magnetic anomaly in the western central part of this area may correspond to the ditch identified from aerial photographs. The geophysical data suggest that this feature is poorly preserved in the subsoil.
- 6.6.3 The geophysical survey has provided no evidence for additional features of archaeological interest in this study area.

## 7 CONFIDENCE LIMITS

d1 as ditch	20%	d3 as geological	15%
d1 as land drain	20%	d4 as ditch	30%
d2 as ditch	20%	d5 as ditch	90%
d2 as land drain	20%	d6 as ditch	75%
d3 as ditch	40%	d7-d12 as ditches	60%

d7-d12 as drains 20%



## 8 CREDITS

*Survey:* D.N. Hale, R. Still, R. Carter and N. Till

*Graphics and Report:* M.J. Noel

*Date:* 29th May 1997



# COTTAM GAS PIPELINE

LOCATION OF GEOPHYSICAL SURVEYS

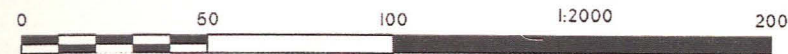
SURVEY BY

**GeoQuest**  
ASSOCIATES

FOR



Wessex  
Archaeology

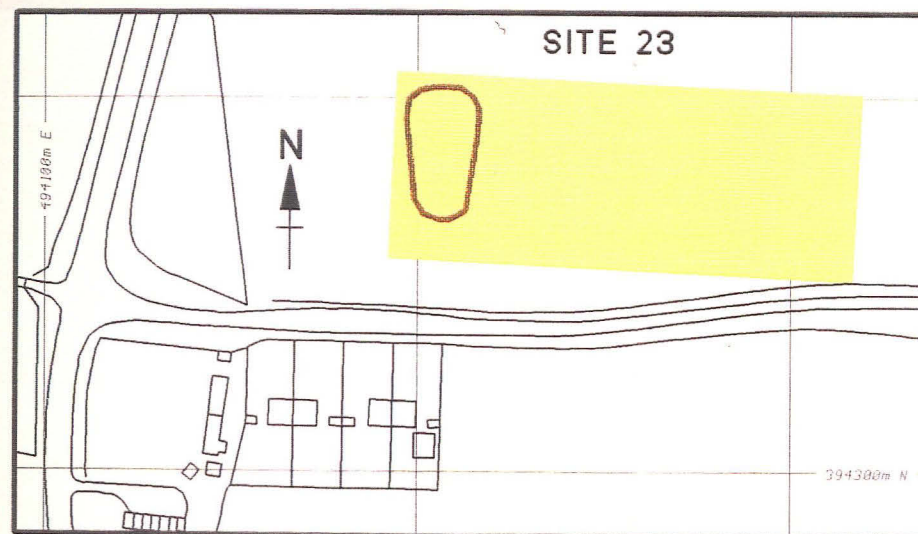


**SURVEY AREA** **CROPMARK** **ARTEFACT SCATTER**

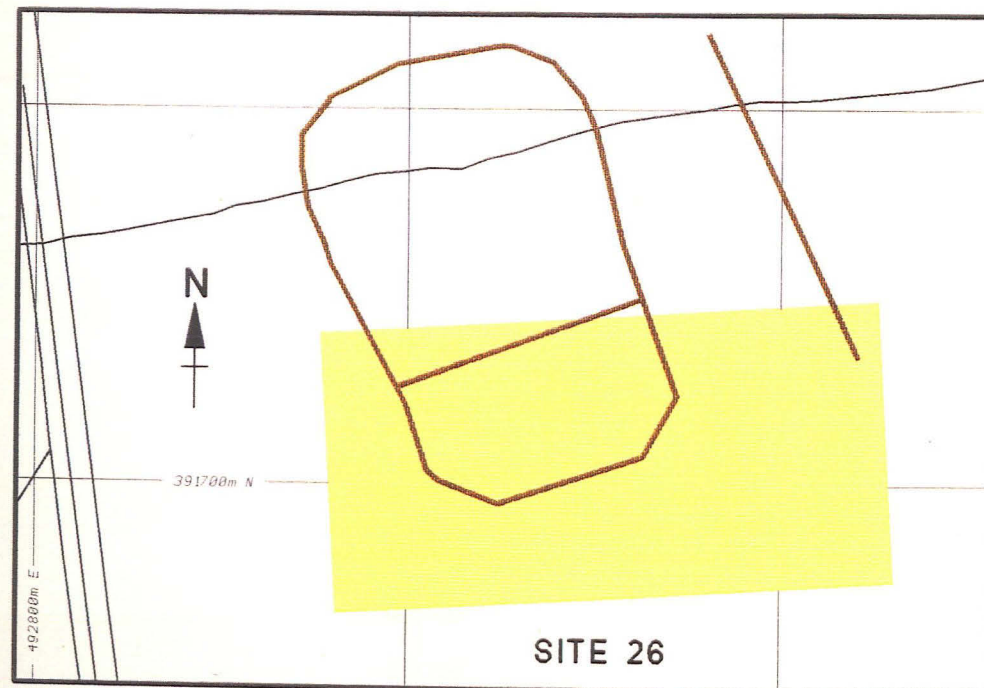
SITE 24



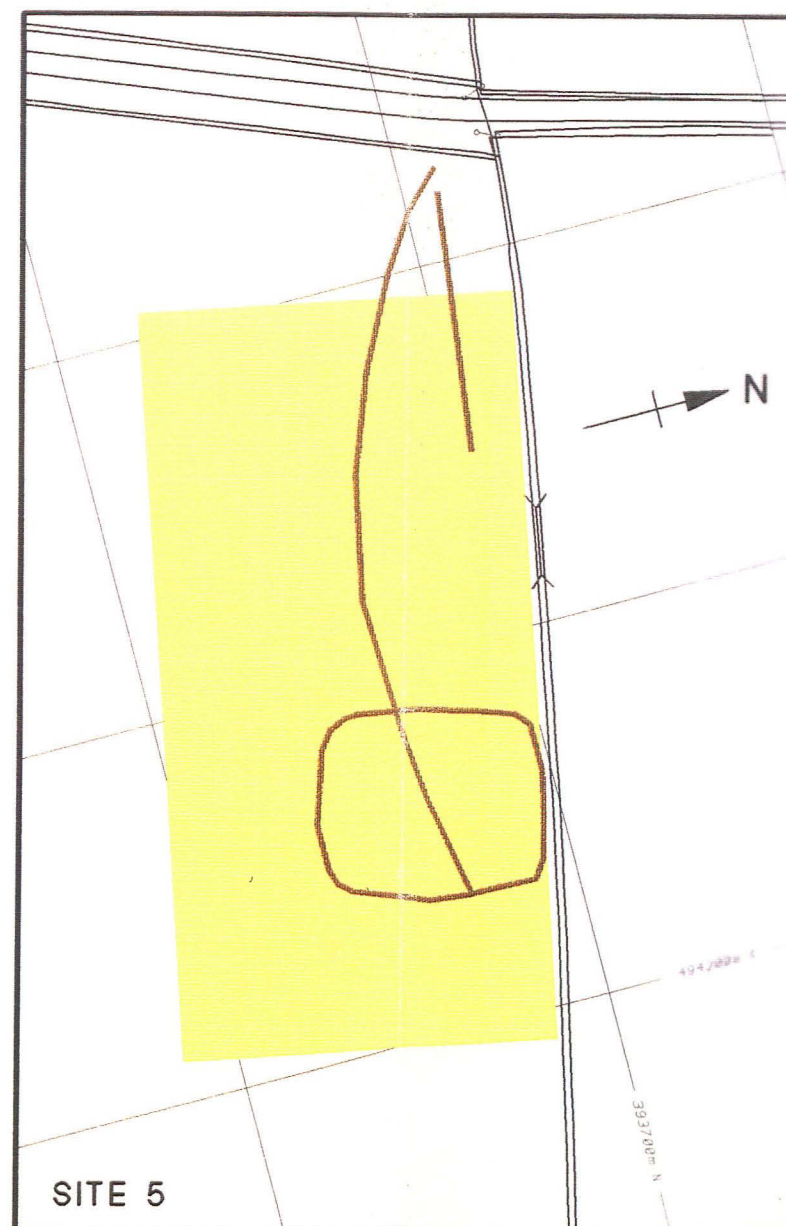
SITE 23



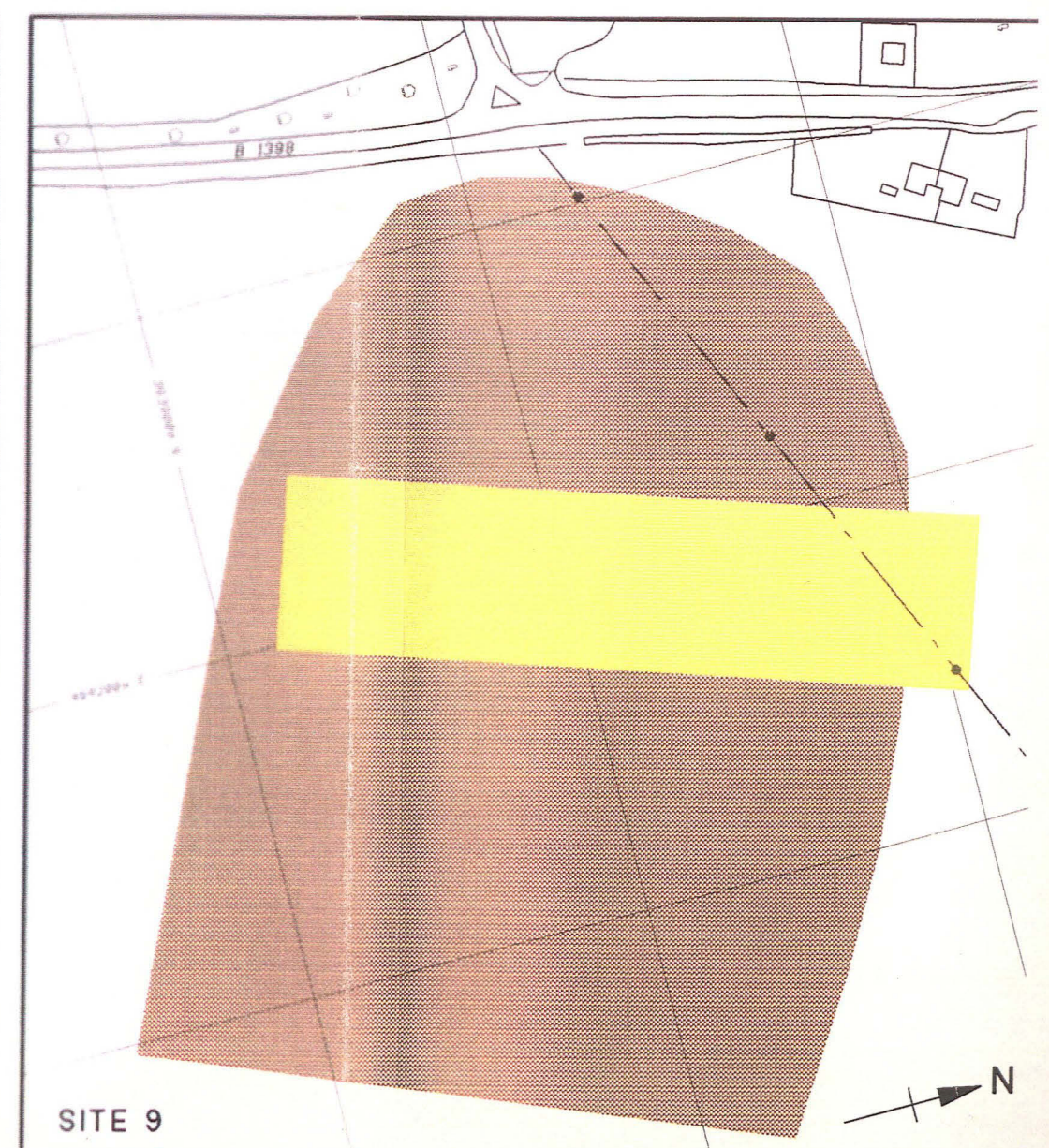
SITE 26



SITE 5



SITE 9





# COTTAM GAS PIPELINE RESULTS OF GEOPHYSICAL SURVEYS

SURVEY BY

**GeoQuest**  
ASSOCIATES

FOR

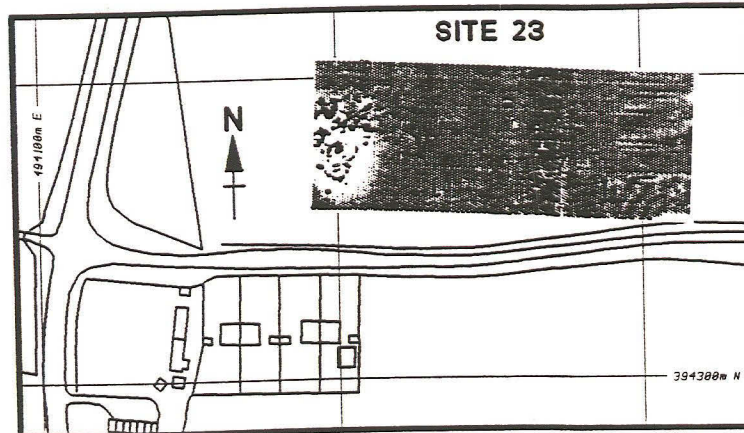


**Wessex**  
Archaeology

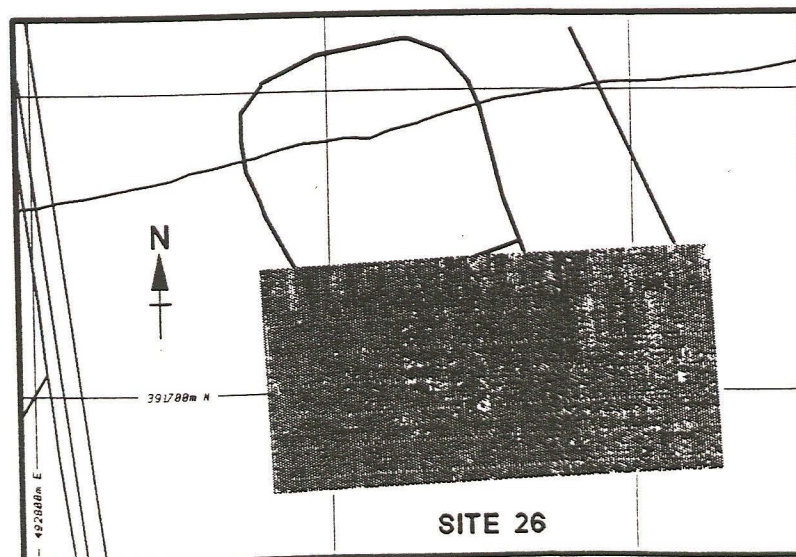


For anomaly magnitudes refer to keys in Figure 2

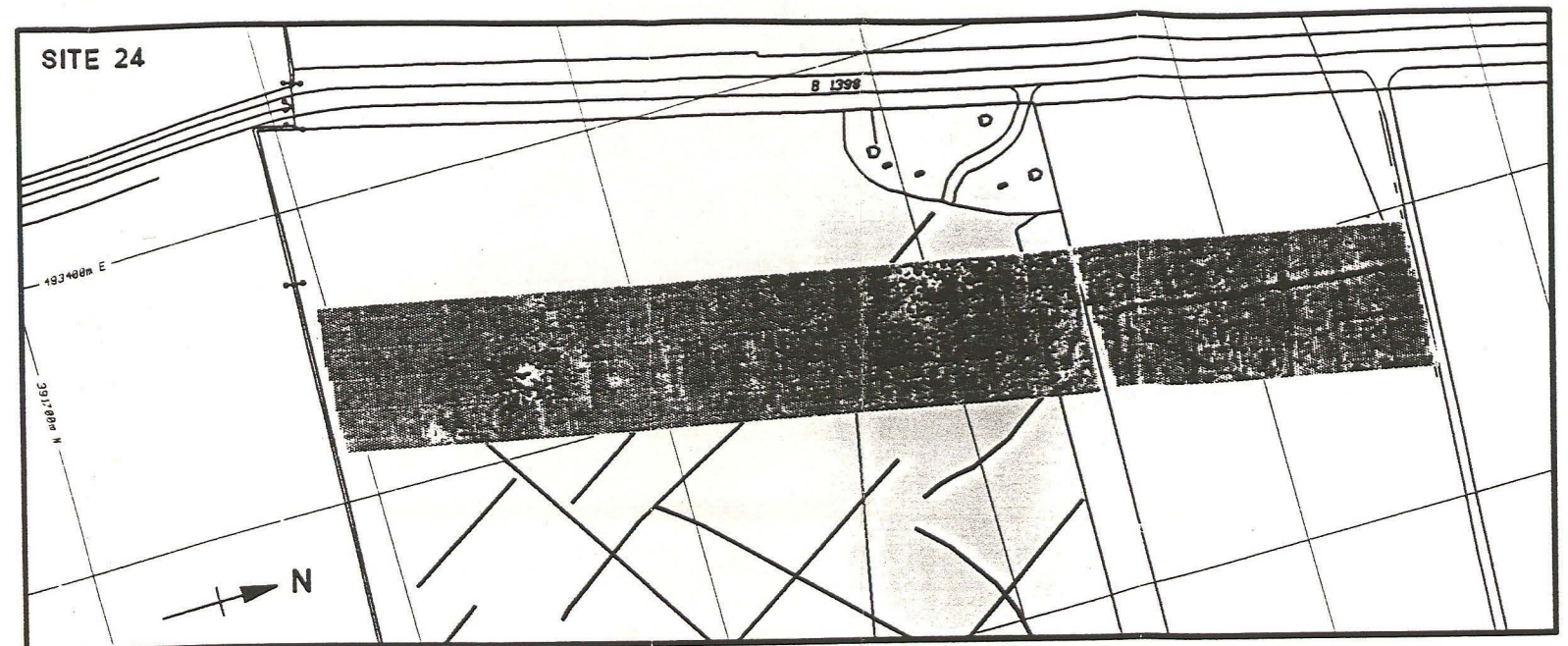
**SITE 23**



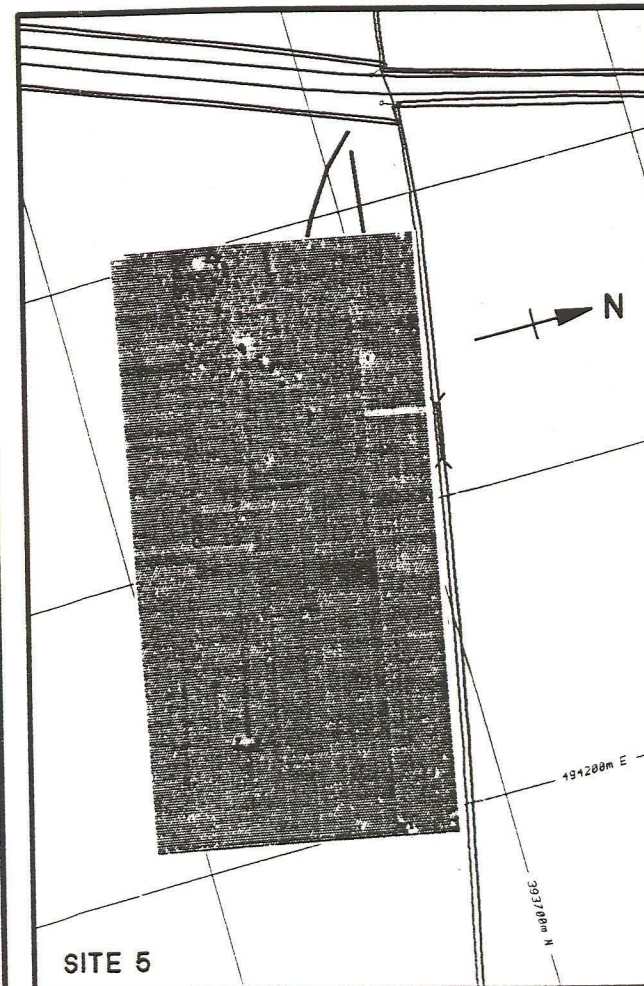
**SITE 26**



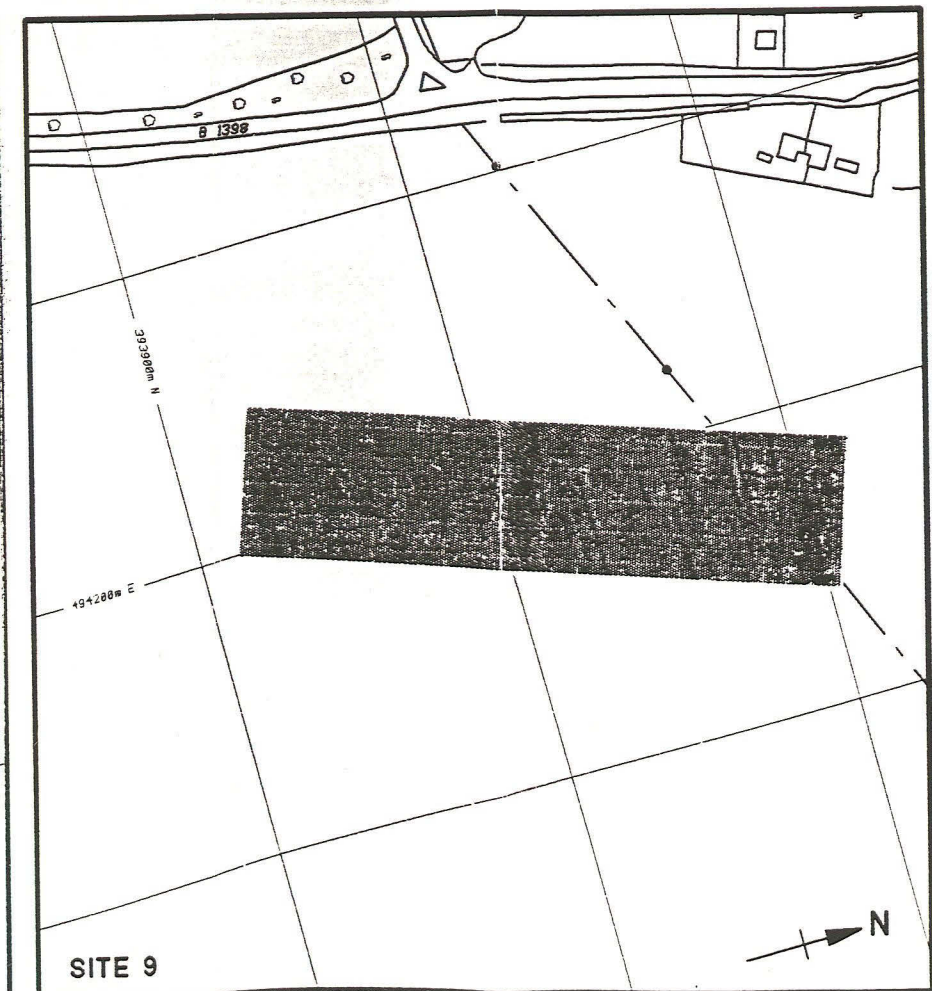
**SITE 24**



**SITE 5**



**SITE 9**





# COTTAM GAS PIPELINE

## GEOPHYSICAL INTERPRETATION

SURVEY BY

**GeoQuest**  
ASSOCIATES

FOR



Wessex  
Archaeology

0 50 100 1:2000 200

### KEY

POSITIVE

NEGATIVE

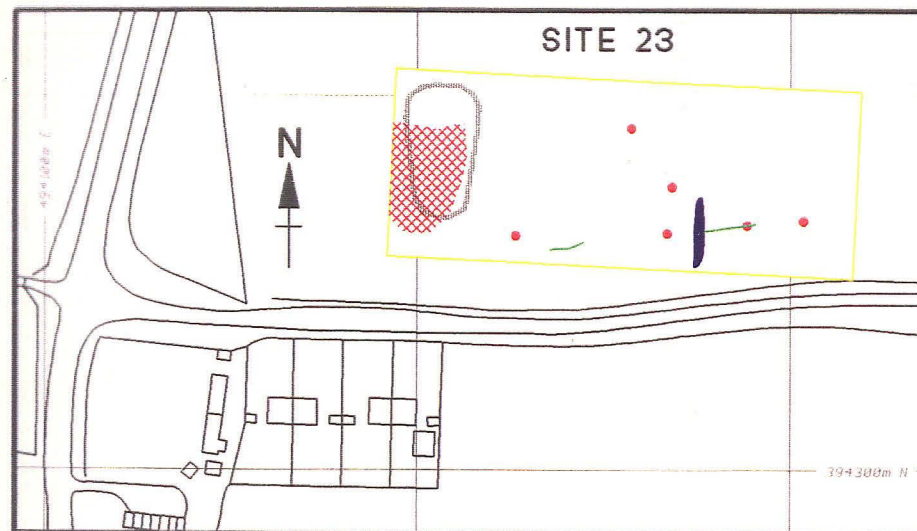
DIPOLE

CROPMARK

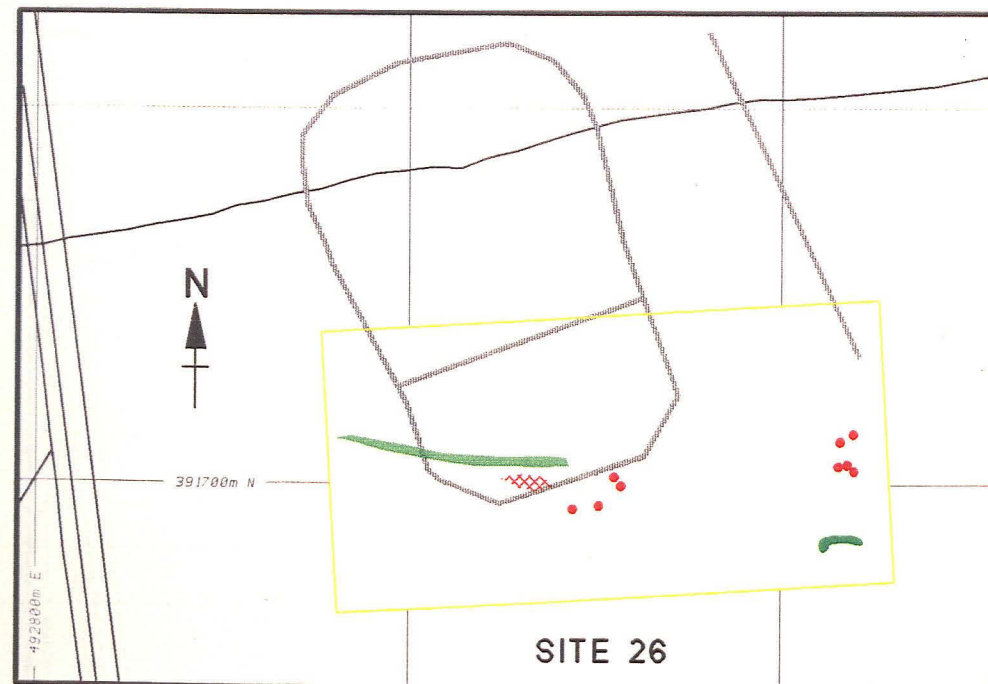
SITE 24



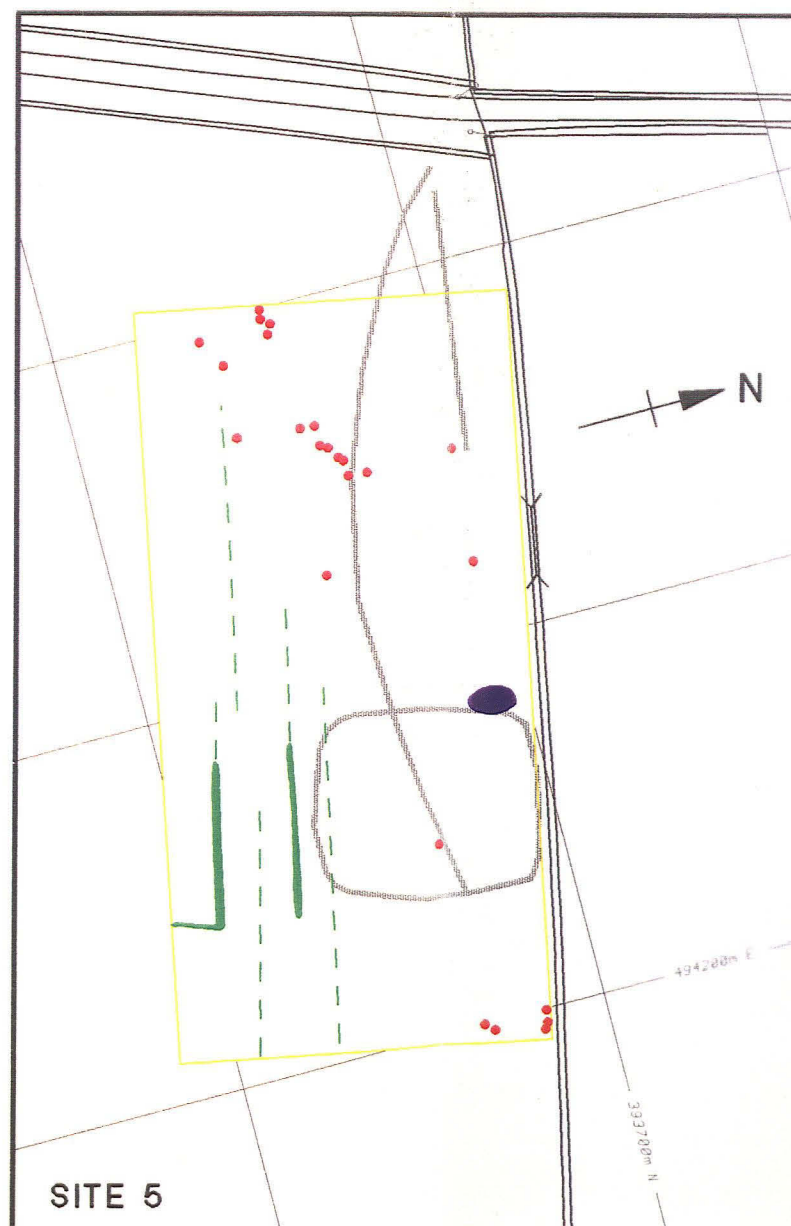
SITE 23



SITE 26



SITE 5



SITE 9

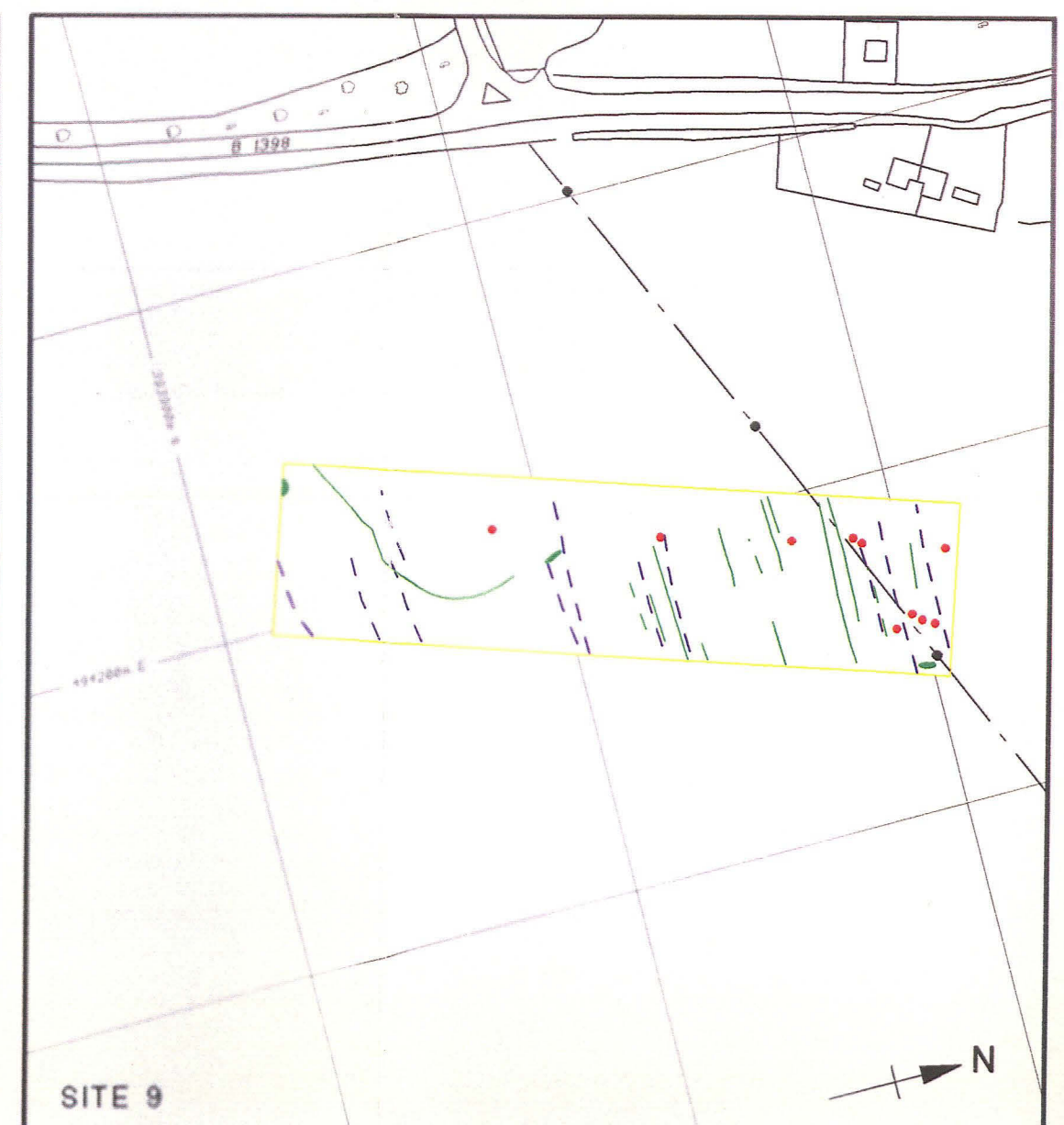


FIGURE 4



# COTTAM GAS PIPELINE

## ARCHAEOLOGICAL INTERPRETATION

SURVEY BY

**GeoQuest**  
ASSOCIATES

FOR



Wessex  
Archaeology

0 50 100 1:2000 200

### KEY



PITS/DITCHES



FERROUS LITTER

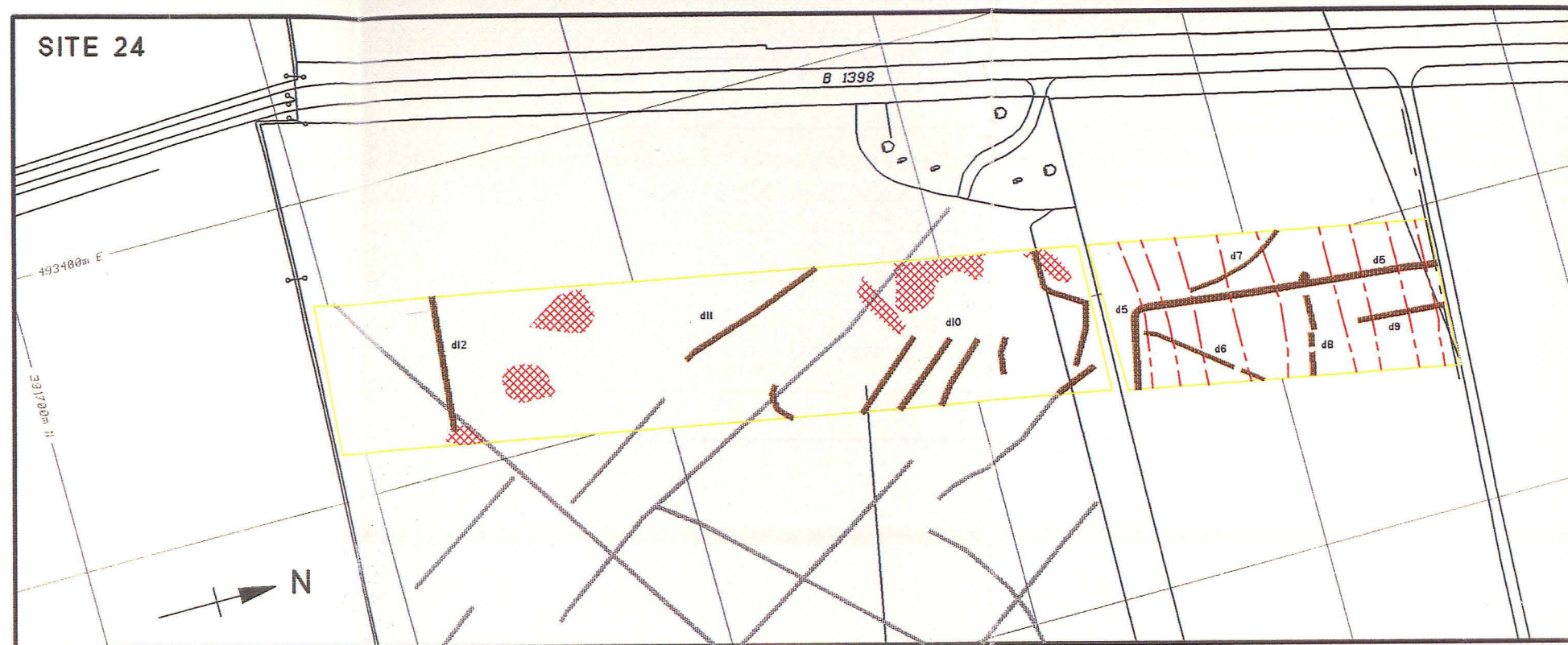


DRAINS

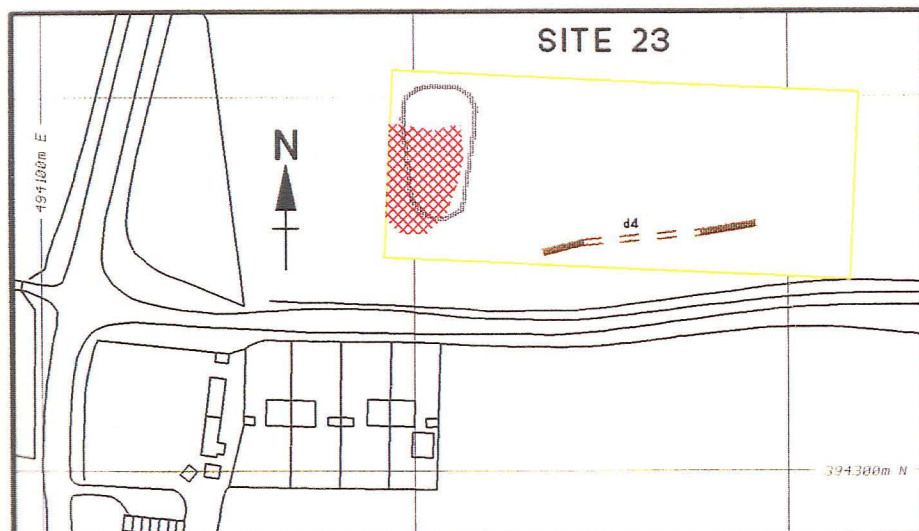


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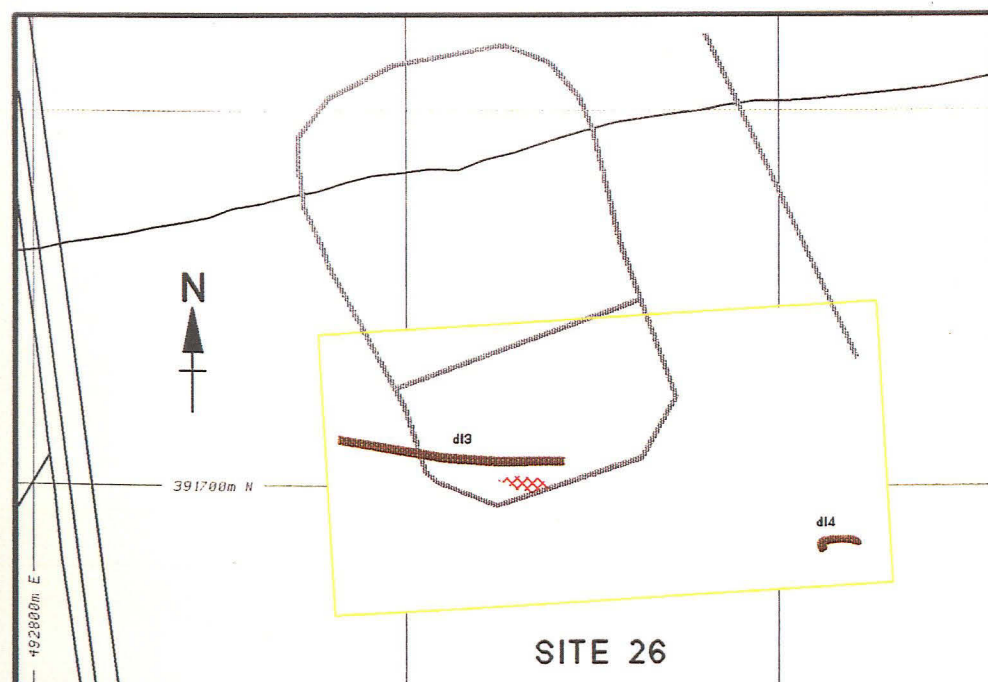
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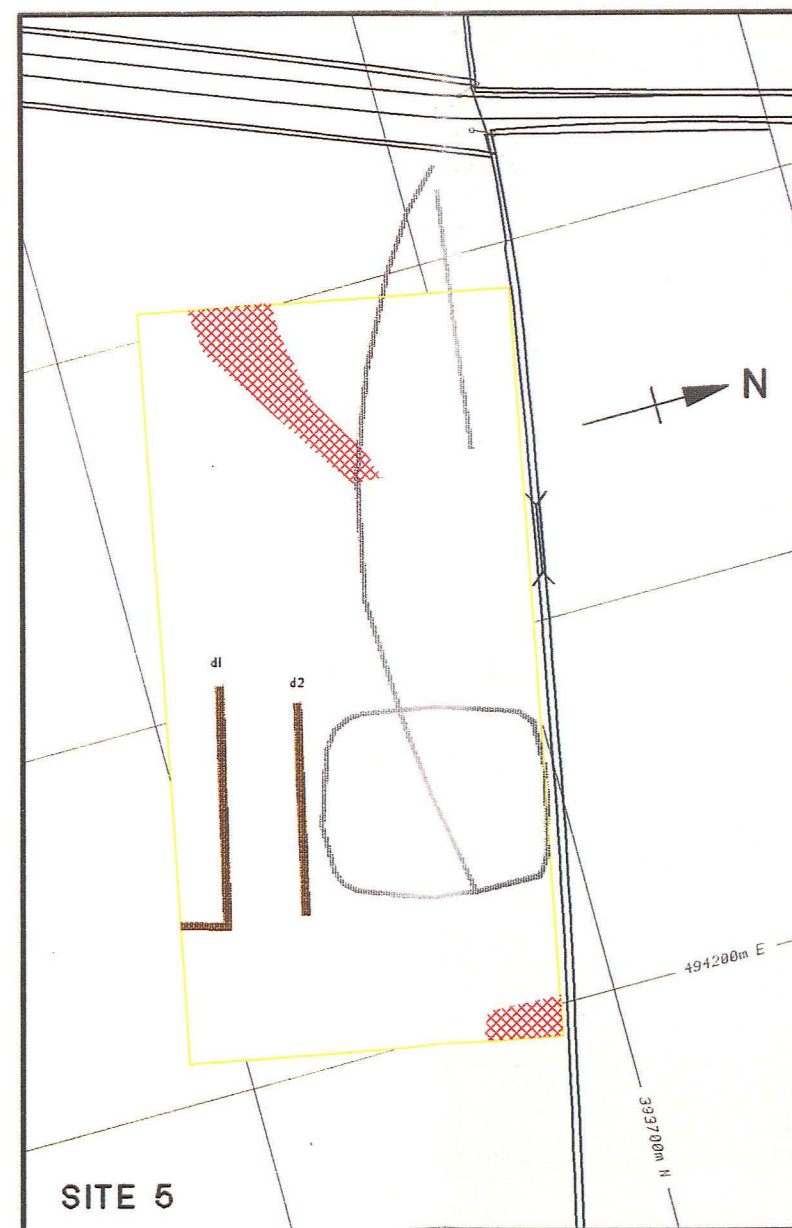
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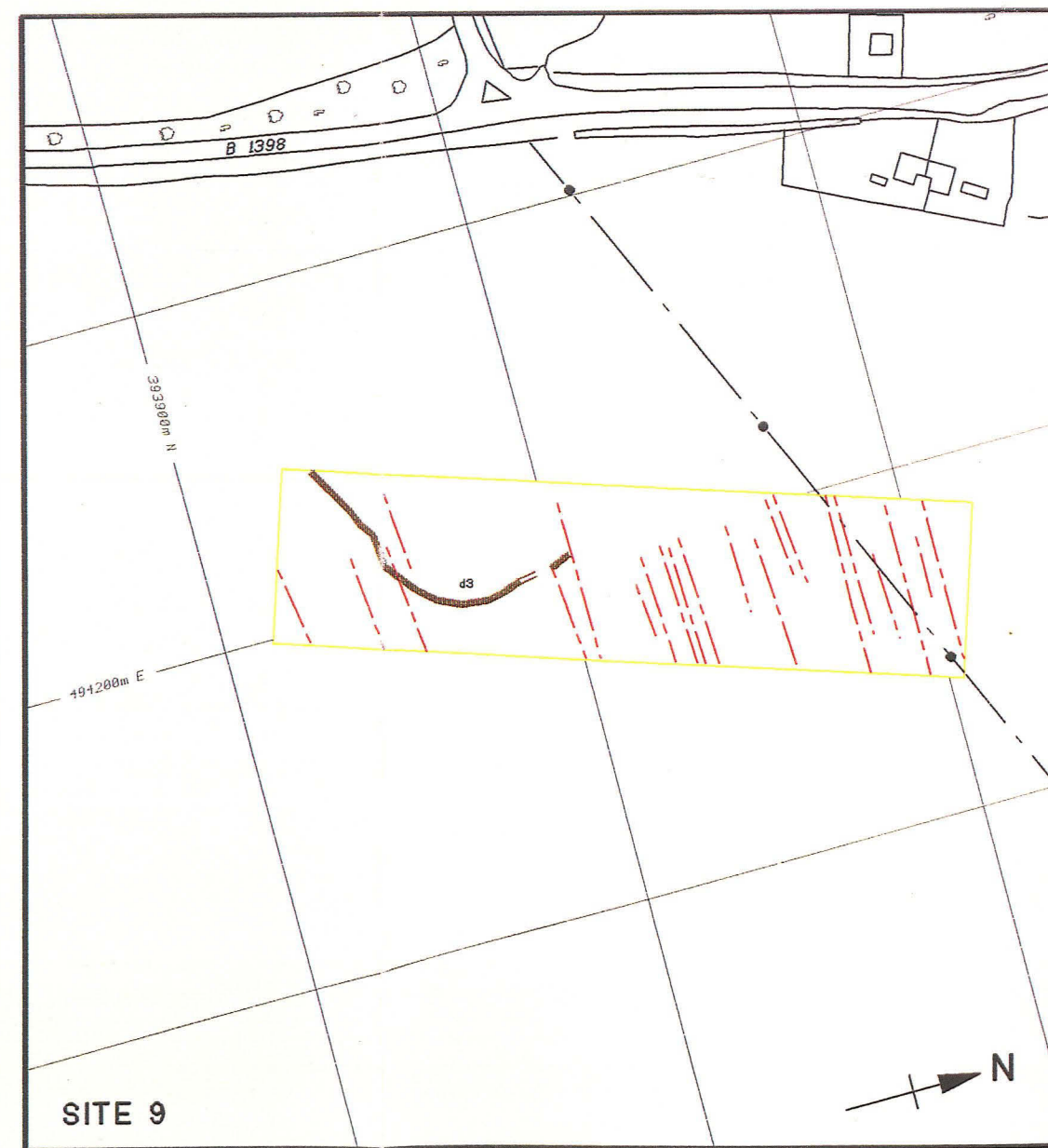
SITE 26



SITE 5



SITE 9





**APPENDIX 3: RECORD OF TRENT VALLEY SEDIMENT PROFILE**

## RECORD OF TRENT VALLEY SEDIMENT PROFILE

### 1. INTRODUCTION

- 1.1. The gas pipeline construction from Blyborough to Cottam has involved topsoil stripping within a 26m wide Working Width and the excavation of a pipe trench generally 0.9m wide and 2.0m deep.
