

KING'S LYNN TO WISBECH
PROPOSED NATURAL GAS PIPELINE
FOX HILL REROUTE

Archaeological Desk Based Assessment

Prepared By

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On behalf of

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For

MURPHY PIPELINES LTD

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NON-TECHNICAL SUMMARY

This archaeological desk-based assessment relates to a proposed pipeline re-route between West Bilney and Blackborough, in Norfolk (NGR 571248 315009 to 568033 314022). The re-route crosses an area known as Fox Hill.

This report presents the results of desk-based study of published archaeological information in the public domain lying within a one kilometre-wide Study Corridor, centred on the proposed pipeline re-route. Searches of national and county databases, the study of maps, aerial photographs and written sources, have identified 105 sites of archaeological importance. All the sites studied have been graded according to their perceived archaeological importance. The scale of impact of the proposed scheme upon each archaeological site has been assessed, and the significance of each impact determined (taking into account the importance of each site).

Two sites benefit from statutory protection, one is nationally important, four are regionally important, ninety-five are locally important and three are ungraded. Only nineteen of the locally important sites are impacted upon. The impacts on two locally important sites are uncertain, and two ungraded sites are directly impacted upon.

A staged approach to the archaeological investigation and mitigation of the proposed re-route is recommended. Recommendations are made for the completion of reconnaissance survey, targeted fieldwalking survey, and metal detector survey along the route. Specific recommendations are made for fourteen D grade sites which lie on or close to the proposed re-route.

Alluvial sediments and peat may occupy parts of the re-route. Here, the potential exists for the discovery of buried landscapes and valuable palaeo-environmental evidence, as well as preserved timbers and organic remains.

1 INTRODUCTION

1.1 Purpose of the report

This report presents the results of an archaeological desk based assessment of a proposed pipeline re-route between West Bilney and Blackborough, Norfolk (Figure 1). This re-route is part of the proposed pipeline route from King's Lynn in Norfolk to Wisbech in Cambridgeshire (Network Archaeology 2006a).

1.2 Commissioning bodies

This archaeological assessment was commissioned by Black and Veatch Ltd on behalf of Murphy Pipelines Ltd for National Grid. The archaeological contractor was Network Archaeology Ltd, a professional organisation which provides consultancy advice and undertakes archaeological field services.

1.3 Proposed development

National Grid proposes to construct a new pipeline for the transportation of natural gas, between the King's Lynn Compressor Station, in Norfolk and the Wisbech Nene West Above Ground Installation (AGI) in Cambridgeshire (Network Archaeology 2006a, Figure 1). This re-route represents one part of the proposed pipeline, which is intended to reinforce National Grid's National Transmission System and Local Transmission System, primarily in response to increasing demand for gas by domestic and commercial users in Eastern England. The proposed 1220mm (48") diameter pipeline will be 30.3km long and will be designed for pressures up to 75 bar g.

The pipeline is to be built within a 42m wide working width, although it may be widened at railway, road and river crossing points, and narrowed at hedgerows. Construction will involve four main phases of activity. The first phase, Right Of Way Activities, includes hedge removal, cleaning, fluming and temporary bridging of ditches, fencing the working width, topsoil stripping of access areas and the installation of pre-construction drainage. Topsoil stripping across the working width will then take place along the length of the pipeline. Trench Excavation and Pipe Laying will then follow. The pipe-trench will have a usual excavated depth of 2.5m and width of 1.8m, with greater dimensions taken where the pipe is to be bored beneath railways, roads, river crossings and other areas of constraint. All roads, major rivers, major services, railways, etc will be crossed by non-open cut. Finally, Reinstatement, involving the replacement of topsoil and the installation of post-construction drainage, will take place.

1.4 Staged approach to archaeological investigation and route selection

National Grid intends to adopt a staged, multi-disciplined approach to route selection.

This archaeological assessment forms the first stage in what is expected to be a detailed investigative programme of archaeological research, investigation and mitigation during the design phase and construction phase of the pipeline.

1.5 Legislation, regulations and guidance

The pipeline will be constructed under the Gas Act, 1986 (as amended by the Gas Act, 1995), and therefore does not require permission from the Department of Trade and Industry (DTI) under the Pipeline Act, 1962.

The pipeline is subject to the requirements of The Public Gas Transporter Pipeline Works (Environmental Impact Assessment) Regulations, 1999 (S.I. 1999/1672). As the pipeline will have a design operating pressure above 7 bar g and is in a 'sensitive area' (Area of Outstanding Natural Beauty), as defined by the Regulation, National Grid is required to submit an Environmental Statement for approval by the DTI or seek determination from the DTI over the need for submission of an Environmental Statement. In this instance, National Grid has opted to submit an Environmental Statement for approval by the DTI.

Temporary works areas (e.g. the construction yard, pipe storage areas and mobilisation areas) will not require planning consent as they fall within the definition of Permitted Development under the Town and Country Planning (General Permitted Development) Order, 1995 (S.I. 1995/418).

The Hedgerow Regulations (1997) define a set of archaeological and historical criteria used for determining whether hedges are "important" (see Appendix B).

1.6 Aims

The purpose of this assessment is to consider the cultural heritage implications of the proposed pipeline re-route and to provide a basis for further stages of investigation.

The specific objectives are:

- To identify and define the extent of known archaeological remains within and immediately outside the 1km wide Study Corridor;
- To provide a preliminary assessment of their significance;
- To assess the overall impact of the proposed pipeline re-route on the known and potential archaeological constraints;
- To assess the need for further evaluation and mitigation prior to and during construction; and
- To make recommendations for further evaluation and mitigation, where necessary.

1.7 Circulation of report

Ursula Bycroft of Black & Veatch, Mike Eyres of Murphy Pipelines Ltd, Barry Robinson of National Grid, and David Robertson of Norfolk Landscape Archaeology will receive a copy of this report.

1.8 Resourcing

This report was undertaken over a four week period in February and March 2007. Data collection by one researcher took place over one week, one day for collecting aerial photographs and report writing was undertaken by one individual over a two week period. MapInfo GIS was used to manage and present the data.

1.9 Report structure

This desk based assessment is divided into seven chapters followed by appendices, forming four main sections:

Chapters 1-2 serve to introduce the organisations involved, the proposed pipeline re-route, the context, method and standards of assessment, and the layout of this report. All headings up to and including circulation of report deal with aims. The remaining headings in the introduction deal with scope. The Method of Assessment is also part of the scope of the report, but is large enough to need its own section. It deals with the archaeological standards and methods used for the data collection, analysis and reporting. Additionally, the chapter defines nomenclature used in this report, and states where the project archive will be deposited upon project completion.

Chapters 3-4 present the results of the assessment. Specifically, they describe the physical environment through which the pipeline re-route is to be built, and present the known archaeology of the Study Corridor

Chapters 5-7 deal with the impacts of the proposed pipeline re-route on the archaeological sites within the Study Corridor and discuss approaches which can be adopted for dealing with them.

Appendices: Four appendices (A – D) comprise an explanation of the phased approach to mitigation, explanation of statutory and non-statutory protection of archaeological sites, gazetteer of archaeological sites and constraints figures.

2 METHOD OF ASSESSMENT

2.1 Standards

This assessment has been conducted according to the Institute of Field Archaeologists' *Code of Conduct* (2000) and *Standard and Guidance for Archaeological Desk-based Assessment* (2001), as well as the *Standards for Field Archaeology in the East of England* (Gurney 2003) and English Heritage's *Management of Archaeological Projects* (1991).

2.2 Study corridor

Data collection focused on a kilometre-wide Study Corridor, centred on the proposed pipeline re-route. Background archaeological and historical information for the localities through which the corridor passed was also studied to provide a broader archaeological context.

2.3 Data collection

Data and views have been sought from statutory and non-statutory bodies during the assessment process, as summarised in Table 2.1.

Table 2.1 Summary of data sources and data collected during the assessment process

Source	Data type	Data in Study Corridor
British Museum (BM)	Portable Antiquities Database	No
Council for British Archaeology (CBA)	Defence of Britain Database	No
Countryside Agency	Heritage Coasts	No
English Heritage	List of Buildings of Special Architectural or Historic Interest held by the Department of Culture, Media and Sport	Yes
	National Monuments Register (NMR) Events database of archaeological works	Yes
	NMR Monarch database of registered archaeological sites	Yes
	NMR collection of vertical aerial photographs	Yes
	NMR collection of oblique aerial photographs	Yes
	Schedule of Ancient Monuments of England	No
	The National Mapping Programme (NMP)	No
	Register of Historic Battlefields	No
	Register of Parks and Gardens of Special Historic Interest in England	No
World Heritage Sites	No	
English Nature (EN)	Ancient Woodland	No
Network Archaeology	Field survey results	Yes
Norfolk Record Office	Historic maps (tithe, OS etc)	Yes
	Secondary printed sources	No
Norfolk Landscape Archaeology	Sites and Monuments Record	Yes
	Grey Literature	No

2.4 Data management and presentation

2.4.1 Definition of a 'site'

The term 'site' is used throughout this report to refer to ancient monuments, buildings of architectural and historical importance, parks, gardens, designed landscapes, battlefields, public spaces, historic landscapes, historic townscapes, findspots of artefacts and any other heritage asset. Unless otherwise stated the term 'site' refers to the location where a site was situated and not to extant remains (e.g. a windmill means the location of a former windmill, and a pond means the location of a former pond). The only exception is structures, which can be taken to be extant unless otherwise stated.

2.4.2 Reference conventions

The information gathered from the data sources listed in Section 2.4 is uniquely referenced throughout this report and on all the figures. Information retrieved from public databases is prefixed by a two, three or four letter code, followed by their original source number. Sites found during the course of this desk based assessment that are not currently listed in a public database are referred to as DBA sites, identified by a two-letter suffix (Table 2.2).

Table 2.2 Summary of site reference codes

Reference code	Terms of reference	Example site reference
DBA	Desk Based Assessment Site	DBA:AA
DOB	Defence of Britain Project	DOB:S0013298
FSU	Field Survey Site	FSU:001
HER	Norfolk Historic Environment Record	HER MNF3430
LS	Listed Structure	LS 489422
MON	English Heritage MONARCH Database and Events Database	MON 1309749
SM	Scheduled Ancient Monument	SM 19023

2.4.3 Archaeological constraint gazetteer

Known archaeological sites lying within the Study Corridor are summarised within a gazetteer in Appendix C. The gazetteer is structured in alphanumerical order. The gazetteer provides the source, cross-references, description, period and location of each site. The location is given as a 12 figure national grid reference to the centre of the point, area or linear. The gazetteer also gives a category of importance (see Section 2.5.1), an assessment of impact (see Section 2.5.2) and an assessment of the significance of impact (Section 2.5.3).