- 1.2. The first stage of work, a desk-based study (Ref 42155) for the Archaeology and Heritage section of an Environmental Statement, was carried out in September 1996 (Wessex Archaeology 1996).
- 1.3. This identified a number of archaeological sites which would be affected by construction. In these areas special archaeological provisions were made to confirm the presence of archaeological deposits and to reduce or mitigate any impact of the development.
- 1.4. As part of these provisions an auger transect across the floodplain of the River Trent was conducted to provide a general sediment profile and provide undisturbed core suitable for description and sampling.
- 1.5. Subsequently more detailed records of the upper 1.7m to 2.45m+ of the upper floodplain deposits were recorded during the watching brief of the pipe trenching in September 1997.
- 1.6. Archaeological work was undertaken in consultation with the County Archaeological Officer for Nottinghamshire, Mr Mike Bishop.

### 2. AIMS

- 2.1. The primary objective of coring and further detailed sediment descriptions across the Trent floodplain from Cottam to the bore exit point, west of the River Trent, was to provide a record of the palaeo-stratigraphy. This was to enable:
  - an assessment of the sedimentation history of the floodplain
  - an indication of the palaeo-environmental potential of these deposits
  - an assessment of the palaeo-environment of potentially significant deposits
  - a prediction of the potential location of more archaeologically sensitive areas



### **3. METHODS**

#### **3.1. Coring**

- 3.1.1. Coring was conducted from the start of the floodplain west of Cottam power station (NGR 482021 37965) to the bore exit point at about 140m west of the Trent (NGR 48293 38056). A series of 19 points along *c.* 1450m of the pegged line of the pipe trench were cored (Figure 1) to a depth of 2.5m. Some areas of the route were stripped of topsoil, and in others coring went through the turf.
- 3.1.2. Coring by Geodrive Ltd ensured the recovery of sheathed, undisturbed samples from all the points using U100/U4 plastic lined cores. The upper 0.4 m (i.e. the modern soil profile) was not retained.
- 3.1.3. The first sleeve (sampling the upper portion) was 0.08m in diameter and sampled the upper 1.3 m. The second sleeve was 0.065m in diameter and sampled the lower sediment (1.3m - 2.5m).
- 3.1.4. The location and OD height for each borehole point was recorded.
- 3.1.5. The undisturbed cores were retained for:
- further detailed description
  - sampling for palaeo-environmental assessment
  - consideration for detailed sampling for palaeo-environmental analysis

#### **3.2. Sediment descriptions (watching brief during pipe trench construction)**

- 3.2.1. During the excavation of the pipe trench by the construction contractors the sediment sequence was described in the open section in nine observation points (figure 1) to augment that recovered from 19 auger points. The topsoil, although stripped from the trench corridor, was described from the edge of the stripped corridor and depths added to compile a complete sediment profile. The records of these observations are given in appendix 2.

### **4. FIELDWORK AND SEDIMENT DESCRIPTIONS**

#### **4.1. Descriptive methods (sleeved auger cores)**

- 4.1.1. A series of 19 auger points produced 39 sleeved cores from along the route (Figure 1).
- 4.1.2. For boreholes 6 to 19 the plastic sheath of each core was slit to expose the undisturbed sediments. These were described following basic sedimentological (rather than archaeological context) terminology and the cores retained in temporary storage.
- 4.1.3. Cores from boreholes 1 to 5 were deemed to lie outside the main area of interest. These were described from examination of the cleaned, but still sheathed undisturbed cores. Occasional windows were cut in the sleeves to sample the sediments to record true colour and texture.
- 4.1.4. All sediment descriptions and borehole locations are given in Appendix I.

#### **4.2. Descriptive methods (watching brief)**

- 4.2.1. The open section face of the excavated pipe trench was recorded to the limit of excavation (L.O.E.) and recorded as Geological Observation Point Records. These are presented in appendix 2.

### **5. RESULTS: THE TRENT VALLEY SEDIMENT PROFILE**

- 5.1. The auger logs enabled a general profile of the floodplain to be illustrated (figure 2), and the sediment observations during the watching brief, provided further stratigraphic details with the main units isolated. For instance, the sediment observations were able to confirm that riverine deposits for which no texture and detailed description was previous available should be largely considered as alluvium.
- 5.2. The sediment profile indicates in general terms a mass of oxidised and gleyed overbank floodplain alluvium sealing anaerobic and finer grained grey alluvium over the entire examined transect. It occurs from the surface (at about 4.0m aOD) to depth of about 1.5 m (i.e. 2.5m aOD), but as shallow as less than 1m and as deep as 2.3m (i.e. 1.7m aOD). Occasional discontinuous humic lenses occur with this unit, often at the boundary between this and the coarser facies beneath.
- 5.3. There is a transition zone between this alluvial facies, and the mixed re-worked sands (Figure 2), occasionally incorporating organic detritus.



- 5.4. The base, as recorded in auguring and by observation is a sand facies (medium to coarse sand) with gravel lenses.
- 5.5. In the north significant deposits of peat and organic debris were encountered at depth of 1.8m + (i.e. c. 1.8 - 1m aOD). This horizon was sampled in detail and selection analysed for pollen (see 6 below).