2.4.4 Archaeological constraint figures

The archaeological sites listed in the gazetteer are presented on A3 constraint figures (2-3). Each site is represented by a star, shaded area or dashed/dotted line, depending on the type of data held. The symbols and corresponding labels are coloured according to the importance of the site (see section 2.5.1).

2.4.5 Accuracy of displayed data

Site data originally may have been captured at a different scale to that which it is now displayed. This should be borne in mind when interpreting the exact location of

constraint points and polygonal boundaries. Table 2.3 presents estimated accuracy levels based upon visual comparison with plots.

Table 2.3 Summary of accuracy levels for displayed data

Source	Source type	Source scale	Positional accuracy in relation to current OS mapping	Accuracy in relation to position on the ground
DBA	OS map	1:10,000 1:10,560	1mm	± 10m
DBA	OS map	1:2,500	1mm	± 2.5m
DBA	AP vertical	1:5,000 - 1:10,000	1-5mm	± 5 - 50m
DBA	AP oblique	1:1,000 - 1:2,500	1-5mm	± 5 - 50m
DBA	Tithe/enclosure map	1:5,000 - 1:10,000	1-5mm	± 5 - 50m
DBP	digital points	-	-	?
LS	digital points	-	-	? ± 10m
MON	digital points	-	-	? ± 10m – 1000m
HER	Annotated maps, digital points and text data	(1:10,000)	±1-200mm	? ± 10m – 2000m

2.5 Impact assessment process

Archaeological impact assessment is the process by which the impacts of a proposed pipeline re-route upon the archaeological resource are identified. Each site has been assessed in its wider heritage landscape, taking account of identity, place, and past and present perceptions of value.

A three stage process was adopted:

- Stage 1: assessment of importance (see 2.5.1)
- Stage 2: assessment of the impact of the proposed development (see 2.5.2)
- Stage 3: assessment of significance of impact (see 2.5.3)

2.5.1 Importance

The sites listed in the gazetteer have been rated according to their perceived importance into categories A to D and U (as shown in Table 2.4). Where possible, each site has been assessed on the following characteristics:

- complexity (i.e. diversity of elements and relationships)
- condition (i.e. current stability and management)
- period
- physical form
- rarity
- setting

- survival (i.e. level of completeness)

The grade awarded to each site considered the scale at which the site may be judged significant (i.e. in terms of local, regional and national policies, commitments and objectives); representational value, diversity and potential; and existing local, regional and national designations (e.g. Scheduled Ancient Monuments). Some sites within the Study Corridor benefit from statutory protection and other protection (see Appendix B).

The process of importance categorisation has been adopted as a tool in determining appropriate mitigation. The categories should not be taken as a statement of fact regarding the importance or value of a particular site. The use of examples of types of site is simply a guideline. The inclusion of a site in a particular category often involves a degree of subjective judgment and is based upon the current level of information. Categories are not fixed or finite, and there is every possibility that the classification of a site may change as a result of findings made during later stages of investigation.

Table 2.4 Site category definitions

Grade	Description	Examples	Investigation and mitigation
A	Statutorily protected	Conservation Area, Listed Building, Scheduled Ancient Monument, World Heritage Site	To be avoided
B	Nationally important	Grade I and II* Registered Park and Garden, Registered Battlefield, Major settlements (e.g. villas, deserted medieval villages), Burial grounds, Standing historic buildings (non-listed)	To be avoided
C	Regionally important	Grade II Registered Park and Garden, Some settlements, finds scatters, Roman roads, sites of historic buildings	Avoidance desirable, otherwise investigation recommended
D	Locally important	Field systems, ridge and furrow, trackways, wells	Avoidance /investigation may or may not be envisaged at this stage
U	Ungraded	Non-archaeological site held by data source	N/a

2.5.2 Impact of the proposed pipeline re-route

The potential impact of the proposed scheme upon a site has been assessed at three levels:

- nature of impact (see Table 2.5)
- type of impact (see Table 2.6): a nominal 42m working width has been allowed.
- magnitude of impact (see Table 2.7)

Table 2.5 Nature of impact definitions

Impact	Description
Positive	Beneficial contribution to the protection or enhancement of the archaeological and historical heritage
Negative	Detrimental to the protection of the archaeological and historical heritage
Neutral	Where positive and negative impacts are considered to balance out
None	No or negligible impact due to distance from proposed scheme, and/or construction technique which negates the impact

Table 2.6 Impact type definitions

Type	Description
Direct	Physical damage, including compaction and/or partial or total removal. Severance, in particular linear sites
Indirect	Visual intrusion affecting the aesthetic setting of a site. Disturbances caused by vibration, dewatering, or changes in hydrology etc.
Uncertain	Where the physical extent or survival of a site is uncertain, or where the visual impact of the proposed scheme on the setting of sites or the landscape has not been determined

Table 2.7 Magnitude of impact definitions

Magnitude	Description
Severe	Entire or almost entire destruction of the site
Major	A high ratio of damage or destruction to the site
Minor	A low ratio of damage to the site
Indeterminate	Where the data level does not allow any secure calculation (e.g. because the quality and extent of the site is unknown, or because construction techniques have not yet been decided)

Factors affecting the assessed magnitude of impact include:

- the proportion of the site affected
- the integrity of the site; impacts may be reduced if there is pre-existing damage or disturbance of a site
- the nature, potential and heritage value of a site

2.5.3 Significance of impact

The ‘significance’ of the impact has been assessed as the product of the importance of each site, and the impact of the proposed scheme upon each site. The levels of significance of impact are defined in Table 2.8. Significance of impact definitions are provided only for negative impacts, as these were the only type on this particular scheme. The significance of impact rating takes no account of potential mitigation.

Table 2.8 Significance of impact definitions

Stage 1	Stage 2			Stage 3
Importance of site	Nature of impact	Type of impact	Magnitude of impact	Significance of impact
A	negative	direct	severe	high
			major	high
			minor	high
			indeterminate	high

Stage 1	Stage 2			Stage 3
		indirect	severe	high
			major	high
			minor	medium
			indeterminate	high or medium
		uncertain	n/a	unknown
B	negative	direct	severe	high
			major	high
			minor	medium
			indeterminate	high or medium
		indirect	severe	high
			major	medium
			minor	medium
			indeterminate	high or medium
		uncertain	n/a	unknown
		C	negative	direct
major	medium			
minor	low			
indeterminate	low or medium			
indirect	severe			medium
	major			low
	minor			low
	indeterminate			low or medium
uncertain	n/a			unknown
D	negative			direct
		major	low	
		minor	low	
		indeterminate	low or medium	
		indirect	severe	medium
			major	low
			minor	low
			indeterminate	low or medium
		uncertain	n/a	unknown

2.6 Limitations of assessment

2.6.1 Reliability of the data

Information held by public data sources can normally be assumed to be reliable, but uncertainty can arise in a number of ways:

- The Historic Environment Record (HER) can be limited because it depends on random opportunities for research, fieldwork and discovery.
- Documentary sources are rare before the medieval period, and the few that do exist must be considered carefully for their veracity.
- Primary map sources, especially older ones often fail to locate sites accurately to modern standards.
- There may be a lack of dating evidence for sites.
- The usefulness of aerial photographs depends upon the geology and land use of the areas being photographed and also the season and weather conditions

when the photographs were taken. Many types of archaeological remains do not produce crop, soil or vegetation marks and the aerial photographs themselves necessarily involve some subjective interpretation of the nature of sites.

2.6.2 Potential limitations of an impact assessment

Limitations of impact assessment can include:

- Inaccuracies of map sources which make it difficult to provide a precise assessment of potential impact
- Uncertainty regarding the survival and current condition of some sites. This means that the importance of some sites cannot be finalised until reconnaissance and/or evaluation has taken place on the ground
- Uncertainty regarding the precise methodologies of the development proposals
- The possibility that hitherto unknown archaeology will be encountered

3 DESCRIPTION OF THE PROPOSED PIPELINE RE-ROUTE

3.1 Location and topography

The pipeline re-route is located between West Bilney (NGR 571248 315009) and Blackborough (NGR 568033 314022) in Norfolk.

The re-route is 3.6km long and starts to the south-west of West Bilney and continues in a south-westerly direction. It runs almost parallel with Dodd’s Lane and passes to the north of Lindale Lodge before turning sharply to the south-west. Just to the north of Whinhill Plantation the route turns to the west, crossing the Fox Hill Plantation then turning south-west for short distance before taking a north-westerly direction to the south of Middleton Common.

The re-route Study Corridor generally ranges between 5m and 15m above OD. Much of it is a low-lying floodplain landscape, though there is a slightly raised, drier stretch in the central part of the re-route, part of which coincides with Fox Hill Plantation.

3.2 Solid geology

The Study Corridor crosses several types of solid geology (Table 3.1). The pipeline re-route sits on a thin section of Ampthill Clay, Kimmeridge Clay and Corallian. To the east is a north-south band of Upper Greensand and Gault, and Chalk.

Table 3.1 Description of solid geologies

Period	Epoch	Unit	Description
Jurassic (195-135 million years BP)	Upper	Corallian	Coralliferous, sandy, free draining limestone
		Kimmeridge Clay	Grey fissile mudstone/clay rock occurring at surface (1.4 to 5.8m thickness)
		Ampthill Clay	Calcareous grey mudstones with cementstone bands and phosphatic nodules
Cretaceous (144-65 million years BP)	Upper	Upper Greensand	dark green to grey sands with calcareous concretions which give way to sands with chert and shell beds
	Lower	Gault Clay	Stiff dark grey clay plus limestone and marl layers and concretions. Weathered zone is often fractured, raising permeability
	various	Chalk	grey-white or yellow-white sedimentary rock derived chiefly from fossil seashells; soft compact calcite, with varying amounts of silica, quartz, feldspar, or other mineral impurities; laid down in a sub-tropical marine environment

3.3 Drift geology

The solid geology along the re-route is entirely sealed by drift geology. These are largely River Terrace deposits (some with peat), though pockets of alluvium may also exist (Table 3.2). A slightly raised area in the central part of the re-route (partly coinciding with Fox Hill) would appear to be a fairly well-drained sand and gravel zone (with lower lying sands/gravels with peat to the east and west).

Table 3.2 Description of drift geology

Period	Epoch	Unit	Description
Eocene (1.8 my – 11ky BP)	Pleistocene	Alluvium	ranges from fine sands and gravel through silty and sandy clays to stiff clays with occasional buried peat or organic clays, depending upon local depositional factors
		River Terrace Deposits	undifferentiated silty sands and gravels with variable quantities of stone, loosely consolidated; sometimes with peat

3.4 Soils

The Study Corridor crosses two soil associations (Table 3.3). Approximately 0.7km of the eastern sector of the Study Corridor crosses soils of Isleham 2 association, as well as the western 1.5km. The central 1.4km of the Study Corridor crosses soils of Newport 2 associations. The central, raised part of the re-route crosses Fox Hill plantation and this partly coincides with the Newport 2 soils, which are sandier and lighter than the Isleham 2 soils to the east and west and which often contain peat.