## **6. POLLEN ANALYSIS BY ROBERT G. SCAIFE**

### **6.1. Introduction**

- 6.1.1. Core 18 was noted to contain the deepest sequence of peat occurring within the alluvium at a depth of 1.8m to 2.52 m; i.e. 1.81 to 1.06 m aOD (see figures 2 and 3) and section 10: auger logs. A 6cm window was cut in the sleeved core to expose the peat sequence, and samples were taken contiguously at 2cm intervals through the silty humic clay (at 1.46m) and through the cored peat sequence (to 2.52m). Fifty two samples were taken by Dr M. Allen, Wessex Archaeology, with an artists pallet knife which was washed and dried after each sample. In the firm peats, intact slices were cut and removed. The core was sampled from 1.46m to 2.52m contiguously at 2cm intervals in 52 samples. Eight samples from this sequence (1.70, 1.86, 2.02, 2.18, 2.26, 2.34, 2.42 and 2.52m depth) were removed for assessment purposes and are reported on below by Dr. Robert G. Scaife.
- 6.1.2. A total of eight of these samples was prepared for pollen analytical assessment by Dr Robert G. Scaife in the Department of Geography, University of Southampton who provides the following report. The principal aims of this study were as follows.
- To ascertain presence or absence of sub-fossil pollen and spores. If present, to detail the preservation character and absolute pollen frequencies available for analysis.
  - If present, to provide preliminary information on the 'on-site' depositional habitat and the near vegetation environment.
  - If possible, to provide some idea of the age of the sequence, although it is realised that pollen is not a dating technique as such.
  - To delimit any possible effects and/or potential for human activity/disturbance of the landscape.
  - Assess the potential of the sequence for more detailed pollen work.



- 6.1.3. With these aims delimited, the eight pollen samples were subjected to standard pollen extraction techniques and analysis .

## 6.2. Outline Methods

- 6.2.1. Standard pollen procedures were been used for the extraction of the preserved pollen and spores. These procedures are detailed in Moore and Webb (1978) and Moore *et al.* (1991).

Samples of 3-4 ml size.

Decalcified (10% HCL).

Deflocculation with 10% NaOH.

Sieving at 150 $\mu$  for removal of the coarse fraction.

Sieving at 10 $\mu$  (residue kept) for removal of clay.

Hydrofluoric acid (boiling) digestion of silica.

Erdtman's acetolysis.

Washing/centrifuging.

Staining with aqueous safranin and mounting in glycerol jelly.

- 6.2.2. Pollen was examined, identified and counted using an Olympus biological research microscope at magnifications of x400 and x1000 with normal transmitted and phase contrast lighting. An extensive pollen reference/comparative collection is available for identification of difficult/critical taxa (*Palaeopol*). Plant taxonomy follows that of Stace (1991) and for pollen (in general) Moore and Webb (1978). Absolute pollen frequencies were calculated by using the addition of a known number of 'exotic' spores (Stockmarr *Lycopodium* tablets) to a known volume of sample. Pollen taxonomy generally follows that of Moore *et al.* (1991), modified according to Bennett *et al.* (1994) in accord with Flora Europaea/Stace (1991). The data have been presented in standard pollen diagram form (Figures 4a and 4b) with the pollen of dry-land taxa calculated as a percentage of their sum. Marsh types and spores are as a percentage of the dry land sum+the sub-group. *Alnus* was excluded from the pollen sum for reasons outlined by Janssen (1969). The pollen diagram was plotted

using *Tilia* and *Tilia* Graph. These procedures were carried in the Department of Geography, University of Southampton.

### 6.3. Results of the Analysis

#### 6.3.1. Introduction

Of the eight samples prepared, seven yielded pollen in large enough numbers to enable pollen counts to be made and a preliminary pollen diagram to be constructed (Figures 4a and 4b). A pollen sum of 100 or 200 grains of dry land pollen was counted for each level (t.d.l.p.). *Alnus*, being a very local or 'on-site' component, was excluded from the pollen sum because of its statistically depressing effect on percentages of within sum, non autochthonous vegetation components (Janssen 1969). Thus, *Alnus* along with other wetland taxa and spores of ferns were counted but excluded from the pollen sum. Total pollen counts on which the pollen diagram (Figures 4a and 4b) are based, range from 200 to 1400 grains per level. Percentages have been calculated as follows:

Pollen sum (t.d.l.p.)      = % dry land pollen (trees, shrubs and herbs)

Marsh (include. *Alnus*)    = %t.d.l.p. + marsh

Spores                        = %t.d.l.p. + spores

Absolute pollen frequencies per ml of peat/sediment were calculated using known quantities of exotic/introduced markers to a known volume of sediment. These values were calculated and ranged from as low as c. 25,000 grains/ml. to 250,000 grains/ml. These figures include total dry land pollen and marsh and aquatic totals. As noted above, pollen was absent in one level (2.02 metres).

#### 6.3.2. Pollen Zonation

From the data presented in Figures 4a and 4b, two pollen assemblage zones have been tentatively delimited on the basis of fluctuations in the percentages of taxa. These zones are characterised from the base at 2.52 metres upwards.

Zone 1: *Quercus-Corylus avellana* type-*Alnus-Dryopteris*.



This zone (2.52m - 2.38m: 1.09-1.23 m aOD) falls in the lower levels of the organic peat which also has some sediment content. Trees and shrubs are dominant (to 56% and 30% respectively) and with *Alnus* (62% t.d.l.p.+*Alnus*). Also present are *Pinus* (8%) in the basal level and sporadic *Ulmus*, *Fraxinus* and *Tilia*. Shrubs are dominated by *Corylus avellana* type (increasing from 30-50%). In this zone, herbs are fewer than in subsequent levels and with lesser diversity. Spores of ferns are particularly prevalent with high values of monolete *Dryopteris* type (70% t.d.l.p.+spores). *Polypodium vulgare* and *Pteridium* are also noted. APF values are small at 25-40,000 grains/ml.

**Zone 2: *Quercus-Corylus avellana-Poaceae***

APF values increase sharply at the base of the zone (2.38 - 1.70m: 1.23-1.91m aOD) with the change to pure highly humified peat (to >200,000 grains/ml). However, this declines in the middle of the zone with absence of pollen at 2.02 (1.59n aOD) metres in extreme humic levels.

Tree and shrub pollen percentages remain largely unchanged with *Quercus* (40%). *Corylus avellana* shows some reduction (30%). *Betula*, *Pinus*, *Ulmus*, *Tilia* and *Fraxinus* are present (<5%). Of note is the small but consistent curve of *Taxus*. Herbs expand to 30% also with a substantial increase in diversity. Poaceae expand to 20%. Evidence of human activity is present with cereal type, *Plantago lanceolata* (<5%), Cruciferae, *Chenopodium* type, *Rumex*, *Persicaria maculosa* type. Wetland/mire taxa are clearly dominated by *Alnus* which attains extremely high percentage and APF values (to 93%). This is especially so at the base of the zone (2.18-2.35 m: 1.43-1.26m aOD). Other mire taxa include *Salix*, *Chrysosplenium*, *Typha/Sparganium* and Cyperaceae all in small numbers. *Dryopteris* type declines but remains important.

The upper-most horizon/level at 1.70 metres indicates a greater diversity and increase in herb percentages. This corresponds with the upper transition from peat to overlying sediments and corresponding changes in pollen taphonomy.

**6.3.3. Discussion and Inferred Vegetation History**

Pollen present reflects the vegetation growing on the site and its peat forming community and also from the adjacent terrestrial region. Interpretation is further complicated by the changing taphonomy of water transported pollen and via 'normal' airborne and insect means. High biological activity in the



depositional environment has been responsible for some degradation of the pollen (as evidenced by severe microbial etching of the pollen wall/exine). With these aspects in consideration, some preliminary data on the vegetation growing during the time-span of peat accumulation have been obtained.

The 'on-site' habitat: since pollen analysis has concentrated on the peat horizon, the pollen assemblages largely reflect this wetland/marsh habitat. This was clearly Alder carr (Alnetum) throughout. This was a mature community which was largely damp/dry during the summer months; hence the high biological activity noted. Other constituents possibly comprised *Taxus* and *Salix* with a ground flora of sedges and other herbs and ferns. *Chrysosplenium oppositifolium* (golden saxifrage) is typical of this habitat today. Cyperaceae may have typically consisted of *Carex paniculata* (tussock sedge). The presence of *Taxus* (yew) is interesting since this has now been widely reported in inter-tidal peat sequences and from dry fen carr woodland communities (Godwin 1975; Sidell forthcoming). This community does not appear to exist today. In such a community, *Quercus* (oak), *Corylus avellana* (hazel) and *Fraxinus* (ash) may also have grown in valley fen carr areas with limited winter waterlogging. However, these trees may also have been elements of woodland on the interfluvies.

Marshland herbs/marginal aquatics are more prevalent in the highest sample (1.70 metres). *Alnus* is calculated within the wetland/mire category and has suppressed the percentages of *Typha/Sparganium* (reedmace and bur-reed) and *Alisma* (water plantain) which are present in substantially greater numbers at this level. This may represent locally increased wetness of the floodplain prior to deposition of the extensive alluvial spreads. Alternatively, fluvial transport of the taxa from further up-river may have occurred with over-bank deposition.

The dry-land habitat: woodland appears dominant throughout with some evidence of arable agriculture. *Quercus* (oak) and *Corylus avellana* (hazel) may have been the dominant elements. However, *Fraxinus* (ash) and *Tilia* (lime/lindens) are poorly represented in pollen spectra due to production of small numbers of pollen grains and in the case of *Tilia* due to insect pollination (Andersen 1970,1973). Hence, these taxa are under-represented in pollen spectra and pollen diagrams. Percentages of c.5% for these taxa imply local presence. It is not possible to say whether this was dominant woodland at some distance or local sporadic growth. A further reason to suggest their local importance is the effect of pollen filtration by dominant

and closed aspect alder woodland (Tauber 1963). i.e. preventing or reducing ingress of pollen of even closely adjacent dry-land communities.

Human activity: Pollen assemblage zone 1 has no evidence of human activity. Small percentages of *Ulmus* imply a post 'elm decline' age (i.e. post c.5000 BP). In zone 2, however, there appears *Plantago lanceolata* (ribwort plantain), cereal type (>45u with thick exine, large columellae and large pores) and various herbs which may relate to arable land. This relatively minor evidence plus the dominance of woodland suggests only localised woodland clearance and agriculture. It must, however, be considered that such activity may have been more substantial but at some distance from the site. Expansion of herbs at the top of the profile (1.70 metres) may be a taphonomic factor due to an increase of fluvially transported pollen in this highest pollen sample.

#### 6.3.4. *Summary and Conclusions*

Pollen and spores have been successfully extracted from 7 of the 8 samples analysed. In some levels, biological deterioration is marked and possibly caused absence of pollen in at least part of the peat profile. The preliminary pollen diagram (Figures 4a and 4b) illustrates clearly, the dominance of alder carr woodland on the site with *Salix* (willow), *Taxus* (yew), possibly *Quercus* (oak), *Corylus* (hazel) and *Fraxinus* (ash) and a typical fen carr ground flora.

Adjacent woodland comprised *Quercus*, *Corylus* but with *Tilia* (lime) and *Fraxinus* of possible importance. In pollen zone 2, expansion of herbs including cereal is evidence of arable agriculture. Evidence of age of the profile is limited and it can only be stated very tentatively that the peat and vegetation may be Neolithic. This is based solely on the fact that woodland remained largely dominant but with possible localised cereal cultivation.

#### 6.3.5. *Suggestions for Further Analysis*

The pollen profile provides information on the local vegetation habitat at the time of the peat accumulation. This includes evidence of what may be early agriculture (Neolithic?). Pollen is variably preserved giving a somewhat large gap in the pollen profile. From these points, it is concluded that the following aspects might be usefully pursued.

- Radiocarbon dating of the top and bottom of the peat.



- Examine some additional samples between 1.86 metres and 2.18 metres. This may provide pollen in some samples within this highly humified peat.
- Zone boundaries have been delimited on palynological grounds. However, it seems that these may also be linked to changes between peat and sediment stratigraphy. Some pollen samples might be analysed from further above and below the peat horizon.

## 7. DISCUSSION AND CONCLUSIONS

- 7.1. The River Trent is a grossly underfit river flowing in an incised meander belt between the Trent Clay Vale to the east and the lowlands and gravel terraces to the west. The Lower Trent is not as well investigated or understood as areas further upstream (Knight and Howard 1995).
- 7.2. The modern course of the river was probably established as a result of the Wolstonian glaciation retreat around 180,000 years ago. The river was characteristically unstable and prone to meander, braiding and flooding. Abrupt changes of course (avulsion) and oxbow formation and isolation are attested as late as the 15th century AD. Relict oxbows and channels form a major element of the topography of the alluvium.
- 7.3. The present day soils in the floodplain are palaeo-alluvial brown earths
- 7.4. The coring provided an indication of the sediment profile (Figures 2 and 3) to 2.5m below ground surface. The solid geology was not encountered; gravel was only thought to have been encountered in one location (auger 17) at the limit of the sleeved core.
- 7.5. The sediment profile consisted of a dark greyish brown (10YR 4/2) to dark brown (7.5YR 4/2) firm silty clay to about 1.5m depth, overlying grey sand in which occasional humic lenses and larger, but thin, stony sand lenses occur. These sediments appear to occur as 'blankets' and do not seem to record any former channels of the River Trent.
- 7.6. Towards the northern end of the sediment profile the upper alluvial deposits were deeper, and the sands diminished. Also at this point, peat or highly humified deposits were recorded (cores 18 and 19; see figure 2). In one (core 18), in excess of 1.2m of 'peat' was recorded (Section 10., Auger Logs).
- 7.7. The records of coring for engineering purposes in the area (Soil Mechanics boreholes 22/2, 22/1A and 22/1) reflect the sequence noted by the

archaeological coring. Approximately 1m of reddish brown alluvium (colour is oxidised colour, actual colour is a greyish brown - see core logs below), overlies sandy clays down to about 2.5m below ground surface. Loamy gravels occurred at 2.4 - 5.0m below ground surface for the most part below the range of the archaeological coring. These are probably the gravels encountered in auger 17.

- 7.8. To the north and east of the archaeological coring organic clays and 'closely spaced beds of peat' are recorded at 2.5 to 4.6m below ground surface with river gravels being recorded at about 4.6m depth (Soil Mechanics boreholes 21/5 to 21/1).
- 7.9. The peats seem, tentatively, to date to the Neolithic period and in their upper horizon (i.e. zone 2 c. 1.2 - 1.9m aOD) contain limited evidence of local activity in the form of minor woodland clearances and limited tillage. The peats themselves, however, were not recorded from auger cores to contain any artefactual or structural remains. The pollen reflects activity within the floodplain rather than within the deposits identified.
- 7.10. The overlying alluvium remains undated.

## **8. IMPLICATIONS**

### **8.1. Sediment history of the floodplain**

- 8.1.1. The sediment profile recorded during the coring is not complex and is relatively uniform. It only records the upper, possibly relatively (geologically) recent, strata of a very deep ancient valley.
- 8.1.2. Palaeo-channels might exist at a greater depth than 2.5m below present ground surface and will not have been impacted by the pipeline construction works. No palaeo-channels were observed during the watching brief on the pipeline trench construction in this area.

### **8.2. Palaeo-environmental potential of the deposits**

- 8.2.1. The palaeo-environmental potential of the majority of the deposits is considered low. No extensive, organic, waterlogged deposits were encountered on the line of the pipe. The sands are unlikely to provide any macrofossils or pollen. The alluvium, however, may contain pollen (not



assessed), but the palaeo-environmental potential is considered low as this sequence lacks specific archaeological or temporal indicators.

- 8.2.2. The small area of undated peats contain pollen. These peats represent extensive deposits outside the nominal depth of trenching (Figure 3), though pipe trenching was seen to impact considerable into these deposits (observations points 9 and 10, appendix 3). The borehole work undertaken by Soil Mechanics also suggests that the peats recovered in the archaeological cores 18 and 19 represent the upper layer of a sequence.
- 8.2.3. The peats have been shown to contain pollen with varying levels of preservation, but with a vegetational sequence relating the local habitats relating to post elm-decline conditions (5000 BP), but prior to landnam and thus probably relating to the Neolithic period.
- 8.2.4. Further analysis and radiocarbon dating would therefore elucidate the chronology and amplify the details of the human interference with the woodland and floodplain alder carr. Such recommendations are presented at the end of the pollen report (see 6 above).
- 8.2.5. The detailed sample suite suitable for analysis will be made available to the appropriate museum or to any known researcher for analysis.

### **8.3. Prediction of potential location of archaeologically sensitive areas**

- 8.3.1. No gravel islands or island margins were located. If these exist, they are likely to be deeper than 2.5 m below the present ground surface.
- 8.3.2. No facies obviously specifically relating directly to archaeological or anthropogenic activity were detected.