Table 3.3 Soils and landuse

Soil association	SSEW sub-group	Description	Geological location	Land use
861b	Isleham 2	Deep permeable sandy and peaty soils affected by groundwater. Complex soil pattern with hummock and hollow microrelief locally. Risk of both winter flooding and wind erosion	Kimmeridge Clay, Ampthill Clay and Corallian	Cereals, sugar beet potatoes and horticultural crops, rough grazing where undrained
551e	Newport 2	Deep well drained sandy often ferruginous soils. Risk of wind and water erosion	Kimmeridge Clay, Ampthill Clay and Corallian	Cereals, sugar beet and peas and beans

3.5 Land use

The Study Corridor is dominated by farmland, with small areas of woodland located within the central section of the Study Corridor.

3.6 Hydrogeology and hydrology

The Ampthill Clay, Kimmeridge Clay and Gault Clay provide a non-aquifer which is of negligible permeability.

The proposed pipeline re-route passes through the fluvial floodplain of the River Nar and a number of drainage systems are present within the Study Corridor. This accounts for the sand/gravel drift geology along the re-route.

3.7 Areas of former mineral extraction

Areas of former mineral extraction (sand and gravel) exist to the east and south-west of Blackborough End, but neither area is crossed by the proposed pipeline.

4 ARCHAEOLOGY WITHIN THE STUDY CORRIDOR

4.1 Previous archaeological work within the Study Corridor

The county and district Sites and Monuments Record (SMR) and English Heritage's National Monuments Record (NMR) contain one record of an archaeological investigation within the Study Corridor. In March 2006 Archaeological Project Services undertook a fieldwalking survey of the proposed King's Lynn pipeline (HER MNF48751) (Archaeological Project Services 2006). Seven blocks of land were surveyed and items of prehistoric, medieval and post-medieval date were identified. Apart from a clustering of post-medieval items adjacent to farms, most of the material is suggestive of casual loss or manuring scatters. Recent items were also retrieved in a generally even distribution along the pipeline corridor. Finds included pottery and ceramic building material (brick and tile) from medieval and later periods. Other finds included flints, glass, clay pipe and a range of metalwork.

Network Archaeology, in addition to producing a desk-based assessment for the King's Lynn to Wisbech Proposed Pipeline (2006a), has undertaken a number of field surveys on the route (Network Archaeology 2006b), which also includes areas which fall within the Study Corridor for the Fox Hill re-route. Network Archaeology carried out field reconnaissance, geophysical survey and limited field walking and metal detecting along the King's Lynn to Wisbech route and within the Fox Hill re-route Study Corridor.

4.2 Prehistoric Period (c. 4000 BC – AD 43)

4.2.1 Prehistoric Period: General Background

Unexcavated cropmarks are not easily datable and there are difficulties in differentiating late Mesolithic/early Neolithic and late Neolithic/early Bronze Age flintwork. This section deals with those 'prehistoric' sites that cannot be more closely dated.

4.2.2 Prehistoric Period: Known Sites

A number of flints are recorded in a field immediately south of West Bilney (MON 357083). Flint finds were also recorded during fieldwalking in 2006 (HER MNF48751a) and the proposed pipeline re-route crosses the route originally walked by APS.

4.2.3 Prehistoric Period: Additional Information

No additional information about sites of this period within the Study Corridor has been produced by researching secondary sources.

4.3 Palaeolithic (c. 500,000 – 8,300 BC)

4.3.1 The Palaeolithic Period: General Background

Palaeolithic culture flourished during the Pleistocene, a period of glaciation interspersed with long periods of slightly warmer climate. Britain was still joined to continental Europe at this time, so in periods of intense cold people retreated to warmer parts of the Continent. The last glaciation occurred c.25,000 - 18,000 years ago.

Tools from the Acheulian and Clactonian tool industries of the Lower Palaeolithic period (c.700,000-150,000 years ago) include flint and quartzite handaxes, saws and awls. In the Middle Palaeolithic (c.150,000-35,000 years ago), the Mousterian and Levalloisian stone-working industries broadened the assemblage to include blades, disks, arrows and oval and biface flint tools. In the Upper Palaeolithic (c.35,000-8,300 years ago) more sophisticated tools of flint and bone were produced, including needles and harpoons.

Both the Desk-based Assessment (Network Archaeology 2006a) and the Field Survey Report (Network Archaeology 2006b) for the proposed pipeline route between King's Lynn and Wisbech, provide a detailed discussion of the Palaeolithic evidence for the Norfolk region and the King's Lynn to Wisbech pipeline route.

4.3.2 The Palaeolithic Period: Known Sites

A handaxe was discovered in 1957 to the south of Cranberry Plantation, which is to the east of Blackborough (HER MNF3434). To the south-west of this find, near Heater Carr, an Acheulian handaxe was discovered (MON 356390). In 1967 a handaxe and a fragment from another were recorded to the north of Lindale Lodge and the proposed pipeline re-route (HER MNF42349).

4.3.3 The Palaeolithic Period: Additional Information

No additional information about sites of this period within the Study Corridor has been produced by researching secondary sources.

4.4 Mesolithic (c. 8,300 – 4,000 BC)

4.4.1 The Mesolithic Period: General Background

Mesolithic culture appears to have been a response to dramatic environmental changes created by much warmer climatic conditions. The huge body of water freed by the melting of the ice sheets contributed to the enlargement of the oceans, and by c. 5800 BC, the raised sea level had isolated Britain from the rest of Europe. The insulating properties of the sea caused further rises in winter temperatures, encouraging the spread of coniferous forest. This provided habitats more suitable for small woodland game than herbivorous herds of large animals. By 6,500 BC the climate had become warmer and wetter, and the coniferous forest gave way to denser, deciduous woodland.

New tool types, tactics and skills were developed for the exploitation of resources. Tools were fashioned from stone, wood or bone, but organic artefacts rarely survive. Flintwork of this era is distinctly different from earlier material and is generally more common. Greater reliance was placed on composite tools, particularly small flint blades (microliths) set in wooden shafts. Projectiles, to be thrown by hand or shot from a bow, are particularly prominent in the archaeological record. Other diagnostic flintwork includes tranchet axes (where the cutting edge is produced by a transverse blow), end scrapers and micro-burins. The manufacture of hafted flint axes and adzes indicates that some woodland clearance was being attempted and that timber working was possibly taking place. Towards the end of the Mesolithic, it is likely that fire was being used to clear trees and to create scrub and grassland.

The Desk-based Assessment (Network Archaeology 2006a) and the Field Survey Report (Network Archaeology 2006b) for the proposed pipeline route between

King's Lynn and Wisbech, provide a detailed discussion of the Mesolithic evidence for the Norfolk region and the King's Lynn to Wisbech pipeline route

4.4.2 The Mesolithic Period: Known Sites

No sites are currently known for this period within the Study Corridor.

4.4.3 The Mesolithic Period: Additional Information

No additional information about sites of this period within the Study Corridor has been produced by researching secondary sources.

4.5 Neolithic (c. 4,000 – 2,500 BC)

4.5.1 The Neolithic Period: General Background

In the archaeological record, the shift from hunting and gathering to a settled agrarian society is manifested by the appearance of new artefact types - pottery, querns, sickles and polished stone axes. These began to replace the microliths and spears used throughout the Mesolithic period. During the late Neolithic a new style of ceramic, 'Beaker' pottery, appeared in Britain. Commonly associated with the beakers are other artefacts such as stone wrist-guards and barbed and tanged arrowheads.

At the beginning of the Neolithic period, farming methods of crop cultivation and animal husbandry were adopted, and people began to live in more permanent and settlement communities. However, this was a gradual process and during the earlier part of the period (4500-3500 BC), the farmers were probably still semi-nomadic, mixing hunting with the cultivation of small plots of land and small-scale animal husbandry.

New types of site emerged in this period, including settlements and large ceremonial monuments. The early Neolithic period saw the introduction of long barrows (burial mounds) and long mortuary enclosures, causewayed camps (large enclosures with interrupted ditches), cursus monuments (parallel ditches sometimes stretching for several kilometres), ring ditches and round barrows. Cursus monuments often became a focus for later funerary activity.

Long barrows ceased to be built in the later Neolithic, but a new type of site - the henge - came into use. Henges range in size from quite small sites to huge enclosures. Consisting of a roughly circular bank with a ditch (usually internal) and one or more entrances, these monuments may have been the successors of causewayed camps. Some henges were also the sites of stone circles or wooden post settings.

Detailed discussion of evidence for this period in Norfolk and the King's Lynn to Wisbech pipeline is provided in the Desk-based Assessment (Network Archaeology 2006a) and the Field Survey Report (Network Archaeology 2006b) for the proposed pipeline route between King's Lynn and Wisbech.

4.5.2 The Neolithic Period: Known Sites

A chipped flint adze was identified in 1966 to the south of Middleton Common and to the north-east of The Decoy (HER MNF17283). A leaf-shaped arrowhead was discovered in 1994 to the north-west of West Bilney Hall and the proposed pipeline

re-route (HER MNF30811). An isolated find of a Neolithic polished flint axehead was recorded c. 200m to the east of West Bilney Hall (HER MNF42350).

4.5.3 The Neolithic Period: Additional Information

No additional information about sites of this period within the Study Corridor has been produced by researching secondary sources.

4.6 Bronze Age (c. 2,500 – 800 BC)

4.6.1 The Bronze Age: General Background

Metalworking technology, along with new types of flint-tool and pottery design, was introduced from continental Europe at the start of this period. Food vessels, Deverel-Rimbury urns and Collared Urns were all forms current in the early Bronze Age, although Deverel-Rimbury urns became the characteristic middle Bronze Age pottery. Early metal objects appear to have been limited in their use and availability. In the middle Bronze Age new types of metal objects, including ‘palstave’ axes, spearheads and longer-bladed rapiers were introduced. With the transition to the late Bronze Age c.1100 BC, socketed leaf shaped spearheads, slashing swords and socketed axes began to be produced. These implements are often found in hoards.

The Bronze Age is marked by the appearance of more permanent habitation sites and the first use of metal. Bronze Age settlements tend to be more substantial than the semi-permanent Neolithic settlements and often include timber round-houses, fields and banks and ditches around the farm areas.

Copper and bronze metalworking also makes its first appearance, although initially a ‘prestige’ material used only for weapons and ritual purposes. The most common surviving Bronze Age monuments are the burial mounds or round barrows. These, like the earlier long barrows, are often sites in prominent locations, but usually only contain a single burial, accompanied by artefacts or grave goods.