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## 10. AUGER LOGS

Auger Log No: 1	visual inspection through sleeve only	
ref no.: 1011	Ground Surface: 4.12m aOD	
depth	sediment description	interpretative comment
0.2 - 1.1	Dark greyish brown (10YR 4/2) uniform stiff clay	Overbank floodplain alluvium
1.1 - 1.3	transition	transition
1.3 - 2.2	dark grey uniform (silty clay) sediment, becoming darker from 1.9m, with occasional humic and fibrous elements.	grey alluvium
2.2 - 2.5+	lighter grey silty clay	grey alluvium

Auger Log No: 2	visual inspection through sleeve only	
ref no.: 1012	Ground Surface: 3.91m aOD	
depth	sediment description	interpretative comment
0.3 - 1.4	Dark greyish brown massive clay	overbank floodplain alluvium
1.4 - 2.0	gradually becoming darker and ?more humic	?humic alluvium
2.0 - 2.5+	very dark brown humic silty clay, becoming darker	alluvium

Auger Log No: 3	visual inspection through sleeve only	
ref no.: 1013	Ground Surface: 3.84m aOD	
depth	sediment description	interpretative comment
0.3 - 1.1	Dark greyish brown (10YR 4/2) uniform stiff clay (greyish)	?floodplain alluvium
1.1 - 1.7	transition	transition
1.7 - 2.0	grey silts, becoming brown	alluvium
2.0 - 2.5+	very dark brown silty loam, some stones	?sand

Auger Log No: 4	visual inspection through sleeve only	
ref no.: 1014	Ground Surface: 3.83m aOD	
depth	sediment description	interpretative comment
0.3 - 1.35	Dark greyish brown (10YR 4/2) uniform stiff clay (greyish)	?floodplain alluvium
1.35 - 2.2	grey sediment	grey alluvium
2.2 - 2.5+	becoming darker, dark brown silty loam (silts with coarse sand grains)	?sand

Auger Log No: 5		
ref no.: 1015	Ground Surface: 3.93m aOD	
depth	sediment description	interpretative comment
0.3 - 1.9	Dark greyish brown (10YR 4/2) uniform stiff clay (greyish)	?floodplain alluvium
1.9 - 2.0	dark silt some ?mollusc fragments	humic alluvium
2.0 - 2.1	silty sand	transition (sand)
2.1 - 2.5+	sands	Sand

Auger Log No: 6			
ref no.: 1016		Ground Surface: 4.07m aOD	
depth	sediment description	interpretative comment	
0.3 - 0.7	stiff grey clay	alluvium	
0.7 - 1.3	becoming darker, some gleying (mottles)	alluvium	
1.3 - 2.5+	clean silty sand, becoming sandier with depth to medium/coarse bleached sand	Sand	

Auger Log No: 7			
ref no.: 1019		Ground Surface: 4.13m aOD	
depth	sediment description	interpretative comment	
0.3 - 0.8	Dark brown (7.5YR 4/2) firm clay to silty clay with good blocky structure and rare inclusions	?floodplain alluvium	
0.8 - 1.1	Dark greyish brown (2.5Y 4/2) stiff 'grey' clay, massive structure very firm	alluvium	
1.1 - 1.25	Very dark greyish brown (10YR 3/2) rich colour humic silt with some 'dry' organic detritus ?phragmites, some inwashed fine bleached sand.	humic alluvium	
1.25 - 1.9	Dark greyish brown (2.5Y 4/2) soft 'grey' silt sand becoming slightly browner and sandier (sandy clay - sandy clay loam) with depth with	Sandy loam - Sand	
1.9 - 2.5+	Strong brown (7.5YR 5/6) medium sand	Sand	

Auger Log No: 8			
ref no.: 1020		Ground Surface: 4.11m aOD	
depth	sediment description	interpretative comment	
0.3 - 0.6	Dark brown (7.5YR 4/2) firm clay to silty clay with good blocky structure and rare inclusions, some mottling	?floodplain alluvium	
0.6 - 1.05	Dark greyish brown (2.5Y 4/2) stiff 'grey' clay, massive structure very firm	grey alluvium	
1.05 - 1.5	Soft grey silt	grey alluvium	
1.5 - 2.1	Greyish brown (10YR 5/2) to light greyish brown (10YR 6/2) soft silty clay loam becoming sandier and siltier with depth	sandy alluvium	
2.1 - 2.5+	Sand, with some organic phragmites at 2.1, becoming sandier with silt matrix. Medium bleached sand.	Sand (and organic matter)	



Auger Log No: 9			
ref no.: 1029		Ground Surface: 4.24m aOD	
depth	sediment description	interpretative comment	
0.4 - 0.65	Dark brown (7.5YR 4/2) firm clay to silty clay with good blocky structure and rare inclusions, some mottling	?floodplain alluvium	
0.65 - 0.9	Grey (2.5Y 5/12) stiff 'grey' clay, massive structure very firm	grey alluvium	
0.9 - 1.1	Greyish brown (10YR 5/2) silty clay, becoming sandier		
1.1 - 2.0	Yellowish brown (10YR 5/6 - 5/8) fine sandy loam, becoming sandier	transition	
2.0 - 2.5+	Sand	Sand	

Auger Log No: 10			
ref no.: 1032		Ground Surface: 4.16m aOD	
depth	sediment description	interpretative comment	
0.3 - 0.65	Stiff, grey (10YR 5/1) clay, becoming more mottled with depth	grey alluvium	
0.65 - 0.85	Mottled, mixed brown silty clay	gleyed	
0.85 - 1.1	Coarse sand some silt	Sand lens	
1.1 - 2.0	Compacted medium and coarse sand, becoming wetter and less compacted with depth	Sand	
2.0 - 2.1	Grey sand, with some silt matrix	Sand	
2.1 - 2.4	brown/dark brown (10YR 4/3) dark ?humic clay loam, becoming sandier with depth	humic zone	
2.4 - 2.5	Sand	Sand	

Auger Log No: 11			
ref no.: 1033		Ground Surface: 4.11m aOD	
depth	sediment description	interpretative comment	
0.3 - 0.8	Stiff, grey (10YR 5/1) clay, becoming more mottled with depth	grey alluvium	
0.8 - 1.2	SEDIMENT MISSING		
1.2 - 1.7	Grey sandy loam, becoming sandier with depth	Sand	
1.7 - 1.8	Organic sand with some stones	humic zone	
1.8 - 2.2	Sand, silty matrix	transition (sand)	
2.2 - 2.5+	Sand	Sand	

Auger Log No: 12			
ref no.: 1036		Ground Surface: 3.97m aOD	
depth	sediment description	interpretative comment	
0.4 - 0.5	SEDIMENT MISSING		
0.5 - 0.75	Stiff, grey (10YR 5/1) clay, becoming more mottled with depth, @0.6 highly mottled, and softer	grey alluvium, gleyed	
0.75 - 1.05	as above but becoming softer	grey alluvium	
1.05 - 1.4	Moist brown grey sand loam, becoming sandier	sandy loam	
@ 1.4	Clean sand	Sand lens	
1.4 - 1.5	Silty sand loam band	transition	
1.5 - 2.5+	Sand, silty sand loam band @ 2.4	Sand	

Auger Log No: 13			
ref no.: 1038		Ground Surface: 3.95m aOD	
depth	sediment description	interpretative comment	
0.3 - 0.8	Stiff, grey (10YR 5/1) clay, becoming more mottled and moister with depth	grey alluvium	
0.8 - 1.1	Brown clay, moist and malleable, becoming greyer and sandier with depth	clay alluvium	
1.1 - 1.9	Grey sandy loam	transition	
1.9 - 2.0	Grey sand	Sand	
2.0 - 2.1	yellowish medium 'beach' sand, with many stones	stony sand	
2.1 - 2.5+	Sand (becoming slightly silty)	Sand	

Auger Log No: 14			
ref no.: 1039		Ground Surface: 4.03m aOD	
depth	sediment description	interpretative comment	
0.4 - 0.9	Stiff, grey (10YR 5/1) clay	grey alluvium	
0.9 - 1.0	As above becoming orange/brown some small stones	transition	
1.0 - 1.1	Yellowish orange medium/coarse bleached and iron stained 'beach' sand	Sand	
1.1 - 1.8	Sand, becoming greyer and more silt matrix with depth	Sand	
1.8 - 2.1	Sand and stones	stony sand	
2.1 - 2.5+	Sand	Sand	

Auger Log No: 15			
ref no.: 1041		Ground Surface: 4.06m aOD	
depth	sediment description	interpretative comment	
0.3 - 0.9	Stiff, grey (10YR 5/1) clay, sharp boundary	grey alluvium	
0.9 - 1.85	Light brownish grey (10YR 6/2) sand/sandy loam	Sand (and alluvium)	
1.85 - 1.95	As above but with stones	stony sand	
1.95 - 2.5+	Sand, fine and medium sands	Sand	



Auger Log No: 16			
ref no.: 1055		Ground Surface: 4.00m aOD	
depth	sediment description	interpretative comment	
0.3 - 0.7	SEDIMENT MISSING		
0.7 - 1.5	Stiff, grey (10YR 5/1) clay, becoming wetter with depth	grey alluvium	
1.5 - 2.0	Wet sand becoming stiffer and compacted with depth	Sand	
2.0 - 2.5+	Sand, with some stones	Sand (stony sand)	

Auger Log No: 17			
ref no.: 1053		Ground Surface: 4.12m aOD	
depth	sediment description	interpretative comment	
0.3 - 1.3	Stiff, grey (10YR 5/1) clay	grey alluvium	
1.3 - 1.75	SEDIMENT MISSING		
1.75 - 1.8	Soft grey clay	grey alluvium	
1.8 - 2.05	Brown, fine sandy lens some stones @ 2.05	transition	
2.05 - 2.5+	Sand and stones	Sand (stony sand)	
2.5+	Appears to hit gravel (field log)	Gravel	

Auger Log No: 18			
ref no.: 1052		Ground Surface: 3.61m aOD	
depth	sediment description	interpretative comment	
0.3 - 1.3	Stiff, grey (10YR 5/1) clay	grey alluvium	
1.3 - 1.7	SEDIMENT MISSING		
1.7 - 1.8	Soft humic sandy silt with organic detritus	humic horizon	
1.8 - 2.5	Peaty humic	Peat	

Auger Log No: 19			
ref no.: 1049		Ground Surface: 4.41m aOD	
depth	sediment description	interpretative comment	
0.4 - 0.8	SEDIMENT MISSING		
0.8 - 1.35	Stiff, grey (10YR 5/1) clay	grey alluvium	
1.35 - 1.8	SEDIMENT MISSING		
1.8 - 2.0	Brown silty (slightly organic) becoming greyer with depth	humic horizon	
2.0 - 2.3	Grey silt	silt	
2.3 - 2.5+	Grey silt some humic inclusions	peaty	

## 11. OBSERVATION POINT SEDIMENT LOGS

Observation Point: 1			Site Sub-division: 16.4
Depth	context	description	interpretative comment
0.0-0.25	101	Topsoil:- dark brownish grey clay loam	Topsoil
0.25-0.75	102	'Subsoil'- very dark yellowy brown slightly sandy clay, some rooting, flecking with orange clay and blue grey; stiff but malleable	Overbank floodplain alluvium
0.75-1.10	103	Very similar to 102, slightly finer and becoming more blue/grey. Flecked and merges into 104	Overbank floodplain alluvium
1.10-1.25	104	Blue/grey clay, easily worked. No coarse components but some orange flecking - mainly in central band.	Overbank floodplain alluvium and transition
1.25-1.35	105	Thin band of orange/blue mixed clay, quite gritty but no coarse components evident	transition
1.35-1.65	106	Dirty grey/blue clay, very fine, no mottling but starts to feel peaty though interface with 107 is clear	Grey alluvium
1.65-2.10	107	Very dark grey plastic peaty clay, humic clay with no obvious organic remains.	humic lens in Grey alluvium
2.10-2.35	108	Pale grey sand, occasional medium unsorted gravel components	Sand

Observation Point: 2			Site Sub-division: 16.4
Depth	context	description	interpretative comment
0.0-0.30	201	Topsoil:- dark brownish grey clayey loam	Topsoil
0.30-0.80	202	'Subsoil' - dark yellowish brown sandy clay becoming darker and finer with depth	?floodplain alluvium
0.80-1.40	203	Fine greyish brown clay with no coarse components	?floodplain alluvium
1.40-1.70	204	Dark grey peaty/humic layer with some molluscs; not proper peat, just plastic peaty clay. Water table below 1.7m	Humic alluvium

Observation Point: 3			Site Sub-division: 16.3
Depth	context	description	interpretative comment
0.0-0.30	301	Topsoil:- very dark greyish clayey loam	Topsoil
0.30-0.70	302	'Subsoil'- dark yellowish brown slightly sandy clay, mottled with frequent orange clay flecks.	?floodplain alluvium
0.70-1.25	303	Blue grey fine soft malleable clay, some orange clay flecking	Grey alluvium
1.25-1.35	304	Pale yellowy brown sandy clay, no coarse components	Sandy alluvium
1.35-1.45	305	?possible remnants of dark grey peaty/humic clay layer	humic lens
1.45-2.30	306	Pale yellowy brown sand, very occasional gravel pieces at very bottom of trench	Sand



Observation Point: 4			Site Sub-division: 16.2
Depth	context	description	interpretative comment
0.0-0.30	401	Topsoil:- very dark greyish clay	Topsoil
0.30-0.88	402	Blue/grey smooth pliable clay, no coarse components but some orange flecking	grey alluvium
0.88-0.90	403	Very thin peaty layer at base of blue/grey clay	humic lens
0.90-1.20	404	Yellow clayey sand, no coarse components	sand lens
1.20-1.90	405	Various laminations; yellow, blue/grey, dark yellowish brown, maximum laminations 0.01m, fairly even depths of sandy clays, no coarse components	Laminated sandy alluvium
1.90-2.45	406	Pale yellow sand, no coarse components	Sand

Observation Point: 5			Site Sub-division: 16.2
Depth	context	description	interpretative comment
0.0-0.25	501	Topsoil:- very dark grey loamy clay	Topsoil
0.25-0.55	502	Pale brownish clay no coarse components	Overbank floodplain alluvium
0.55-0.80	503	Blue/grey very fine clay, no coarse components	?Grey clay
0.80-1.00	504	Mixed orange and blue/grey clay layer, slightly sandy with depth	sandy loam
1.00-2.20	505	Yellowy brown sand - medium grains, occasional lenses of dark grey peaty clay material	Sand

Observation Point: 6			Site Sub-division: 16.1
Depth	context	description	interpretative comment
0.0-0.25	601	Topsoil:- very dark grey clay loam	Topsoil
0.25-0.80	602	'Subsoil'- firm stiff grey brown clay, no coarse components	?floodplain alluvium
0.80-1.15	603	Blue/grey clay, malleable and fine, very occasional gravel pebble inclusions	grey alluvium
1.15-1.30	604	Mixed orange and blue/grey fine clays, no coarse components	gleyed alluvium
1.30-1.35	605	Very pale grey clayey sand - in places almost white, fine - medium grains, very thin layer	Sand lens
1.35-1.85	606	Clayey sand, dark yellowish brown, no coarse components	transition - sand
1.85-2.25	607	Dark yellowish brown sand, moderate to frequent small and medium sorted gravel pieces and organic (root) material	Sand

Observation Point: 7			Site Sub-division: 15.5
Depth	context	description	interpretative comment
0.0-0.30	701	Topsoil:- very dark greyish brown loamy clay	Topsoil
0.30-0.90	702	'Subsoil' - dark greyish brown firm clay no coarse components	?floodplain alluvium
0.90-1.05	703	Blue/grey clay, very fine and malleable, moderate to occasional mottling	grey alluvium
1.05-1.25	704	Mixed fine orange and blue/grey clay no coarse components	transition
1.25-1.30	705	Very pale grey/almost white very thin sand layer, medium grains	Sand lens
1.30-1.55	706	Mixed pale grey and yellowy brown clayey sand, medium to coarse grains, some rooting	transition
1.55-1.70	707	Mixed blue/grey and yellowish brown clayey sand with frequent dark organic material	Sand with organics
1.70-1.80	708	Yellowy brown sandy clay, no organic material	Sand
1.80-1.90	709	Grey sandy clay, no coarse components or organic material	Sand
1.90-2.00	710	'Mustard' yellow gravelly coarse grained sand	Sand
2.00-2.15	711	Grey sand with moderate small to medium rounded gravel inclusions	Sand and gravel

Observation Point: 8			Site Sub-division: 15.5
Depth	context	description	interpretative comment
0.0-0.25	801	Topsoil: - very dark greyish brown loamy clay	Topsoil
0.25-0.85	802	'Subsoil'- dark blue/grey and yellow mixed firm clay	?floodplain alluvium
0.85-1.10	803	Blue/grey soft clay, firm with some rooting	
1.10-1.30	804	Slightly peaty plastic dark grey clay, some rooting but no other organic remains	humic horizon
1.30-1.45	805	Dark blue/grey clay, very soft and malleable, no coarse component or organic material	greyish alluvium
1.45-1.70	806	Dark brownish grey peaty clay with some organic material; merges into 807	humic horizon
1.70-2.20	807	Very dark grey peat with moderate organic pieces, start of organic preservation coincides with watertable. Water level at 1.80m	Peat



Observation Point: 9			Site Sub-division: 15.4
Depth	context	description	interpretative comment
0.0-0.30	901	Topsoil:- dark brownish grey clay loam	Topsoil
0.30-1.30	902	'Subsoil'- dark yellowish brown silty clay with orange and blue/grey flocking, no coarse components	?floodplain alluvium
1.30-1.80	903	Mid grey peaty clay with some dark greyish black lenses	Peat
1.80-2.20	904	Peat - very dark grey/black, some medium to large organic wood pieces, no archaeology	Peat
2.20-3.90		observations limited but is 904	
3.90-4.20	905	Blue/grey sandy clay	Silt
4.20-4.50	906	Grey sand with gravel and pebble inclusions	Sand