A wide variety of burial practices were employed in Britain during the Bronze Age: inhumation, cremation, simple pits, stone cists, wooden coffins, flat graves with no surface marker, and graves covered by a cairn or mound. The more prominent, above ground monuments have made a greater impact on the archaeological record, and very few simple pit burials are known, although graves containing Beaker, or collared urn ceramics were relatively common in southern England. The construction of round barrows as funerary monuments reflects social change in the early Bronze Age. These are found in barrow cemeteries, in small groups, or as isolated remains. Burial evidence in the middle Bronze Age is dominated by cremations, either in urns or unaccompanied, and often focused on earlier or contemporary round barrows. There is a marked absence of large ceremonial monuments during the late Bronze Age, although barrows were still occasionally constructed. Nationally, burials are rare, but human remains are occasionally found on settlement sites.

Detailed discussion of evidence for this period in Norfolk and the King’s Lynn to Wisbech pipeline is provided in the Desk-based Assessment (Network Archaeology 2006a) and the Field Survey Report (Network Archaeology 2006b) for the proposed pipeline route between King’s Lynn and Wisbech.

4.6.2 The Bronze Age: Known Sites

An axehead has been recorded to the north-west of West Bilney Hall (HER MNF33417). However, its true provenance is uncertain for this axehead was reported to have been found in a brown glass bottle, along with some galvanised nails in a shed.

4.6.3 The Bronze Age: Additional Information

No additional information about sites of this period within the Study Corridor has been produced by researching secondary sources.

4.7 Iron Age (c. 800 BC – AD 43)

4.7.1 The Iron Age: General Background

Iron-working, coinage and the potter's wheel were among the new technologies introduced to Britain from the Continent in this period. Iron was largely used for weapons and farming tools, the production of which would have increased during the period. Copper, bronze and gold continued to be used for utensils and decorative ware.

As the population grew, improved farming technology and the increasing scarcity of land led to the cultivation of heavier and poorer soils. Pollen analysis has shown that most of the suitable land in lowland Britain had been brought under the plough before the Roman conquest. Population growth also led to competition for land and the development of a more territorial society. Hillforts and defensive enclosures are manifestations of this social shift. Most enclosures are thought to have been built as a defence against stock-raiders.

In addition to hillforts, there were smaller earthworks with defences of comparable scale. Lowland settlement sites could also be 'open', or undefended. Settlement layouts varied in complexity and could include either an isolated farm, or a group of farms, often with banks, ditches, storage pits, trackways and rectangular plots.

Escalating demands for agricultural land and fuel for iron smelting, meant that forest clearance continued apace. Many new fields were cut from the forest, whilst fields established in the Bronze Age probably continued in use. Remnants of Iron Age field systems are often known as 'Celtic' fields.

The earlier part of the Iron Age witnessed a continuation of the trends begun in the late Bronze Age of increasing population. There is also a general lack of evidence for formal burial and it is likely that in the Iron Age that the deceased were either buried in water or left exposed in the open air.

Detailed discussion of evidence for this period in Norfolk and the King's Lynn to Wisbech pipeline is provided in the Desk-based Assessment (Network Archaeology 2006a) and the Field Survey Report (Network Archaeology 2006b) for the proposed pipeline route between King's Lynn and Wisbech.

4.7.2 The Iron Age: Known Sites

No sites are currently known for this period with the Study Corridor.

4.7.3 The Iron Age: Additional Information

No additional information about sites of this period within the Study Corridor has been produced by researching secondary sources.

4.8 Roman (AD 43 – 410)

4.8.1 The Roman Period: General Background

The Roman invasion was followed by a rapid implementation of centralised administration based on towns and supported by a network of roads. In AD 49, after the Roman invasion, the Iceni were given the status of client kingdom, and were allowed their own ruler (probably Prasutagus). This ruler died in AD 60. His widow, Boudica, led a revolt that failed after which the Icenian ceased to exist. Britain became absorbed into the Roman Empire, and three centuries of new order, peace and prosperity followed.

During the period of Roman rule most of the population lived in continuity with their Iron Age past: in the countryside in small villages or native style farmsteads. This dispersed settlement pattern raises the potential for abandoned Romano-British sites in apparently blank areas. Little is known about rural settlements, such as villages, farmsteads and hamlets, where the majority of the population probably lived. In general, settlement appears to have focused upon the Fen edge and coastal and estuarine regions, with only limited activity in areas of boulder clay, although dense occupation is present over the heavy soils of southern Norfolk (Dymond 1990). Some Roman style villas were built as the residences of Roman officials or prosperous landowners or farmers. Of only twenty or so known sites, most were built on spring lines along the Icknield ridge, in the west of the county (Margeson et al. 1996). Just outside of the eastern edge of the Study Corridor, a Roman villa is noted at Gayton Thorpe. The villa produced evidence from iron slag, furnace refuse and ironstone and thus it was suggested it was the residence of an ironmaster.

Analysis of palynological data has indicated that East Anglia was agriculturally productive in the Roman period. Charred crop remains from the Fens, the Fen edge, the Boulder Clay plateau, areas of light sand soils and coastal areas in Norfolk indicate that spelt wheat was the predominant crop. Barley and emmer were also quite common, with a lesser amount of horse bean, pea, oats, rye and flax/linseed.

Evidence for industrial activity within the areas has been found just outside of the Study Corridor. To the north of Blackborough End, a Roman iron workings is recorded at Leziat. Just north of the River Nar in Setchey, a Roman kiln site is recorded. This evidence suggests that this area was being supplied by locally based industrial sites, perhaps in a similar nature to Brampton, as mentioned above.

Located to the south-east of Walpole Highway is a concentration of Romano-British sites. They appear to follow the route of a roddon (Silvester 1988: 71). Most of the material recovered during the Fenland Survey would suggest that settlement with salt-production typified sites further south (Silvester 1988).

To the north-east of West Walton is a concentration of Romano-British settlement sites, dating to the 3rd and 4th centuries AD. These were identified during the Fenland Survey (Silvester 1988: 91).

Road networks had previously been little more than tracks. Roman army engineers built more substantial roads to expedite the movement of soldiers, food and

equipment. Naturally these roads were also exploited as trade and communication routes. Several roads purported to be of Roman origin are located across the region: Icknield Way and Peddars Way. Both of these are orientated north-north-west to south-south-east, passing to the east of King's Lynn. These were two major routes connecting with London. The Icknield Way originated in prehistoric times and was reused in the Roman period due to its strategic location. A third, roughly east to west running road passed south of Castle Acre, connecting the Fen Causeway with Smallburgh (Margary 1957: 212-214). Together the Fen Causeway, the Icknield Way and Peddars Way formed the infrastructure for a more comprehensive road system with inroads into the boulder clay region of Norfolk (Wade-Martins 1993).

A north-south orientated stretch of road linked Toftrees with the north coast, just to the west of Holkham. Pye Road linked Caistor St Edmund (the proposed Iceni capital, near present day Norwich) with London, and another short piece of road linked Caistor St Edmund with the River Yare. Another road, from Horningtoft to Oxwick, extended northwards. A nearby finds scatter including pottery and wall plaster probably signifies Roman settlement associated with the road. The western edge of Stanfield is skirted by a road which runs west-north-west to east-south-east, towards an area of substantial Roman finds south of the village.

Parts of these Roman roads have become fossilised in later roads and field boundaries, and have thereby influenced settlement patterns. Compared with other parts of the country, road construction in Norfolk has been shown to be quite poor. Only Peddars Way and occasional sections of other roads have yielded evidence of an agger. Upon dereliction some roads have disappeared completely, indicating that metalling and embankments were insubstantial (Margary 1957: 212-214).

The Roman Empire was in decline in the fourth century AD, and in AD 407, the Roman army left Britain. The Roman Emperor, Honorius, wrote to the cities of Britain in AD 410 telling them to defend themselves. The monetary system introduced by the Romans ceased to function when the last consignment of bronze coins was sent to Britain in AD 402 and by 411 all supply of coinage had ceased. Britain was no longer part of the Roman Empire.

4.8.2 The Roman Period: Known Sites

Just to the south of Blackborough Priory, a bronze cauldron was ploughed up from the marshes. It was 1 foot deep in peat in a field below the level of the River Nar. It had a hole in its base and is believed to be of native type (HER MNF3445).

As part of the Fenland Survey, a moderate amount of pottery sherds was found (c. 24 sherds). These included one sherd of Much Hadham colour-coated ware and one sherd of white painted ware (HER MNF20180). Metal detectorists also discovered a copper alloy brooch on the site 10 years later.

Network Archaeology surveys for the King's Lynn to Wisbech pipeline recovered a coin and a piece of Roman pottery (FSU:097) to the north-west of West Bilney. The metal detector survey also identified two brooches just to the south of the proposed pipeline re-route and Dodd's Lane (FSU:098).

Fragments of Roman pottery were found in 1935 to the south of West Bilney, on the eastern edge of the Study Corridor (HER MNF3784).

4.8.3 The Roman Period: Additional Information

No additional information about sites of this period within the Study Corridor has been produced by researching secondary sources.

4.9 The Anglo-Saxon Period (c. 410 – 1066)

4.9.1 The Anglo-Saxon Period: General Background

The collapse of Roman rule in Britain resulted in economic and social change throughout Britain. The economy stagnated, coins stopped circulating and much of the Roman infrastructure fell into disrepair. Potteries went out of production, resulting in an aceramic phase. Without the dating evidence provided by coinage and ceramics, it is difficult to identify areas where settlement continued into the Saxon period. A political economic vacuum appears to have existed between the withdrawal of Roman power in the early fifth century, and the establishment of Anglo-Saxon polities in the sixth century.

The customs and language of the Anglo-Saxon peoples swiftly replaced Romano-British culture after the withdrawal of the last Roman troops. The Saxons were a complex and sophisticated society with a royal dynasty and a hierarchy ranging from nobles to slaves. The period can be divided into three main phases: early, middle and late.

Evidence suggests that a decline in population size, which began in the fourth century, continued during the early Anglo-Saxon period. Artefacts, found by systematic fieldwalking and metal detecting, have indicated that settlement was mainly restricted to lighter soils and river valleys in East Anglia. Indeed, evidence of early Saxon settlement over the boulder clay area of Norfolk is thin. Only one existing village, Longham, is thought to have such early origins (Wade-Martins 1980). Two multi-period find scatters to the north and south of East Bilney, include a small number of early Saxon sherds found alongside Romano-British settlements and Roman roads (Dymond 1990), possibly indicating continuity of settlement. Many early Saxon pottery scatters have been found in Norfolk, although there is often a problem distinguishing between sand tempered pottery of the Iron Age and the early Anglo-Saxon period, especially when the sherds are heavily abraded.

The earliest Saxons were pagans, some of whom buried their dead with grave goods. Around 200 pagan cemeteries have been found in the county, many of which have been excavated, such as Spong Hill (near North Elmham), where nearly 2500 cremations and nearly 60 inhumations, dating from the late fifth and sixth centuries, were recorded. Spong Hill cemetery may have served a large territory, rather than a single settlement. Artefacts and burial practices suggest that the people who buried their dead at Spong Hill had strong contacts with Schleswig Holstein, indicating the possibility that they were Germanic immigrants. However, there are also many similarities with a site at Issendorf in Lower Saxony, to the south of Hamburg. Most pagan Saxon cemeteries were located away from contemporary areas of early Anglo-Saxon occupation (Margeson et al. 1996) and are often found on elevated land overlooking rivers, or in low-lying positions close to rivers.

By the middle Saxon period, there appears to have been population growth, rapid economic expansion, a shift in the location of settlements, and settlement nucleation which led, in some cases to the creation of towns. Although there are no known middle Saxon town sites in Norfolk, there were settlements of importance at Norwich and Thetford.

Middle Saxon sites have been recorded in all but the most inhospitable parishes of Norfolk, providing important evidence regarding the deliberate resettlement of the Norfolk Fen edge (Silvester 1988: 156-60). The sites have mostly shown up as surface artefact scatters, although excavations have also taken place at Middle Harling, Billingford and at three Fenland sites: Terrington St Clement, West Walton and Walpole St Andrew. Iron smelting, using a process which was rare in East Anglia, has been found in association with post-Roman posthole structures at Billingford. A coin hoard was excavated at Middle Harling, but there was no evidence of contemporary structures, nor was there evidence of structures at the three Fenland sites. The lack of structural evidence at the Fenland sites could have been due to the fact that only a 5% sample was excavated, or may have reflected seasonal occupation of the sites.

The middle Saxon phase saw the introduction of Christianity in the form of churches and ‘churched’ cemeteries, and the eventual disappearance of accompanied burials, although special, pseudo-ship burial took place in the seventh to eleventh centuries. There were probably many monasteries, but only the names of two are known, including one in Dereham where there is a large middle Saxon cemetery.

Monastic settlements probably acted as central places, perhaps operating as mini wics with direct access to exchange networks. In addition to their religious role, monasteries at this time probably had advantageous legal status.

Middle and late Anglo-Saxon burials have a much better survival rate than early Saxon burials, and important groups, with monastic connections, were found at Burgh Castle and Caister-on-Sea, on the east coast of Norfolk, and at North Elmham.

The Danish invasion of the late ninth century had no effect on the continuity of settlement (Wade-Martins 1993), although the Danes may have had a formative influence on the early growth of Norwich. For instance, fortifications may have been built in response to the Danish threat, and the fortifications could have been re-used for the burgh in the tenth century. Late Saxon fortification, or re-fortification of a camp at Tasburgh, is also believed to have taken place during the Danish period.

Further discussion of evidence for this period in Norfolk and the King’s Lynn to Wisbech pipeline is provided in the Desk-based Assessment (Network Archaeology 2006a) and the Field Survey Report (Network Archaeology 2006b) for the proposed pipeline route between King’s Lynn and Wisbech.

4.9.2 The Anglo-Saxon Period: Known Sites

West Bilney has produced pottery finds: a sherd of middle Saxon, grey Ipswich ware (MON 357088) and late Saxon pottery (HER MNF20180). These were recovered as part of the Fenland Survey.

4.9.3 The Anglo-Saxon Period: Additional Information

No additional information about sites of this period within the Study Corridor has been produced by researching secondary sources.

4.10 Medieval (c. 1066 – 1540)

4.10.1 The Medieval Period: General Background

Prior to the 12th century AD, the population of each parish usually lived in large nucleated villages. During the 12th to early 14th centuries improved drainage, probably combined with drier conditions, enabled gradual but significant movement from higher level sites to greens and commons. These areas were typically marginal land in the damper parts of a parish. They tended to be boulder clay areas which were difficult to cultivate and were therefore probably set aside for communal grazing.

By the 14th century, Norfolk was one of the most arable productive counties in Britain. Two centuries of demographic expansion and economic growth had caused areas of cultivation to expand, but the amount of privately owned grassland was below average for Britain. This probably made greens and commons necessary for the grazing of livestock (Wade-Martins 1993). Although there was an increasing trend towards ‘green and common-edge settlement’ (Margeson et al. 1996), occupation around greens was transient.

The arrival of the Black Death in 1349 led to a dramatic fall in the population of England. It has been estimated that the population probably fell by between a third and a half from its 1349 level, and did not recover to this peak until over 200 years later. A result of this population decline was that many farms and villages were left abandoned, particularly in the areas of poorer farming. Deserted settlements (DMVs) have been recorded in many areas of England. The earthwork remains of street layouts, building platforms and drainage can still be seen at some sites; others can be identified from documentary sources or from crop marks seen on aerial photographs.

The medieval landscape was one of intensive arable cultivation with large ‘open fields’ divided into numerous strips. Low-lying, flood-prone land was retained for meadow and pasture, and some areas of poor soils were left as open heaths. Each village was surrounded by its own fields, woods and pastures. Some areas retain evidence of the ridge and furrow earthworks that resulted from strip-farming.

4.10.2 The Medieval Period: Known Sites

Listed Buildings

In West Bilney is the 14th century church of St Celilia, although it is now redundant (LS 221947). It is Grade II* listed and was restored in 1881. This church has a Norman nave and a later 14th century tower (Pevsner 1990: 373).

Near West Bilney Hall, a limestone carved roof boss is set into the wall of a farm building. The farm building is in a garden to east of West Bilney Hall. The boss is believed to have come from a medieval vault, dating to the 15th century, and depicts the entombment of Christ. It is probably from the ruins of the Augustinian Priory at Pentney. The boss is grade II listed (LS 221946).

Non-Listed Buildings

The Study Corridor encroaches on the original extent of the 12th century Blackborough Priory (HER MNF3430). The probable south wall of the church and the gable end of a substantial medieval building are still standing, and dense spreads

of building materials mark the sites of other buildings attached to the Priory. This area encloses most of a smaller designated area, which is a Scheduled Ancient Monument (SM 30560).

Ridge and Furrow

One area of ridge and furrow was identified during a geophysical survey, which was commissioned by Network Archaeology (FSU:009). The survey was carried out as part of the King's Lynn to Wisbech pipeline route. The ridge and furrow is located on the proposed line of the re-route.

Moat

Around 1.5km to the south-east of East Winch is the site of a medieval moat (HER MNF39604). It is visible as a soilmark on aerial photographs and was confirmed by the 2006 geophysical survey (Network Archaeology 2006b).

Isolated Find

To the south of West Bilney, a strap fitting was identified during fieldwalking undertaken as part of the Fenland Survey (HER MNF20180).

4.10.3 The Medieval Period: Additional Information

West Bilney was a separate settlement at this time. It is referenced by the Domesday Book as *Bilenei*. The name is probably Old English and translates as 'Billa's stream or island' (Ekwall 1959). In 1086, the land was held by Hugh de Montfort and contained 28 acres of meadow, 3 mills and a half share in a salhouse (Brown 1984). To the south of the village lies the moated site of Crancourt or Grandcourt Manor, which still retains a single storey structure.

4.11 Post-Medieval (1540 – 1939)

4.11.1 Post-Medieval Period: General Background

Many of Norfolk's great houses were built or extended during this period, financed by new found wealth due to increasing trade and industry and the redistribution of monastic lands. Many were built of brick such as the halls at Great Witchingham, Great Melton and Barnham Broom.

By 1750 onwards, Norfolk was well established as a farming county. Most of the land was owned and farmed by the aristocracy and their tenants. Whole new farms complete with outbuildings were built in a more substantial manner than before. Even new villages with churches and schools sprang up to house the farm staff. By now virtually all the land in Norfolk had been enclosed and was farmed for arable crops or was fenced for grazing.

Roads rather than tracks and cartways began to radiate from the towns and towards the end of the 1700s the tarmac road began to appear although anything other than the roads between main towns were still cart tracks.

During the early 1800s the textile industry in Norfolk began to dwindle and with the dawning of the industrial revolution, major industrial towns appeared elsewhere in the country. These new populated areas needed feeding and Norfolk with its fertile soils, was ideal for growing the ever increasing amounts of wheat and barley. It was

not until the 1850s that the majority of Norfolk saw the age of the train and due to the fact that Norfolk was one of the last counties to benefit from this new mode of transport, the network was not completed until 1906.

Encroachment onto common land and abandonment of open field agriculture continued, culminating in the Parliamentary Enclosure Act of the late 18th and 19th centuries. The act also led to the improvement of heath and fenlands. Major land reclamation schemes, instigated in the mid-17th century, involved the use of windmills (smock and tower mills) in conjunction with drainage channels.

East Anglia was at the forefront of the Agricultural Revolution (1750-1820), a period which saw the transformation of traditional agrarian concepts. In Norfolk, this was a time of rebuilding where, for instance, timber framed barns were replaced by brick built buildings. Many isolated farmsteads rebuilt in this period overlie sites continuously occupied since the early Middle Ages (Dymond 1990). The enclosure movement led to the development of large landed estates which concentrated on arable production, whilst pastoral enterprises allowed the smaller land owner to survive. Model farms were created, using the best available scientific advice. New crop rotations (the Norfolk Four Crop Rotation System), manure and artificial fertiliser use became widespread. The use of lime as fertiliser and for building purposes became common throughout the 18th and 19th centuries. Lime kilns tended to be located on the floors of chalk pits or beside ports and creeks. Brick manufacture was also important.

Enclosure of common lands continued from the fifteenth century, accelerating between 1758 and 1882 to include large tracts of arable and waste land. The introduction of new farming methods in the eighteenth and nineteenth centuries required the enclosure of land, and was necessary for the provision of food to the growing numbers of people dwelling in England's towns and cities. Enclosure greatly changed the appearance of the countryside, creating the small geometrically shaped fields which survive today.

Further discussion of evidence for this period in Norfolk and the King's Lynn to Wisbech pipeline is provided in the Desk-based Assessment (Network Archaeology 2006a) and the Field Survey Report (Network Archaeology 2006b) for the proposed pipeline route between King's Lynn and Wisbech.

4.12 Post-Medieval Period: Known Sites

Non-listed Structures

The OS map of 1906 records two buildings in the Study Corridor: one to the north of Whinhill Plantation and the pipeline re-route (DBA:BB), and the second to the west of Horse Fen (DBA:BC).

The site of a disused drainage pump is located to the south of the pipeline re-route, near Normandy Carr (HER MNF17285).