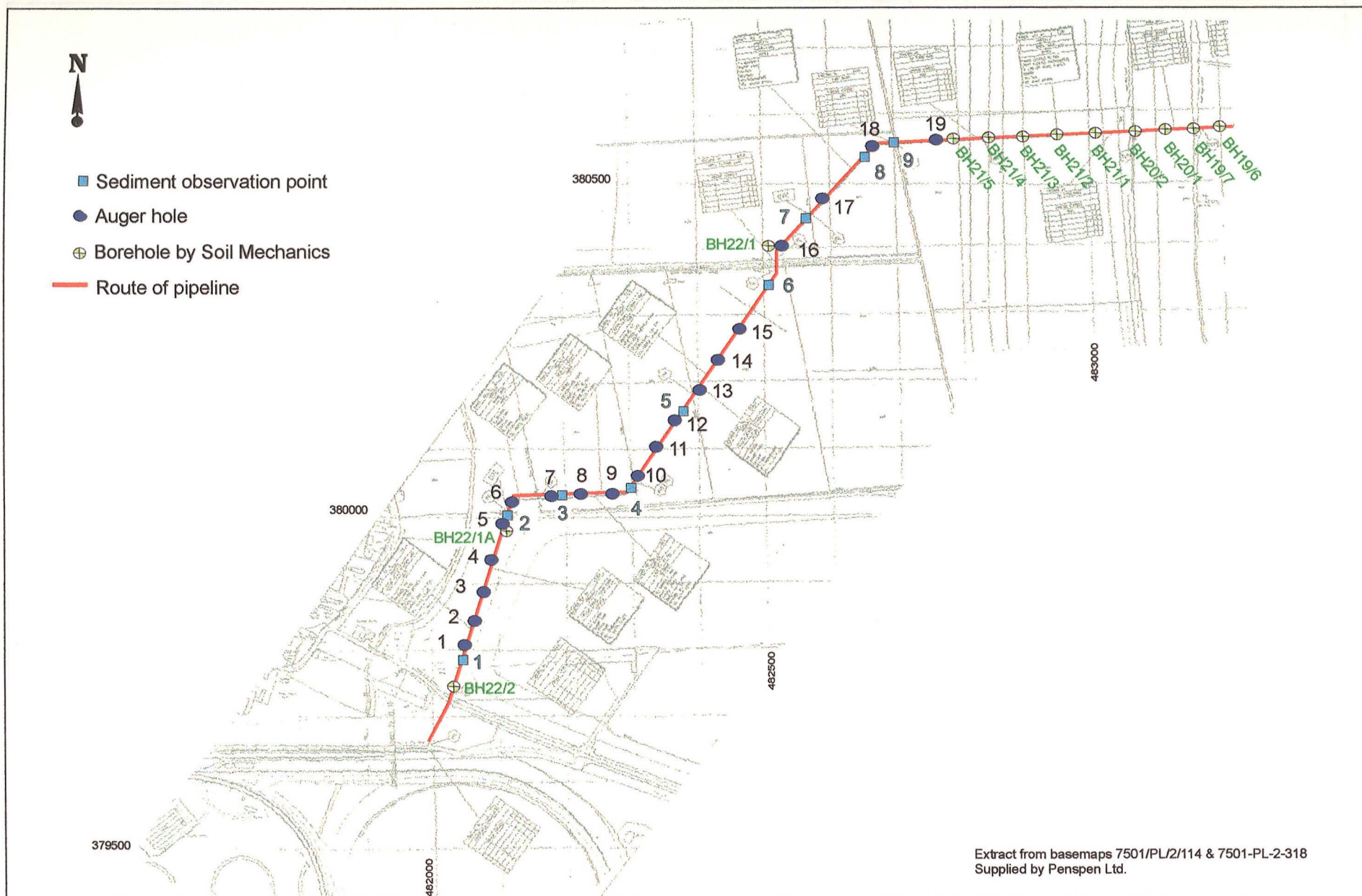


Figure 1



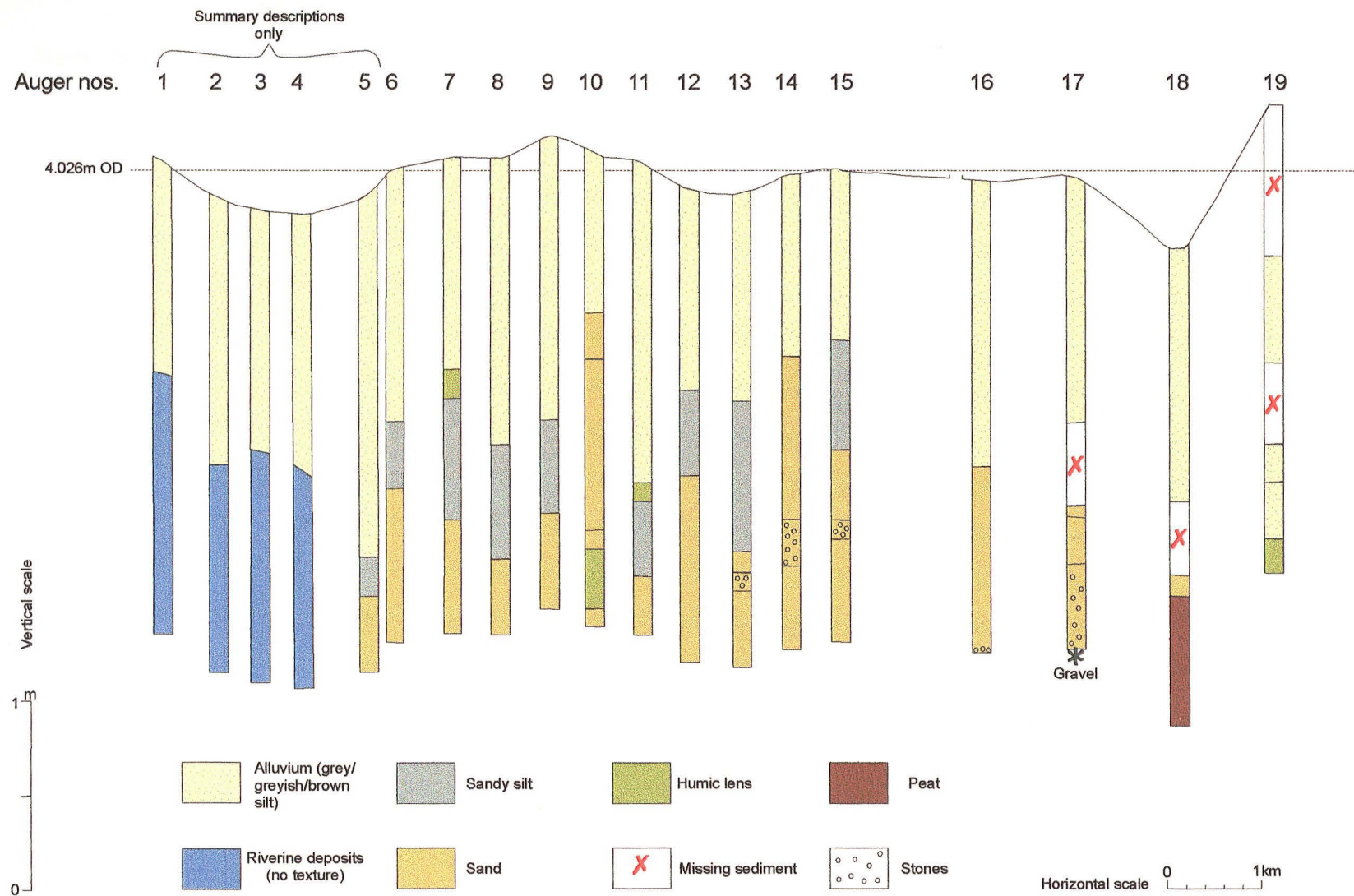


Figure 2

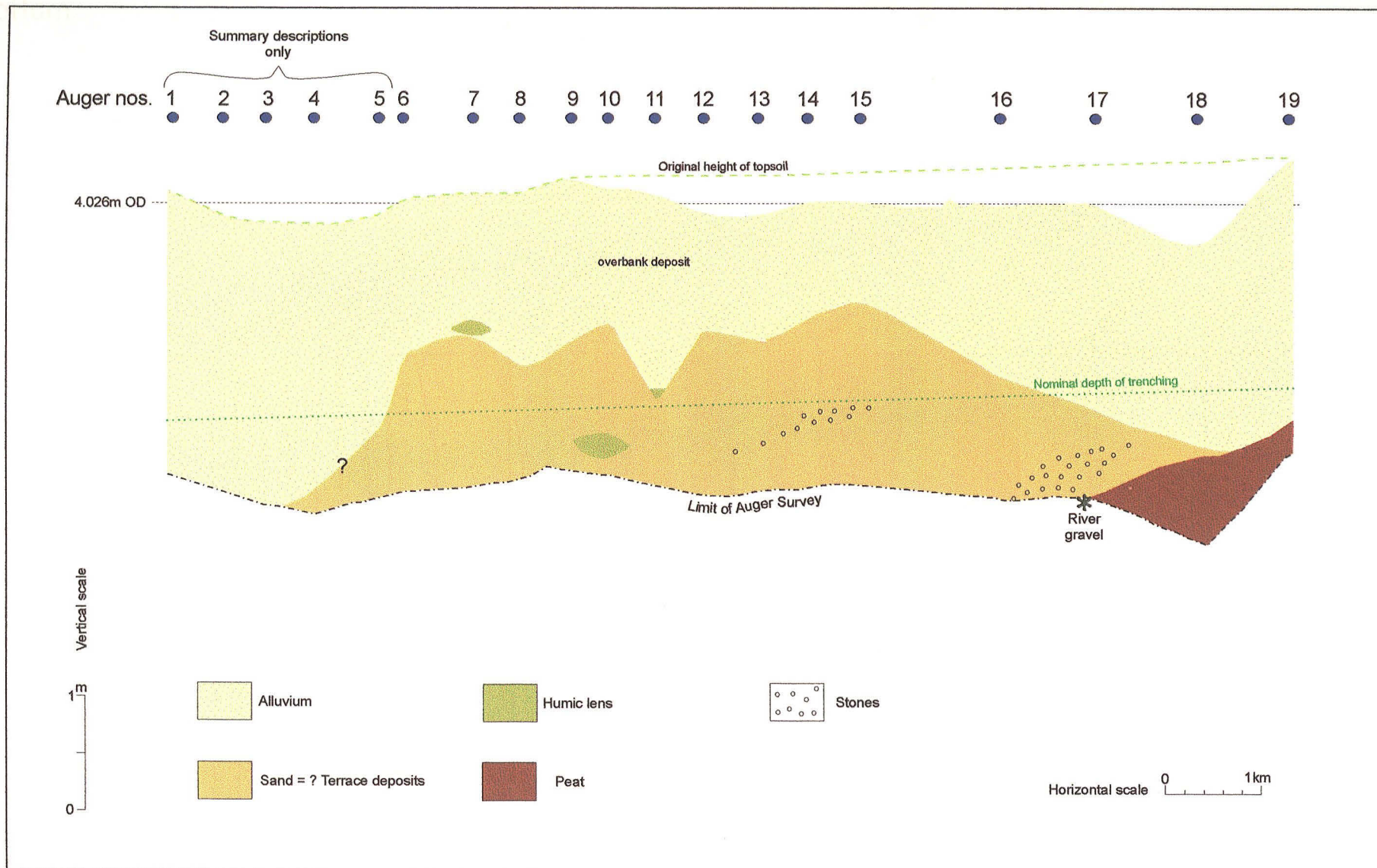
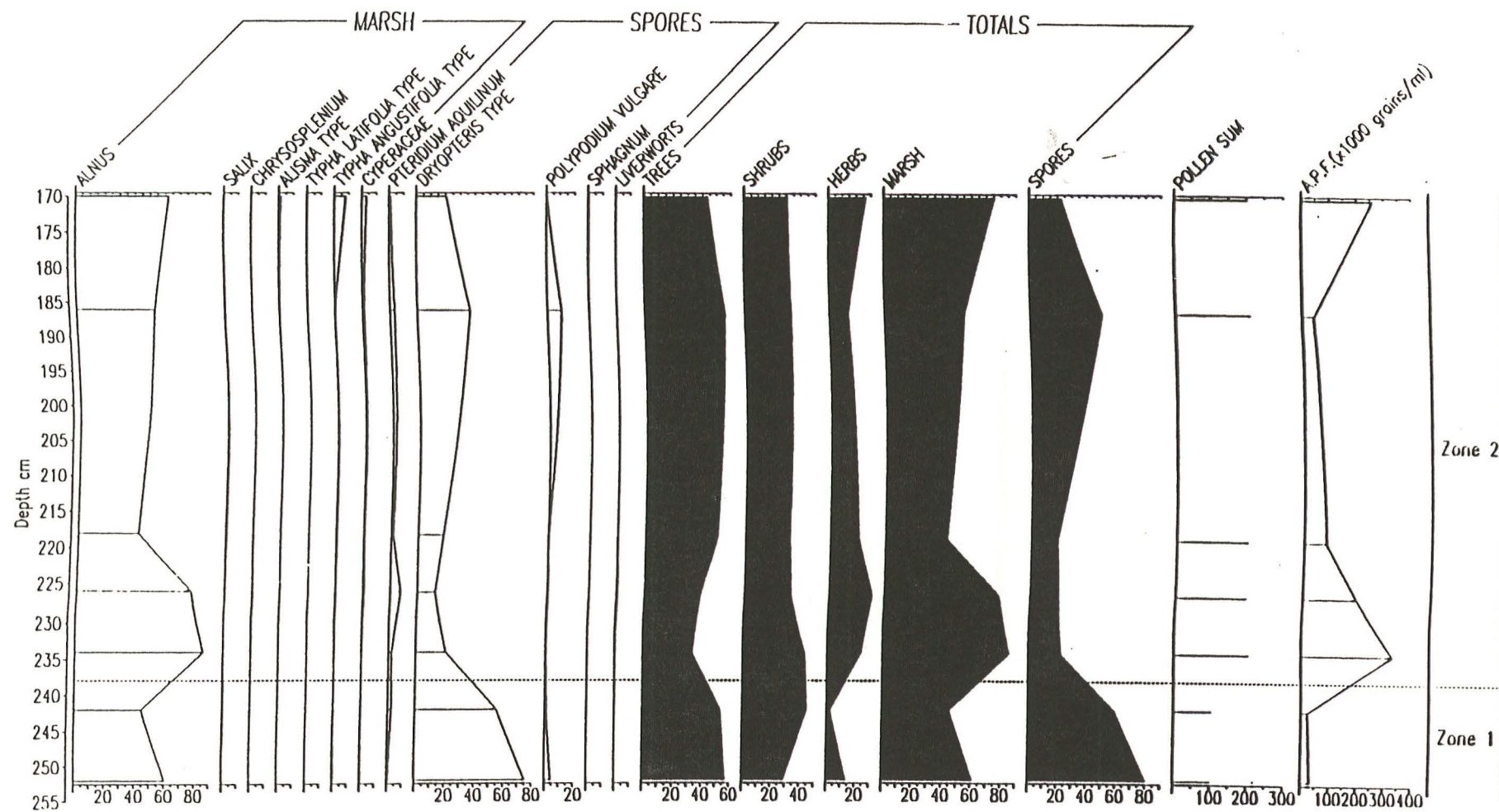


Figure 3



Cottam



Rob Scaife 1997

Figure 4a

Cottam

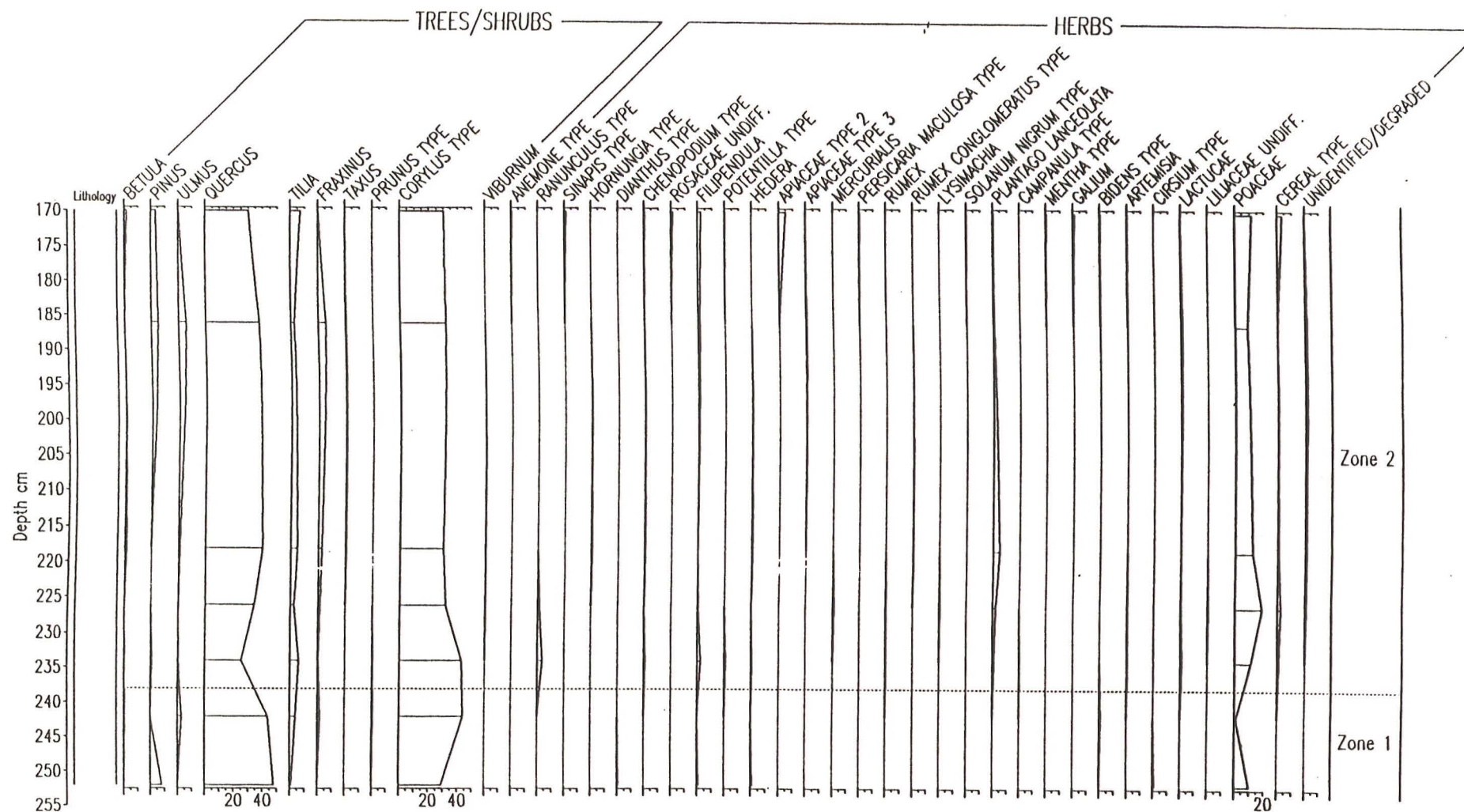


Figure 4b



#### APPENDIX 4: DESCRIPTION OF ALL CONTEXTS

## Description of all contexts

### Field 1.1.

Feat. No	Description	Fills	Stratigraphy	Depth	Date
1003	Palaeochannel. Round bottomed shallow sided linear	1001, a blue grey clay 1002, a yellow sand		0.6m	
1007	Palaeochannel(s). Round bottomed shallow sided linears. 2 channels shallower channel to N. Not fully excavated	1004, a yellowish clayey sand 1005, a dark grey clay 1006, a yellow orange sand		0.75m	
1008	Subsoil		seals palaeochannels 1003 + 1007.	1.0m	