West Bilney is located to the south of the proposed re-route and is an early 20th century building (HER MNF23279). Associated with the house is a concrete icehouse.

Field Boundaries

A number of former field boundaries are noted from the tithe map of 1838 (DBA:AB – DBA:AH), as well as the 1886 edition of the OS map (DBA:AN and DBA:AP). Two former field boundaries (DBA:AM and DBA:AR) noted from the 1886 OS map were also identified during the geophysical survey undertaken by Network Archaeology in 2006 (Network Archaeology 2006b)

A further field boundary was recorded during field reconnaissance for the King's Lynn to Wisbech pipeline route (FSU:025). This is an historic field boundary and is present on the tithe map of 1838.

Ponds

Five former ponds have been identified within the Study Corridor. One was noted on the tithe map of 1838 (DBA:AW) and a further four were present on the 1907 edition of the OS map (DBA:AX - DBA:BA).

Other

West Bilney Park is recorded on the OS map of 1886 (DBA:AO) and is crossed by the pipeline re-route to the north of Lindale Lodge.

To the south-west of West Bilney, the 1886 OS map notes the presence of a mound (DBA:AQ). This feature is located to the south of the proposed pipeline re-route.

A possible vegetable garden was identified from aerial photographs (DBA:BD). It is located to the north of West Bilney Hall.

The OS map of 1891 records a quarry to the west of Gwydir House (DBA:CB). It is situated just to the south-east of the proposed pipeline re-route.

Find Scatters

A number of find scatters were recorded during fieldwalking along the original King's Lynn to Wisbech pipeline route (APS 2006). Finds of pot and tile were identified at West Bilney (HER MNF 48751b) and similar material was also recorded at West Bilney Hall (HER MNF48751c).

4.12.1 Post-Medieval Period: Additional Information

No additional information about sites of this period within the Study Corridor has been produced by researching secondary sources.

4.13 Modern (1939 to present)

4.13.1 The Modern Period: General Background

War made enormous changes to the face of Norfolk. The county was to become known as the 'flight deck of Britain'. RAF stations and concrete runways appeared throughout the county. By the end of the war there were some 37 active airfields in the county. Many remain in some form to this day, others have been returned to farmland. Some, such as RAF Coltishall, are still very active and the airfield of Horsham St Faiths is now Norwich International Airport.

Extensive defences were constructed all along the coast and inland. Not only was it necessary to protect against invasion, but also attack from the air. Some 14 coastal

batteries were installed. Arable land was increased, with every bit of land not used for other war purposes being put under the plough and Norfolk was farmed more intensively than ever before.

Investment and grants meant that with peace came prosperity to Norfolk's farming community and with modern tools and artificial fertilisers farming by the early 1950s was again a very profitable way of life. However, modern methods meant that less manual workers were required. In little more than 10 years the numbers were halved. In 1953 on 31st January, flooding extensively damaged the Norfolk Coast. The county had been subjected to flooding many times before over the centuries but never on such a scale. Force 10 winds and exceptionally high spring tides resulted in the sea defences all along the coast being breached and villages such as Salthouse and Cley were under several feet of water and apart from property damage, large areas of grazing were flooded. In the Heacham area 65 people were drowned. At King's Lynn, much of the town was flooded and 15 people died and this picture was repeated along the coast.

4.13.2 The Modern Period: Known Sites

No sites are currently known for this period within the Study Corridor.

4.13.3 The Modern Period: Additional Information

No additional information about sites of this period within the Study Corridor has been produced by researching secondary sources.

4.14 Sites of Undetermined Date

4.14.1 Sites of Undetermined Date: Known Sites

Trackways

Two trackways have been identified from aerial photographs: one to the north-east of The Decoy (DBA:AS), and the second lies on the route, to the north-east of Normandy Carr (DBA:BO). The latter also comprises two buildings.

Enclosures

Ten enclosures have been noted from aerial photographs (DBA:AT, DBA:BF, DBA:BQ, DBA:BR, DBA:BY, DBA:BZ, DBA:CA, DBA:CM, DBA:CO, DBA:CR). Two further sites include cropmarks of a rectangular enclosure, field boundaries and a track or drain (HER MNF11760). The second consists of odd circular cropmarks, which may be caused by crop irrigation (HER MNF3892).

Structures

Aerial photographs have identified a number of buildings within the Study Corridor (DBA:AU, DBA:CN, DBA:CS).

Ponds

Eight ponds are recorded within the Study Corridor (DBA:CD, DBA:CH, DBA:CI, DBA:CL, DBA:CP, DBA:CQ, DBA:CT). One (DBA:AV) may be a possible moat.

Pits

Several pit-like features were noted from studying aerial photographs of the Study Corridor (DBA:BE, DBA:BJ, DBA:BT, DBA:BW, DBA:CC, DBA:CF, DBA:CJ).

Palaeochannels

Aerial photographs have revealed features which may be indicative of former watercourses (palaeochannels) or flooding (DBA:BL, DBA:BN, DBA:BX, DBA:CG). Geophysical survey undertaken as part of the field surveys completed by Network Archaeology, identified a stream channel (FSU:005) and a palaeochannel (FSU:012). Both these sites are on the proposed pipeline re-route.

Field Boundaries

Six former field boundaries have been recorded from aerial photographs (DBA:BG, DBA:BK, DBA:BM, DBA:BP, DBA:CE, DBA:CK)

Ditch

Two ditch features were identified on aerial photographs (DBA:BH, DBA:BS). A further four were recorded during geophysical survey undertaken in 2006 for the King's Lynn to Wisbech pipeline route. These included a series of three ditches (FSU:004), which were also confirmed by aerial photography, two parallel ditches (FSU:006), several ditches and pits (FSU:007, FSU:010). These latter four sites are also located on the pipeline re-route.

Ring Ditch

Three possible ring ditches have been recorded from aerial photographs (DBA:BU, DBA:BV) and geophysical survey (FSU:008).

Other

Some maculars were noted from aerial photographs to the north-west of Bilney (DBA:BI).

Geophysical survey, carried out as part of the field survey for the King' Lynn to Wisbech pipeline, recorded an anomaly which is indicative of a concentration of ceramic building material. This is located on the pipeline re-route, to the south-west of Middleton Common (FSU:023).

5 ARCHAEOLOGICAL POTENTIAL OF THE LANDSCAPE WITHIN THE STUDY CORRIDOR

5.1 Archaeological Remains

5.1.1 Palaeolithic (c. 500,000 – 8,300 BC)

Palaeolithic finds are rare in Britain, partly because of their great age and partly due to the low level of population and the sporadic and transitory nature of settlement. The paucity of finds means that the Palaeolithic is the least understood period of human history and therefore a research priority.

Shallow excavations are unlikely to produce in-situ remains of Palaeolithic camps or activity areas, but unstratified flint or stone artefacts may occasionally be discovered. During glacial episodes, older bone or stone tools become incorporated in later gravels and boulder clays, and material of this date sometimes travelled some considerable distance from its original point of deposition and is occasionally picked up from the surface. Deep excavations are more likely to encounter material of this period.

The re-route Study Corridor passes along the northern fen edge and to the north of the ‘island’ of Wormegay in the area of the Nar valley. The island is enclosed by peat deposits and demonstrates evidence for early human occupation from the Palaeolithic onwards. There is a moderate potential for encountering Palaeolithic finds, particularly in areas where palaeochannels exist or where glaciofluvial drift occurs. Glacial drift is particularly prominent around Middleton and where gravels and glacial drift is identified in trenches, it is recommended that care is taken for these are areas where there is the best opportunity for identify artefacts and occupational debris dating to the Palaeolithic.

5.1.2 Mesolithic (c. 8,300 - 4,000 BC)

Mesolithic hunter-gatherers, like all prehistoric peoples, normally favoured riverside locations. The potential for encountering settlement remains is very low because Mesolithic communities were largely nomadic. Concentrations of material are much more important than single finds, since they suggest focused activity and sometimes indicate where tool production was taking place.

Due to the difficulty of distinguishing between Mesolithic and Neolithic flint assemblages, it may be possible that ‘prehistoric’ assemblages are in fact Mesolithic in date. There is low potential of encountering Mesolithic material in the re-route Study Corridor. Areas of potential include riverine locations and palaeochannels.

5.1.3 Neolithic (c. 4000 BC to 2350 BC)

Riverside locations continued to attract settlement in the Neolithic period. The Study Corridor has little in the way of material associated with occupation.

Neolithic pottery is nationally rare (Brown and Murphy 1997), but flintwork of this period is not uncommon. Neolithic occupation sites are far more numerous than those of earlier eras, but nonetheless, late Neolithic settlements are rare in Britain and frequently lack the deep subsoil features that occur in earlier Neolithic sites (Healy 1988).

Prehistoric material, comprising flint tools and waste, was retrieved from the area when fieldwalked in March 2006 (APS 2006). This material was sporadic and was not thought to represent settlement, although work by Network Archaeology at East Walton may contradict this (Network Archaeology 2003). Network Archaeology highlighted the complexity of archaeological potential within this area. Prehistoric material recovered from East Walton survived within the complex, undulating glacial topography, which on a geophysical survey could have easily been mistaken for ridge and furrow. However, this pattern is a natural feature and has the potential to contain very significant archaeology, particularly in broader hollows or at the base of slopes, where subsequent colluvial deposition has taken place.

There is a moderate potential of identifying Neolithic material in the Study Corridor of the re-route.

5.1.4 Bronze Age (c. 2350 - 800 BC)

Finds dating to this period are limited and consist of an axe head, although the true provenance is uncertain. It is possible that cropmarks of ring ditches also date to this period, indicating that the landscape was utilised for both everyday purposes as well as funerary activities.

There is moderate potential of encountering Bronze Age material in the re-route Study Corridor.

5.1.5 Iron Age (c. 800 BC - 43 AD)

Areas around springs and watercourses will have a higher potential since these continued to act as foci for settlement and activity during the Iron Age. There is also an increased potential for encountering ritual sites of this period close to ancient boundaries.

The majority of the re-route Study Corridor has been subject to extensive archaeological survey and investigation as part of the Fenland Survey. This determined that much of the marine silts covering the area had been deposited in the late Iron Age, and the area was then cultivated in the Romano-British period. Little evidence for the Iron Age has been identified in the Study Corridor. However, finds that have been recorded, particularly in the area around Blackborough, indicate occupation and settlement (SMR MNF23205).

It is unsurprising that few Iron Age sites have been recorded in the region because it is believed that occupation took the form of open settlement. The limits of settlement are extremely difficult to identify with aerial photography if no enclosures were constructed to demarcate the extent of occupation. Some of the undated features within the Study Corridor may belong to this period.

Much like the Bronze Age, there is moderate potential for identifying Iron Age material culture, particularly in riverside locations. Although no Iron Age sites have been identified in the Study Corridor of the re-route, there is a low to moderate potential of encountering further evidence for the Iron Age in the Study Corridor, particularly in the areas centred on the river terrace gravels.

5.1.6 Roman (AD 43 - 410)

Buried Roman sites to the north indicate a subsequent period of marine flooding. It is believed that the first major acts of land reclamation were carried out during this

period and this coincided with the natural drying out of the Fens. Roman finds indicate an expansion of settlement into previously marginal areas. Finds from the surrounding area indicate that the region was productive in terms of producing pottery, metalwork and salt. The Fenland Survey identified settlement sites as being concentrated on roddons and therefore there is a moderate potential of encountering Roman material where these areas of high ground exist

The recorded distribution of Roman finds indicates there is low to moderate potential of finding further evidence of Roman occupation. There is potential for encountering evidence of occupation due to the presence of brooches and coins recovered during metal detecting in the Study Corridor of the pipeline re-route.

5.1.7 Anglo-Saxon (AD 410 - 1066)

The archaeology of this era is often less easily detected than that of the Roman and Medieval periods for a variety of reasons. Early Anglo-Saxon settlements are generally difficult to locate by fieldwalking because the pottery was low-fired and so disintegrates in the ploughsoil. Furthermore, 5th century pottery types are sometimes indistinguishable from those of the mid 4th century. Later Anglo-Saxon settlements were often subsumed by medieval villages, so evidence of early occupation may have been destroyed, particularly since vernacular buildings were normally built of wood, so their below-ground remains can be easily overlooked. At West Bilney there is small cluster of finds, but they consist only of a few sherds, which is not surprising given the fragility of Anglo-Saxon pottery. During the 2006 fieldwalking by APS, no finds of Saxon date were retrieved, although modern villages probably had their origin during this period.

There is moderate potential for recording Anglo-Saxon material, particularly on the higher ground of the roddons.

5.1.8 Medieval (AD 1066 - 1540)

The abandonment of villages continued into this period. The potential for intact medieval remains to survive on the sites of deserted medieval villages is greatest where there is early abandonment and pastoral land use has protected the archaeological remains from truncation by ploughing or development.

From the recorded finds in the re-route Study Corridor, it is clear that there is a moderate potential of encountering further material dating to this period.

5.1.9 Post medieval (AD 1540 to 1900)

Results from fieldwalking in 2006 by APS indicate that objects of post-medieval date were the most numerous, providing more than half of the entire collection from the fields. Their proximity to farms may indicate refuse disposal or manuring scatters. The Study Corridor contains a number of extant and former field boundaries, some of which may be of considerable antiquity. Most enclosure within the Study Corridor took place during the 19th century. Later enclosures such as these are often recognisable by the regular rectangular shapes of the fields. Early records of post-enclosure field systems often rely on verbal descriptions or are not drawn to scale, making it difficult to locate the positions of field boundaries.

There is a moderate to high potential for encountering features associated with land ownership, e.g. field boundaries in the Study Corridor.

5.1.10 Modern (1900 to present)

The re-route Study Corridor has undergone little urban development and the area has remained primarily agricultural in nature. Of course, the landscape is still prone to flooding and therefore landscape management schemes have required the continual updating and monitoring of land drains, relief channels and improvement works on the region's rivers.

5.2 Built Environment

There is a low potential for encountering and recording the built environment as the pipeline has been routed to avoid buildings and, where possible, built-up areas, and there is low density of structures within the rural landscape through which the pipeline passes in the Study Corridor.

5.3 Historic landscapes and boundaries

The re-route Study Corridor includes lands in the parishes of Middleton, Wormegay, East Winch and Pentney. These parishes area are referred to in the Domesday Book and these were essentially tax districts. Parish boundaries often dated back many centuries (DBA:AI, DBA:AJ, DBA:AK, DBA:AL).

5.4 Palaeo-environmental and organic remains

Waterlogged soils that collect in hollows, pits, and water channels may contain preserved organic material (such as wood, leaves, leather, fabrics and animal tissue) and palaeoenvironmental remains (such as seeds, beetles and pollen). Such material can shed light on past human activities not usually represented in the archaeological record. This type of evidence is nationally rare, and therefore of great significance. Organic and palaeoenvironmental remains may be archaeologically important in their own right, or may have a raised value when found in close proximity to, or in an associated context with, archaeological remains.

Riverside areas are often rich in prehistoric archaeology. In areas where the watercourses have shifted since the prehistoric period, ancient settlements and other signs of activity should be anticipated close to the former riverbeds (palaeochannels). There may be numerous palaeochannels running through the Study Corridor; some are discernible from aerial photographs, whilst others may come to light only during excavations. There is a high potential for the survival of both palaeoenvironmental and organic remains in areas such as palaeochannels, where alluvial deposits would have helped to preserve such material by preventing exposure to the air.

The watercourses running to the south of the Study Corridor may be embanked in places. Early embankments could seal ancient land surfaces, whilst others could be protecting parts of archaeological sites that have been largely destroyed by modern farming in the adjacent fields.

Since the last ice age, the gravel deposits of floodplains of most rivers have been constantly shifted by the meandering, braiding and sudden changes in the course of the river. Tree trunks are one variety of movable organic remains dislodged and transported by these fluvial actions and are then deposited and preserved in airless, waterlogged conditions. There is consequently a high potential for the preservation of ancient organic remains in the parts of the Study Corridor that lie close to river courses.

There is a high potential for encountering preserved organic remains in areas where peat deposits lie close to the land surface. These anaerobic environments will yield information concerning the ancient environmental conditions, landscapes, climate change and have the potential of preserving organic remains, such as wood, leather and textiles, which that would otherwise not survive in an oxygen-rich environment.

6 ASSESSMENT OF IMPACT

6.1 Impacts of the proposed scheme

Construction activities related to this particular scheme are likely to include:

- Fencing
- Topsoil stripping
- Subsoil benching
- Soil storage
- Movement of heavy machinery
- Excavation of the pipe trench
- Working width reinstatement (e.g. subsoil ripping)

Archaeological remains could be subject to short-term, medium-term and/or long-term impacts.

- **Short-term impacts** (i.e. during construction): Direct impacts upon known and potential archaeological remains within the working width of the pipeline route.
- **Medium and long-term impacts**: Indirect impacts upon known and potential archaeological remains within and immediately outside the working width of the pipeline, resulting from compaction damage (beneath areas subject to ground level raise) and hydrological changes (following alterations to the floodplain and drainage).

6.2 Summary of known impacts

One hundred and five sites have been identified by the assessment. Of these sites, twenty-three are impacted upon.

6.3 Beneficial impacts

The proposed pipeline re-route is unlikely to result in short or long term beneficial impacts on the archaeological resource.

6.4 Adverse impacts

Twenty-three sites have been identified by the assessment. The grade of each site and level of impact are summarised below in Table 6.1 and Table 6.2.

Table 6.1 Summary of impacts of the scheme by grade

Grade	Description	Total no. sites collated	No. sites within nominal 42m wide working width		
			Uncertain impacts	Indirect impacts	Direct impacts
A	Statutory protected	2	0	0	0
B	Nationally important	1	0	0	0

Grade	Description	Total no. sites	No. sites within nominal 42m wide working width		
C	Regionally important	4	0	0	0
D	Locally important	95	2	0	19
U	Ungraded	3	0	0	2
TOTALS		105	2	0	21

Table 6.2 Summary of significance of impacts

Significance of impact	Count
N/A	84
Unknown	2
Low	14
Low or Medium	0
Medium	5
Medium or high	0
High	0
Total	105

The following sections deal in category order with sites that are directly, or indirectly or possibly affected by the proposed re-route.

6.4.1 Category A Sites

Two sites benefiting from statutory protection are located within the Study Corridor. These sites are both listed buildings (LS 221946, LS 221947). Neither of these sites is impacted upon by the proposed Fox Hill re-route.

6.4.2 Category B Sites

One nationally important site is located within the Study Corridor. This is the original extent of Blackborough Priory (HER MNF3430), but it is not impacted upon by the proposed re-route.

6.4.3 Category C Sites

Four regionally important sites are located within the Study Corridor. These are a Palaeolithic axe head (HER MNF3434), two Palaeolithic handaxes (HER MNF42349, MON 356390) and soilmarks of a medieval moat (HER MNF39604). No sites are impacted upon by the re-route.

6.4.4 Category D Sites

Ninety-five locally important sites are located within the Study Corridor. Fifteen sites are directly impacted. Nineteen are directly impacted upon and the impacts on a further two are uncertain. Of those directly impacted upon, the impacts on eleven are minor. These include two parish boundaries (DBA:AK, DBA:AL), West Bilney Park (DBA:AO), four field boundaries (DBA:BK, DBA:BM, DBA:BP, DBA:CK), flooding and drainage channels (DBA:BX), a building (DBA:CN), two Roman brooches (FSU:098), and prehistoric flints (HER MNF48751a). These sites are only crossed at one point by the proposed re-route and therefore only a small proportion of them should be affected.

The impacts on two sites are major: a trackway and two buildings (DBA:BO) and a field boundary (DBA:CE). In both cases, less than two-thirds of each site lies within the working width and will be affected by the proposed pipeline re-route

The impacts on six sites are considered to be severe because the known sites fall entirely within the working-width of the proposed re-route. These include an area of ridge and furrow recorded during geophysical survey (FSU:009), a pond identified from aerial photographs (DBA:CD), two parallel ditches located during geophysical survey (FSU:006), two sets of ditches and pits, which were recorded by geophysics (FSU:007, FSU:010), and a ring ditch, which was also identified during a previous geophysical survey (FSU:008).

In addition to these sites, the impacts on two sites are uncertain. These include a quarry recorded on the OS map of 1891 (DBA:CB), and a multi-period find scatter recorded during the Fenland Survey (HER MNF20180). The former site is uncertain due to the fact that it lies on the edge of the working width of the pipeline re-route and therefore it is impossible to ascertain whether the site will be impacted upon and if so, what proportion of the site might be affected. The latter site's location has not been accurately established and therefore due to not knowing its exact location and the full extent of the site represented by the finds, it is not possible to ascertain whether the site will be impacted upon and what proportion of any remains might be affected.

6.4.5 Category U Sites

Two areas of flooding or palaeochannels are impacted upon by the proposed re-route (DBA:BL, DBA:BN). The impacts on the sites are minor because they are crossed at one point and thus only a small proportion of the sites will be affected.

7 RECOMMENDATIONS

7.1 Liaison with statutory consultees

Liaison should be maintained with David Robertson of Norfolk Landscape Archaeology, in order to agree future archaeological investigation, approve and monitor the implementation of any archaeological WSIs, review reports, monitor fieldwork in progress, and also to visit the construction sites.

7.2 Regional Research Frameworks

All future archaeological work relating to this proposed pipeline re-route through Fox Hill should be conceived within the context of the Regional Research Frameworks (Glazebrook 1997; Brown and Glazebrook 2000) and carried out with reference to standards and guidance documents mentioned in Section 2.1.

7.3 Written Schemes of Investigation

An archaeological WSI should be produced for each stage of any future archaeological work.

7.4 Staged approach to mitigation

The most cost-effective means of managing archaeological risk is to implement a staged approach to investigation and mitigation, as laid out below in Table 7.1 and explained in greater detail in Appendix A. It is important, however, to avoid an overly mechanistic approach and to ensure a focus on gaining understanding and information relevant to key issues.

Table 7.1 Staged approach to investigation and mitigation

Archaeological Stages of Investigation		Phase of works
Stage 1	Route Corridor Investigation Study. An appraisal of archaeological potential	feasibility assessment
Stage 2	Desk-based assessment of route corridor. A thorough synthesis of available archaeological information	conceptual design
Stage 3	Field surveys of pipeline route, including field reconnaissance survey, field walking survey, geophysical survey as appropriate	detailed design
Stage 4	Field evaluation of targeted areas along pipeline route, including machine-excavated trenches, hand-dug test-pits, auger survey, as appropriate	
Stage 5	Open-area excavation e.g. detailed investigation of those sites which it is not possible to avoid or desirable to preserve (e.g. excavation, topographic survey)	
Stage 6	Watching brief. Permanent presence monitoring of all ground disturbing activities	construction
Stage 7	Archive and publication. Synthesis and dissemination of results, leading on from each of the stages outlined above	post-construction

7.5 General recommendations

This report represents Stage 2 of this archaeological approach to investigation and mitigation (Table 7.1). Consideration should now be given to undertaking field

surveys along the working width of the proposed pipeline re-route (Table 7.2, Stage 3).

Table 7.2 Proposed field surveys

Proposed survey type	Proposed survey area
Field reconnaissance survey	Entire re-route – excluding a number of fields which were walked during the Network main route field survey in 2006
Field walking survey	Arable only – excluding those areas previously covered by the Fenland Survey (good recovery conditions only) and excluding those areas covered by APS (2006); also excluding a number of fields which were walked during the Network Archaeology main route field survey in 2006
Metal detector survey	Entire re-route – excluding a number of fields which were walked during the Network Archaeology main route field survey in 2006
Geophysical survey: caesium vapour magnetometry survey and magnetic susceptibility survey	This will not be required as the re-route was surveyed during the Network Archaeology main route field survey in 2006
Dyke Survey and Hand Auger Survey	The need for this survey on the re-route will be discussed with the Norfolk Landscape landscape archaeologist
Topographical survey	Extant earthworks, identified by the field reconnaissance survey in 2006, should be revisited and a full survey undertaken in advance of any trench evaluation

7.6 Site Specific recommendations

Archaeological investigation and mitigation will be considered for the following sites (Table 7.3). Agreement over any specific archaeological work, however, will be reached Norfolk Landscape Archaeology (NLA) and English Heritage; it may be that NLA require additional sites to be evaluated and/or mitigated. With most of the sites, the next stage is likely to comprise trench evaluation of potential sub-surface archaeological remains.

Table 7.3 Summary of recommendations

<p>DBA:BO: Trackway and two buildings, identified from aerial photographs Importance D Figure 3, NGR 568532 313889 Recommendations A site visit should endeavour to locate any surviving evidence of the trackway and buildings and to make an assessment of their condition</p>
<p>DBA:AK, DBA:AL East Winch and Wormegay historic parish boundary, East Winch and Pentney historic parish boundary, marked on tithe map of 1838 Importance D, D Figures 2,3 NGR 568578 313655, 572521 316788 Recommendations Record and Reinstate</p>
<p>DBA:AO West Bilney Park, marked on 1886 OS map Importance D Figures 2,3 NGR 569989 314702 Recommendations Reconnaissance survey should establish if any remaining park boundaries still survive and if so, make an assessment of their nature and condition.</p>

<p>DBA:BO: Trackway and two buildings, identified from aerial photographs Importance D Figure 3, NGR 568532 313889 Recommendations A site visit should endeavour to locate any surviving evidence of the trackway and buildings and to make an assessment of their condition</p>
<p>DBA:CN Building, noted from aerial photographs Importance D Figure 2 NGR 570598 314723 Recommendations A site visit should endeavour to locate any surviving evidence of the building and to make an assessment of its condition</p>
<p>HER MNF48751a Flints, recovered during field walking (APS 2006) Importance D Figures 2, 3 NGR 570195 314732 Recommendations Attention should be paid by field survey to the stretch of pipeline re-route which passes close to this area. Consideration should be given to the potential benefits of undertaking further archaeological surveys and/or evaluation in advance of construction. If mitigation is necessary, consideration should be given to advance excavation and/or a watching brief during construction</p>
<p>HER MNF20180 Brooch, pottery, strap fitting and token (Fenland Survey) Importance D Figure 2 NGR 571681 315203 Recommendations Attention should be paid by field survey to the stretch of pipeline re-route which passes close to this area in order to establish the exact location of the sites and its full extent. Consideration should be given to the potential benefits of undertaking further archaeological surveys and/or evaluation in advance of construction. If mitigation is necessary, consideration should be given to advance excavation and/or a watching brief during construction</p>
<p>DBA:CB Quarry, marked on 1891 OS map Importance D Figure 3 NGR 569824 314397 Recommendations Reconnaissance survey should endeavour to locate the exact location of the quarry in order to assess the condition of the site and establish whether or not it is located within the proposed working width of the pipeline.</p>
<p>DBA:CD Pond, noted from aerial photographs Importance D Figure 2 NGR 570425 314648 Recommendations Reconnaissance survey should locate the pond and make an assessment of its condition.</p>
<p>FSU:006 Two parallel ditches, identified by geophysical survey Importance D Figure 2, NGR 571101 314906 Recommendations Trench evaluation (medium priority) is recommended on this site in order to establish the nature and date of these features. Appropriate mitigation will be determined for any of these sites which are found to be archaeological in origin and significant. This might include avoidance and/or minimisation of impact, open-area archaeological excavation or a watching brief</p>
<p>FSU:007, FSU:010 Ditches and pits, identified by geophysical survey Importance D, D Figures 2, 3 NGR 570634 314690, 568309 313867 Recommendations Trench evaluation (medium priority) is recommended on these sites in order to establish the nature and date of these features. Appropriate mitigation will be determined for any of these sites which are found to be archaeological in origin and significant. This might include avoidance and/or minimisation of impact, open-area archaeological excavation or a watching brief</p>

<p>DBA:BO: Trackway and two buildings, identified from aerial photographs Importance D Figure 3, NGR 568532 313889 Recommendations A site visit should endeavour to locate any surviving evidence of the trackway and buildings and to make an assessment of their condition</p>
<p>FSU:008 Ring ditch, identified by geophysical survey Importance D Figure 3 NGR 568913 314006 Recommendations Trench evaluation (high priority) is recommended on this site in order to establish the nature and date of these features. Appropriate mitigation will be determined for any of these sites which are found to be archaeological in origin and significant. This might include avoidance and/or minimisation of impact, open-area archaeological excavation or a watching brief.</p>
<p>FSU:098 Two Roman brooches, recovered by metal detector survey Importance D Figure 2 NGR 570838 314761 Recommendations Trench evaluation (medium priority) is recommended on this site in order to establish the nature of the area and any associated occupation or settlement features. Appropriate mitigation will be determined for any of these sites which are found to be archaeological in origin and significant. This might include avoidance and/or minimisation of impact, open-area archaeological excavation or a watching brief</p>

7.7 Landscapes and Boundaries

Parishes

The re-route crosses land in the parishes of East Winch, Wormegay, Pentney and Middleton.

Ridge and furrow

One area of ridge and furrow earthworks has been identified from geophysical survey within the Study Corridor, and it is crossed by the re-route. The loss of these fragments of medieval landscapes is of current concern. Strategies for the recording of ridge and furrow have been devised to assist in the determination of issues such as importance, management and preservation. The level of recording of ridge and furrow, should any further come to light during subsequent stages of work, should be considered with reference to existing systems and in consultation with the Norfolk landscape archaeologist.

Existing 'historic' boundaries

The proposed re-route crosses numerous existing boundaries some of which may prove to be historic.

Recommendation: The construction programme should aim to minimise the disturbance of existing 'historic' boundaries (township, parish, shire, estate or park), especially those which are later shown to incorporate an Important Hedge and/or early drystone wall. This might be achieved through minimising the working width. Cross sections of significant boundaries which are unavoidable should be recorded during the course of a watching brief, as this might lead to an understanding of land use, environment and construction methods.

Archaeologically significant layers, such as old land surfaces, sealed beneath banks may require sampling. Earthworks, such as banks and ditches, should be sensitively reinstated.

Particular attention should be paid to township, parish and shire boundaries, some of which may have Saxon or medieval origins.

Former boundaries

The proposed pipeline re-route crosses former boundaries some of which may prove to be historic.

Recommendation: Former field boundaries identified as potentially ‘historic’ could also be targeted for detailed recording during the course of a watching brief.

7.8 Eliminating areas of no archaeological potential

Areas of former mineral extraction and/or previous development/disturbance should be determined and excluded from further archaeological examination.

7.9 Route selection

Minor alterations to the proposed re-route or the engineering design should be considered to avoid impacts upon nationally important sites and also regionally important sites that have a high significance of impact, should any come to light during subsequent archaeological investigations.

Where such sites are unavoidable, consideration should be given to minimising impacts by reduction of the working width to the minimum practical level, and/or the laying of geotextile matting or bog mats, and/or careful reinstatement procedures (e.g. avoidance of subsoil ‘ripping’ at archaeological sites).

The final route selection should be determined in relation to archaeological sites of national and regional importance (i.e. sites of Category A, B and C) and to sites where the significance of impact is deemed to be medium or high.

7.10 Avoidance

No sites are recommended for avoidance at this stage.

8 ACKNOWLEDGMENTS

Network Archaeology Ltd would like to thank the following for their contribution to the project:

Table 8.1 Table of acknowledgements

Organisation	Name	Position	Contribution
Norfolk Landscape Archaeology	Edwin Rose	SMR Officer	Provision of SMR data
Black & Veatch	Ursula Bycroft	Senior Environmental Consultant	Client Liaison
Murphy Pipelines Ltd	Mike Eyres	Project Manager	Client Liaison
	Rob Holland	ALO/3 rd Party Liaison Officer	Client Liaison
	Damien Cowley	Environmental Advisor	
National Grid	Barry Robinson	Project Manager	Client Liaison
	