### Field 1.1 (Site 9)

Feat. No	Description	Fills	Stratigraphy	Depth	Date
140	Possible boundary ditch. Irregular shaped linear	141, a mid orangeish brown silty clay		0.27m	
143	Possible field boundary. Round bottomed linear.	144, a mid orangeish brown friable silty sand. Prehistoric pot may be residual as found near surface.		0.42m	
145	Possible field boundary. Round bottom linear.	146, a mid brownish orange silty sand.		0.42m	
147	Shallow flat bottomed linear.	148, a mid brownish orange silty sand.		0.16m	
149	Shallow irregular bottom linear	150, a brown fine loamy sand		0.22m	
151	Truncated ditch/base of ridge and furrow/narrow depression. Very shallow round based linear.	152, a mid brownish orange silty sand		0.07m	
153	Truncated ditch/base of ridge and furrow. Shallow round bottomed linear.	154, a mid greyish brown silty sand		0.08m	
156	Posthole	157, a mixed dark brownish orange and dark grey sandy silt. One flint flake recovered.		0.2m	
158	Posthole	158, a mid orange brown silty sand.		0.2m	
160	Posthole/Root	161, a dark greyish black silty sand		0.06m	



162	Truncated posthole?	162, a dark greyish black silty sand		0.16m	
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### Field 3.2

Feat. No	Description	Fills	Stratigraphy	Depth	Date
1010	Pit? Tree bole? 2m wide rounded in section discreet feature. 8.9m from S end of Site 24.	1009, a dark yellow brown coarse sandy clay.		0.68m	
1012	Posthole? 0.3m wide located 3.6m N of southern end of Tr.24	1011, a dark yellow brown sandy clay		0.26m	
1014	'Feature group'. Rounded irregular section. Not in both sections of pipe trench therefore probably discrete feature(s)	1013, a dark yellowish brown clayey sand		0.9m	

### Fields 3.1, 3.2 and 3.3 (Site 24).

Feat. No.	Description	Fills	Stratigraphy	Depth	Date
127	Steep sided, flat bottomed linear feature, thought likely to be a geological cut	129, a dark orange grey silty sand with occasional angular limestone frags. 128, a dark brownish orange sand with occasional small limestone frags.		0.41m	
130	Shallow east-west gully.	131, a mid greyish brown silty sand with occasional limestone frags.		0.35m	mid C3
133	Natural feature	Examination showed this feature to be natural in origin, and therefore it was not recorded further.		0.05m	
139	Ditch. Unexcavated - trench was backfilled because it was on the wrong alignment	139 was number given to upper fill, and some finds recovered during cleaning of feature		/	
165	Post hole. Unexcavated - trench was backfilled because it was on the wrong alignment	165 was number given to upper fill, and some finds recovered during cleaning of feature		/	C2-C3
166	Curvilinear ditch. Unexcavated - trench was backfilled because it was on the wrong alignment	166 was number given to upper fill, and some finds recovered during cleaning of feature		/	?C3



167	Unexcavated - trench was backfilled because it was on the wrong alignment	167 was number given to upper fill, and some finds recovered during cleaning of feature		/	early-mid C2
168	Natural feature.	Examination showed this feature to be natural in origin, and therefore it was not recorded further.		0.10m	
169	North west-south east linear, steep sided and flat bottomed.	132, a brown sandy silty loam with occasional limestone fragments 170, a yellowish brown sandy clay loam containing rare pebbles 171, a pale brown sandy clay loam, with frequent large limestone frags		1.10m	not well dated
174	Roughly east-west linear, steep sided and concave base	136, a brown sandy silty loam containing occasional limestone frags. 175, a brown sandy silty loam containing frequent limestone frags. 176, a brown sandy silty loam containing occasional limestone frags. (more common near the base).		0.50m	mid-late C2
177	East-west linear, steep sided and flat bottomed	178, a brown sandy silt loam containing occasional limestone frags.		0.27m	C2
179	A natural feature. Originally thought to be an east-west linear.	Only given one number - not recorded in detail once established as natural.		0.07m	
181	Large east-west cut (either terminus of linear or large pit). Steep sided and flat bottomed.	180, an orange brown silty clay containing moderate large limestone frags. 194, a light orange brown sandy silty clay containing relatively frequent limestone frags. 195, a dark grey sand containing occasional limestone pebbles and frequent pieces of charcoal.	Because 201 was left <i>in situ</i> , the precise relationship between [209] and [181] could not be determined accurately, although the burnt layer in the base of [181] suggests a functional relationship.	1.18m	mid-late C2
182	Roughly east-west linear. 'U' profile.	134, a deep orange brown silt loam containing moderate limestone frags. 183, a pale orange brown silt containing frequent amounts of limestone gravel and occasional large limestone frags.		0.94m	early-mid C3
187	East-west linear. Steep sided, 'U' profile.	188, a dark brown sandy loam containing occasional limestone and sandstone frags.		0.46m	mid-late C2



193	Cut of sub rounded posthole	189, a mid greyish brown sandy silt containing frequent sub angular limestone inclusions	This post hole is likely to form part of the same structure as [199], but their exact relationship could not be determined	0.2m	C2
197	Shallow east-west gully, 'U' profile.	198, a dark yellowish brown silty sandy loam containing moderate limestone fragments		0.22m	early-mid C3
199	?Robber trench for wall, running north east-south west.	192, a mid brown sandy silt with frequent patches of friable creamy white mortar containing occasional limestone frags.	Forms part of same structure as [193], but due to robbing, exact relationship impossible to establish.	0.22m	
203	Roughly east-west linear. 'U' profile	202, a dark yellowish brown sandy silty loam with occasional small-medium angular limestone frags		0.26m	mid C3
205	Shallow sub rounded scoop containing burnt fill	204, a mid dark brown sandy silt containing moderate amounts of burnt charcoal.		0.04m	
207	East-west linear, terminates in trench. Steep sided and flat bottomed	206, a mid brown sandy silt containing occasional limestone frags (a few of which appear to have been burnt).		0.32m	mid C3
208	Sub circular ?posthole, 'U' profile	135, a grey brown sandy silty loam containing frequent limestone fragments (?post packing)		0.24m	
209	Sub circular cut, containing structure 201. Cut not fully defined as 201 was left <i>in situ</i>	196, a brown sandy clay silt containing frequent medium to large limestone frags. 200, a mixed light orange brown sandy clay silt containing moderate small-large limestone frags. 201, the number given to the kiln/oven structure. Consists of a base of limestone bedded in mortar, surrounded by a sub-circular wall of mortared limestone blocks, with a stoke hole to the east defined by two stones pitched on end.	Because 201 was left <i>in situ</i> , the precise relationship between [209] and [181] could not be determined accurately, although the burnt layer in the base of [181] suggests a functional relationship.	/	late C2-early C3
210	Natural feature (probably a frost crack)	211, a red-brown silty loam - natural.		0.74m +	
212	Shallow east-west gully, 'U' profile	213, a greyish brown sandy silt loam, with occasional limestone frags.	The exact relationship between this feature and [209] could not be determined	0.10m	



214	Cut of north north east-south south west linear	164, a mid greyish brown sandy silt with very occasional limestone frags.	The exact relationship between this feature and [209] could not be determined	0.24m	
216	East-west linear, 'U' profile	215, a mid brown sandy silt containing frequent limestone frags.		0.43m	mid-late C2

#### Field 4.2 (Site 26)

Feat. No	Description	Fills	Stratigraphy	Depth	Date
100	Drain/ditch. Rounded slightly irregular based linear	101, a light brownish grey sand. 102, a mid orangeish brown sand 103, a mid greyish brown sand.		0.34m	
104	Ditch. Shallow round bottomed V shaped linear	105, a dark grey silty sand		0.26m	
106	Cut of modern field drain	107, a ceramic field drain pipe within 106		0.16m	
108	Drain. U shaped linear	109, a red brown mottled grey sand/loamy sand similar to those containing land drains.		0.23m	
110	Drain/ditch. U shaped linear	111, a mid greyish brown with orange mottling sand	111 cut by [112]	0.36m	
112	Round sided/bottomed linear	112, a mid brownish grey sand.	Possible recut of [110]. Cuts 111	0.23m	
114	Ditch? Shallow round bottomed linear	116, a mid brownish grey with orange mottling sand 115, a dark brownish orange sand/iron pan		0.29m	
117	Topsoil.		Seals 118	0.25m	
118	Ploughsoil below 117		Sealed by 117	0.20m	
119	Subsoil. Mid yellowish brown silty sand.			max 0.35m	
120	Natural. White to orange and brown sands and silty sands with clay towards the centre of the trench				
121	Linear. Round bottomed V shaped linear	122, a grey fine sandy silty loam with red/brown mottling		0.27m	
123	Ditch/drain. Irregular sided and bottom linear.	124, a dark bluish grey with orange patches		0.20m	
125	Shallow ditch. Shallow flat bottomed linear	126, a light brownish grey with orange mottling sand		0.11m	



### Field 6.3

Feat. No	Description	Fills	Stratigraphy	Depth	Date
1015	Subsoil, a pale grey sandy clay		Seals palaeochannels 1021 + 1027	0.46m	
1016	Subsoil layer, a very dark grey sandy clay.		below 1015	0.15m	
1017	Subsoil layer, a pale grey sandy clay		below 1016 ,above 1018.	0.2m	
1021	Secondary cut of palaeochannel. Steep sided round bottomed linear on same alignment as 1027	1018, a pale grey sandy clay 1019, a dark yellowish brown sand 1020, a greenish grey gravel and sand	Cuts 1022	1.1m	
1027	Palaeochannel. Irregular rounded section linear	1022, a mid yellow sand 1023, a mid blueish clay 1024, a dark yellowish brown sand 1025, a dark yellowish brown sand & organic matter 1026, a greenish grey gravel & clay		1.45m	

### Field 12.2 (Site 36)

Feat. No	Description.	Fills	Stratigraphy	Depth	Date
1036	Willingham-Stow parish boundary ditch. U shaped ditch.	1034, a dark grey silty clay 1035, a dark yellowish brown clay		0.50m	

### Field 13.1 (site 46): Watching brief

Feat. No	Description	Fills	Stratigraphy	Depth	Date
1029	Pit. Rounded in section discreet? feature.	1028, a very dark grey sandy clay	1028 cut by [1031]. Possibly a section through linear [1515] from site 46.	0.4m	



1031	Posthole?	1030, a very dark grey sandy clay	Cuts 1028.	0.6m	
1033	Linear. Shallow wide cut of linear.	1032, a very dark grey sandy clay.	Almost certainly a section of [1588] on site 46.	0.75m	

### Field 13.1 (Site 46): Excavation

No.	Description	Fills	Stratigraphy	Depth	Date
1501	Shallow east-west gully. 'U' profile	1502, a dark grey brown silty clay		0.15m	
1505	Small circular steep sided flat bottomed pit.	1503, fragments of an inverted pottery vessel 1504, a dark greyish brown silty loam with occasional small-medium rounded pebbles		0.12m	C1-C2
1508	East-west ditch. 'U' profile	1507, a greyish brown silty loam with very occasional small sub rounded pebbles		0.29m	late C1
1509	East-west ditch. 'U' profile. Fairly substantial	1510, a dark green brown silty clay containing occasional limestone gravel	Relationship with [1595] not established	0.35m	early-mid C2
1513	Shallow north-south gully, 'U' profile	1512, a light greyish brown silty loam with very occasional small sub rounded and sub angular pebbles	Fill 1512 cut by [1530] Cuts 1514, the fill of [1515]	0.14m	
1515	Shallow east-west gully, 'U' profile	1514, a light greyish brown silty loam with very occasional small rounded and sub rounded pebbles	Fill 1514 cut by [1513]	0.18m	
1517	Oval ?posthole/small pit, moderately steep sides, concave base	1516, a dark green grey silty clay containing sparse small sandstone fragments		0.17m	mid C2
1519	Shallow ovoid scoop/pit	1518, a greyish brown sandy silty loam with occasional small rounded pebbles		0.08m	early-mid C2
1520	Layer	1520, a black/brown silty clay containing common limestone gravels	Seals deposits in [1530]. Does not extend beyond limits of [1530], and presumably represents it's last functional use.	/	mid C3
1522	East-west linear which terminates in the eastern half of the site	1521, a dark greyish brown silty loam containing rare large angular pieces of limestone	Cuts 1523, the fill of [1524]	0.24m	
1524	Shallow east-west linear, which decreases in depth to the east. Same as [1532]	1523, a mid yellowish brown sandy silty loam with occasional sub-rounded pebbles	Fill 1523 cut by [1522]	0.19m	



1525	? circular post hole	1526, a black brown silty clay 1534, a dark yellow brown silty clay with black flecks	Cuts 1533, a fill of [1530] Fill 1526 sealed by 1520	0.26m	
1528	Shallow scoop or pit, 'U' profile	1527, a black silty clay with occasional small sandstone and limestone frags.	Cuts 1533, a fill of 1530	0.06m	mid C2
1530	Large, shallow circular pit, associated with later cuts [1525] and [1528]	1520, see above. 1529, a brown black silty clay with occasional small sandstone and limestone frags. 1533, a dark yellow brown silty clay containing abundant small-medium sandstone and limestone frags.	Cuts 1512, the fill of [1513] Relationship with [1595] not established, but [1595] appeared to cut 1520	0.17m	
1532	Shallow east- west linear. Same as [1524]	1531, a light grey brown silty clay containing occasional angular and sub angular pebbles	1532=1524	0.1m	
1538	South west-north east linear, irregular 'v' profile. Same as [1550] and [1575]	1535, a mid to dark grey coarse sandy clay containing occasional rounded pebbles and moderate sub-angular and angular flints 1536, a mid grey brown silty clay containing occasional rounded pebbles and occasional sub angular and angular flints 1537, a mixed yellow brown silty clay containing moderate amounts of rounded pebbles and occasional limestone fragments	Cuts 1539, fill of [1540] Cuts 1551, fill of 1552 1538=1548=1575	0.46m	C2
1540	Shallow flat bottomed gully, which runs NE-SW then turns to run N-S. Terminates to N of 1559. Same as [1546], [1581] and [1567]	1539, a mid grey-brown silty clay with occasional rounded pebbles	Fill 1539 cut by [1538] 1540=1546=1567=1581	0.20m	
1542	South west-north east linear, 'U' profile. Same as [1546], [1564] and [1577].	1541, a mixed mid brownish grey silty clay with occasional rounded pebbles	Fill 1541 cut by [1551] Relationship with [1538] unclear at this point. 1542=1546=1564=1577	0.27m	early- mid C2
1544	Cut of modern land drain Same as [1590]	1543, a mid brown clay silt with occasional mid grey mottles, containing occasional small stones. This number was also given to the field drain itself for ease of recording.	1544=1590	0.19m	C18- C19
1546	South west-north east linear, 'U' profile. Same as [1540], [1567] and [1581].	1545, a mid/light grey clay silt, with orange mottles, containing very occasional small-medium rounded pebbles	Fill 1545 cut by [1550] 1546=1540=1567=1581	0.25m	early- mid C2
1548	South west-north east linear, 'U'/'V' shaped profile. Same as [1538] & [1575]	1547, a dark grey coarse sandy clay with occasional small-large rounded pebbles	Cuts 1549, fill of [1550] 1548=1538=1575	0.32m	early- mid C2



1550	South west-north east linear, 'U' shaped profile. Same as [1542], [1564] and [1577]	1549, a mid grey brown silt clay, heavily mottled with orange, containing occasional rounded and sub rounded small-large pebbles	Fill 1549 cut by [1548] 1542=1546=1564=1577	0.36m	
1552	?linear/discrete feature. Only identified in one section. Not recorded in plan.	1551, a mid grey/brown silty clay containing occasional rounded pebbles	Fill 1551 cut by [1538] Cuts 1541, the fill of 1542	0.18m	
1553 & 1554	Cobbled area (1554) overlain by spread of loose pebbles in a greenish grey sandy silt matrix (1553)		Seals 1587, the fill of [1586] and 1585, the fill of [1584]	0.05m +	mid-late C2
1557	Cut of shallow scoop/pit	1556, a greyish brown silty clay containing occasional angular pebbles		0.07m	mid C2
1559	Large circular pit, relatively shallow, with irregular base	1558, a mid brown silty clay with dark brown mottling, containing occasional small limestone and sandstone inclusions	Relationship with feature to north uncertain	0.5m	late C2- C3
1561	Cut of ? posthole	1560, a dark brownish grey silty clay containing occasional limestone frags.		0.21m	
1564	South west-north east ditch, with relatively steep sided flat bottomed profile. Same as [1542], [1550] and [1577]	1562, a mid grey silty clay with greyish brown mottles, containing occasional rounded and sub angular flints 1563, a mid grey silty clay containing occasional rounded pebbles	Cuts 1565, the fill of [1568] 1564=1542=1550=1577	0.37m	early- mid C2
1567	South-North gully, 'U' profile. Same as [1540], [1546], and [1581]	1566, a mid yellowish brown silty clay with rare small angular limestone frags.	1567=1540=1546=1581	0.12m	
1568	Shallow steep sided, flat bottomed east-west linear	1565, a mid grey brown silty clay with moderate to frequent rounded pebbles and sub angular to angular flints	Fill 1565 is cut by [1564]	0.14m	C2
1570	Shallow scoop/pit	1555, a mid grey brown silty clay containing occasional small gravels and sub angular pebbles 1569, a yellow brown silty clay containing moderate amounts of angular limestone frags.		0.15m	C4
1573	East-west gully, terminates in western third of site.	1572, a very dark grey brown silty clay with orange mottles, containing occasional medium-large angular to sub rounded pebbles	Cuts 1574, the fill of [1575]	0.18m	mid C2
1575	South west-north east linear, only partially excavated. Same as [1538] and [1548]	1574, a dark grey coarse sandy clay with occasional small-large rounded pebbles	Fill 1574 cut by [1573] Cuts 1576, the fill of [1577] 1575=1538=1548	0.15m	



1577	South west-north east linear, only partially excavated. Same as [1564] and [1550]	1576, a mid grey brown silt clay, heavily mottled with orange, containing occasional rounded and sub rounded small-large pebbles	Fill 1576 cut by [1575] Cuts 1580, the fill of [1581] 1577=1542=1550=1564	0.25m	
1579	South west-north east gully at southern end of site.	1578, a mid brown silty clay with rare small to medium angular limestone fragments		0.12m	
1581	South-north stretch of gully, only partially excavated. Same as [1540], [1546], and [1567]	1580, a mid/light grey clay silt, with orange mottles, containing very occasional small-medium rounded pebbles	Fill [1580] cut by [1577] 1581=1540=1546=1567	0.17m	
1583	Cut for C19th land drain	1582 Number used to describe both filed drain and surrounding matrix		/	C19
1584	Natural feature	1585, a mid green brown silty clay containing occasional limestone frags.	Fill 1585 Sealed by cobbled surface 1554	0.23m	
1586	South west-north east linear, only partially excavated. Same as [1588]	1587, a dark green brown silty clay with common small limestone and flint gravel inclusions	Fill 1587 sealed by cobbled surface 1554 1586=1588	0.34m	
1588	South west-north east linear. Same as [1586]	1596, a mid grey silty clay with brown mottles, containing occasional small to medium rounded and sub rounded pebbles	Fill 1596 cut by [1592] 1588=1586	0.68m	C2
1590	Cut of modern pipe trench. Same as [1544]	1589, a light grey brown clay	1590=1544	/	C19
1592	Shallow south west-north east linear.	1591, a dark grey silty clay 1593, a light grey silty clay with brown mottling	[1592] cuts 1596, the fill of [1588]	0.22m	C2- mid C3
1595	V. shallow N-S linear, runs along Western edge of site	1594, a mid brown/grey brown clay silt, with orange mottles, containing occasional small-large rounded pebbles	[1595] appears to cut 1520, the upper fill of [1530]	0.07m	
1598	Cut of shallow circular pit.	1597, a mid greyish brown silt clay containing occasional small angular limestone fragments		0.11m	
1601	Cut of small sub square pit/posthole	1599, a dark grey silty clay with orange flecks, with occasional limestone frags (?post packing) 1600, a mid grey silty clay 1602, an orange/yellow clay flecked with grey		0.26m	mid C2
1604	Cut of shallow east-west gully, not fully excavated.	1603, a mid grey brown clay silt with orange mottles containing moderate amounts of small-medium flint pebbles	Fill 1603 appears to be cut by [1564]	0.12m +	

### Field 13.1 (Site 43)

## APPENDIX 5: AERIAL PHOTOGRAPHIC ASSESSMENT



# **COTTAM PIPELINE**

## **LINCOLNSHIRE**

**Sites 24 & 46**

### **AERIAL PHOTOGRAPHIC ASSESSMENT**

#### **Archaeology**

Aerial photographic interpretation by Alice Deegan BSc. AIFA

Report prepared by Chris Cox MA MIFA

November 1997

**Report No: APSLtd./967/35**

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#### **Commissioned by**

THE TRUST FOR WESSEX ARCHAEOLOGY LTD.  
PORTWAY HOUSE  
OLD SARUM PARK  
SALISBURY SP4 6EB

## SUMMARY

This aerial photographic assessment was commissioned by the Trust for Wessex Archaeology Ltd. from Air Photo Services Ltd. in November 1997.

**The assessment provides** aerial photographic interpretation of archaeological features over two specified sites on the route of the Cottam Pipeline in Lincolnshire. Archaeological features at site 24 were recorded from the air via differential responses of growing cereal crops to buried ditches and pits. Vestigial ridge and furrow - the remains of a former Medieval agricultural landscape - were recorded adjacent to site 46. Due to timescale constraints, the assessment was undertaken using oblique photos only from England's major air photo archive, the National Library of Aerial Photographs at the National Monuments Record Centre in Swindon. The Cambridge University Collection was not consulted, but coversearching here indicated that only vertical photos were held.

**Site 24:** This area contains extensive crop marked evidence for a former ditched occupation site and a multi-ditched sinuous feature which is likely to have been a major land boundary. Such features are usually associated with prehistoric or later settlement areas. The remains of the 'occupation' site are rather faint, and show as indistinct crop marks, indicating that the ditches are less substantial than those of the very striking boundary.

The ditches and pits are probably a lot more extensive than those seen on the available photographs.

**Site 46:** Photographic coverage for this site was particularly poor. The available specialist oblique photos covered fields lying outside the assessment area. Only vestigial Medieval landscape was seen and recorded.



# **COTTAM PIPELINE, LINCOLNSHIRE**

## **SITES 24 & 46**

### **AERIAL PHOTOGRAPHIC ASSESSMENT**

#### **1. INTRODUCTION**

##### **1.1. Introduction**

- 1.1.1. This aerial photographic assessment was commissioned by The Trust for Wessex Archaeology Ltd. from Air Photo Services Ltd. in November 1997.
- 1.1.2. The assessment provides interpretation of oblique aerial photographs over two specified sites on the route of the Cottam Pipeline in Lincolnshire.

##### **1.2. Archaeology from Aerial Photographs**

- 1.2.1. Detailed archaeological interpretation of contemporary and historical aerial photographs allows the accurate mapping of archaeological sites recorded as crop marks (caused by the differential growth of crops over buried features, Riley 1946, Wilson 1982), soil marks (caused by differences in soil colour over ploughed buried features, Wilson 1982) and shadows cast by upstanding earthworks. Aerial photographic evidence is, however, limited by seasonal, agricultural, meteorological and environmental factors which affect the extent to which either buried or upstanding archaeological sites can be detected. (Riley 1987, 17-40).
- 1.2.2. In this case, the specialist oblique aerial photographs recorded an extensive archaeological landscape at site 24, but only in a rather fragmentary manner. This 'partial recording' was largely due to unfavourable crop conditions over some of the recorded fields, and partially to the individual surveyors concentration upon recording the very obvious ditches of the buried boundary, whilst neglecting to fully record surrounding features of equal importance but lesser visibility.
- 1.2.3. It is thus advantageous to examine a range of photos taken under a variety of environmental conditions and preferably by different surveyors in order to build up a comprehensive interpretation of the archaeological landscape. The visibility of

archaeological features may differ from year to year and individual photographs often record only a small percentage of the actual extent of buried features.

- 1.2.4. Within their limitations, aerial photography and photographic interpretation provide information which cannot easily be detected by other means, and are complementary components of multi-disciplinary archaeological investigation. They also provide a cost-effective landscape overview and accurate guidance for ground based investigations or positioning of evaluation trenches.

### 1.3. The Study Area

#### 1.3.1. Study Area Definition

The archaeological study area, as defined by the client, covered a 500 metre radius of the centre point of each site.

#### 1.3.2. Environment

**Site 24** is situated on Chalky till, which gives rise to fine loamy over clayey soils<sup>1</sup> which produce crop marks locally in times of drought over buried features.

**Site 46** is situated on the interface of river alluvium<sup>2</sup> and drift over clay and mudstone. This area was not well covered by specialist oblique photos, although adjacent areas had been surveyed, suggesting that it is not apparently productive of crop marked evidence. However, any buried features in this area and in environmentally similar areas may not be easily visible from the air due to masking by deeper alluvial soils.

### 1.4. Aerial Photographs

#### 1.4.1. Types

Two types of aerial photograph are available for archaeological assessment purposes:

*Vertical photographs* are taken for general purpose survey using a camera mounted inside a modified aircraft. They provide 'blanket' vertical photographic coverage from a fixed scale and viewpoint. Their overlap allows them to be studied in pairs under a stereoscope

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<sup>1</sup> Soil Survey of England and Wales (SSEW, 1983) classification 712g, Ragdale soil association.

<sup>2</sup> Soil Survey of England and Wales (SSEW, 1983) classification 813c, Fladbury 2 soil association.



to give a three dimensional image. They have some inherent perspective and ground height distortions, but are essentially 'map-like' in appearance. They usually provide a good landscape overview, and can, if taken at the correct time of year, show crop marked features.

*Oblique photographs* are taken using a hand held camera by an aerial archaeologist to portray features which have been identified during specialist survey. These photos are extremely useful, but contain inherent perspective distortions which must be accounted for in rectification and mapping procedures. They may also reflect the bias of the photographer's personal research interests, and often present an incomplete picture of the full archaeological landscape.

Both types of photos are held in national and local photographic archives.

#### 1.4.2. Sources

Both study areas were subjected to aerial photographic library searches as of November 1997, and the coversearch obtained by the client over site 46 was utilised. Due to timescale constraints, the assessment was undertaken using oblique photos only from England's major air photo archive, the National Library of Aerial Photographs (NLAP) at the National Monuments Record Centre in Swindon. The Cambridge University Collection (CUCAP) was not consulted, but coversearching here indicated that only vertical photos were held. Further photos may be held by the county Sites and Monuments Record (SMR) or the County Record Office (CRO), but these sources were not searched due to the shorter timescale. The available photos, taken in 1932, 1977, 1979 and 1980, were drawn from the **National Library of Air Photographs (NLAP)**, National Monuments Record (NMR) Centre, RCHME, Kemble Drive, Swindon, Wiltshire.

Figure ?? shows the extent of available photographic coverage over each site.

### 1.5. Assessment Specification

- 1.5.1. Both areas were examined and all visible archaeological features (from prehistoric through to the National Monuments Record terminal date of 1945), were mapped in detail to an accuracy compatible with the mapping scale and the scale of the photographs from which the data were derived. Interpretation and mapping was undertaken at 1:2500 scale.

### 1.6. Interpretation and Mapping Methodology

- 1.6.1. Photographic interpretation, rectification and mapping were carried out following procedures defined by Palmer and Cox (1993). All photographs were closely examined, under 1.5x and 4x magnification, and viewed stereoscopically where appropriate. Transparent interpretative overlays were prepared, from which archaeological and associated relevant information was digitised.
- 1.6.2. Interpreted features were rectified, where appropriate, by computer using the Bradford aerial photographic rectification software, AERIAL 4.20 (Haigh 1993). AERIAL 4.20 calculates values for the closeness of control point match and, using an initial plane surface rectification, the mean control point positioning error in all cases was under  $\pm 5\text{m}$ .

## 1.7. Maps

- 1.7.1. Site 24 was mapped onto a modified version of the digital basemap at 1:2500 scale, and the peripheral medieval features near site 46 were indicated schematically on the digital basemaps provided by the client. All figures are supplied as paper copy and on disc as AutoCAD release 12 files.

## 2. RESULTS

- 2.1. **Site 24: (Figure 11 and 12)** This area contains extensive crop marked evidence for a former ditched occupation site and a multi-ditched sinuous feature. This feature may have been a major former land division or access way. Similar features are seen throughout the Midlands and East Anglia, where they are often associated with prehistoric settlement areas whilst others are post-Roman. No traces of an embankment or associated pit alignment survive at the site, but may be invisible in this area.
- 2.2. A strikingly similar triple ditched crop marked example was recorded at Long Bennington in Lincolnshire (Wilson 1982 page 104). At this location a triple ditched boundary is joined by a double ditched feature and a pit alignment. The feature at site 24 is definitely associated with single sinuous ditches, but is only seen for what must be a short section of its true length. The ditches are of a similar width and appearance to those at Long Bennington. It is likely that this visible portion of the boundary is its terminus, or an intersection with another boundary system at the settlement. One of its ditches exhibits a thickening at the end, as if defining a ditch terminal, and the multiple ditches intersect sensibly with adjoining single ditches.
- 2.3. The remains of the 'occupation' site are rather faint, and show as indistinct crop marks. It is not possible to ascertain their contemporaneity with the sinuous boundary. Some of the



ditches are likely to form part of settlement or stock penning enclosures and associated small access ways.

- 2.4. The ditches and pits are probably a lot more extensive than those seen on the available photographs.
- 2.5. Photo number SK9391/15 shows crop marked linear features which may be the remains of former furrows associated with medieval ploughing which appear to be extensive over the site. Their direction has been indicated schematically.
- 2.6. **Site 46:** Photographic coverage for this site was particularly poor. The available specialist oblique photos covered fields lying outside the assessment area, where some vestigial Medieval landscape was seen and recorded.

### 3. AERIAL PHOTOGRAPHIC SOURCES- PHOTOGRAPHS CONSULTED

#### 3.1. Site 24: Source: National Library of Aerial Photographs

##### *Principal Oblique Photographs*

SK9391/9/18	July 1980
SK9391/10/19	July 1980
SK9391/12	7 <sup>th</sup> July 1977
SK9391/15	29 <sup>th</sup> July 1979

#### 3.2. Site 46: Source: National Library of Aerial Photographs coversearch number 577997

##### *Principal Oblique Photographs*

<i>NB: None directly covering area</i>	
SK8782/1-1	31 <sup>st</sup> October 1980
SK8783/1-3	31 <sup>st</sup> October 1980

### 4. REFERENCES

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## 5. ACKNOWLEDGEMENTS

Thanks are due to:

*Alice Deegan*

*Library staff*

*Nicholas Cooke and Rachel Griffin* Trust for Wessex Archaeology Ltd.

On behalf of Air Photo Services Ltd.

NLAP & CUCAP for library search facilities.




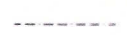


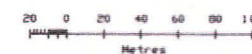
FIGURE 1: Cottam Pipeline, Lincolnshire: Site 24, centred SK936919  
Aerial Photographic Interpretation



AIR PHOTO SERVICES Ltd.  
01249 891411

SITE: Cottam Pipeline, 24  
CLIENT: Trust for Wessex Archaeology  
DATE: November 1997  
SCALE: 1:2500  
SURVEY BY: AD, CC  
SOURCE: NLAP obliques

-  Cut archaeological features
-  Possible ditches
-  Former boundaries
-  Possible ridge and furrow





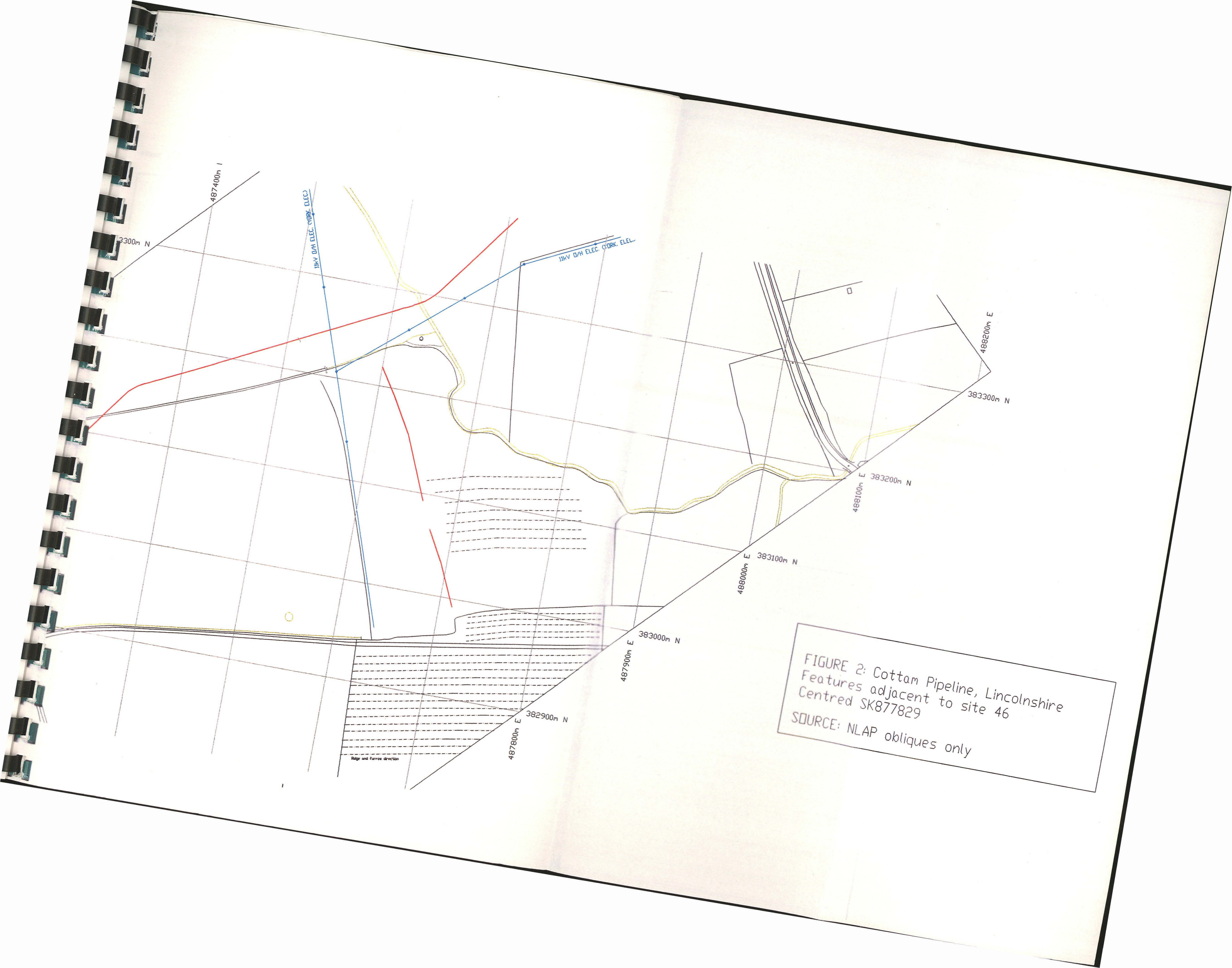


FIGURE 2: Cottam Pipeline, Lincolnshire  
Features adjacent to site 46  
Centred SK877829  
SOURCE: NLAP obliques only



FIGURE 3: NLAP SPECIALIST PHOTOGRAPHIC COVERAGE

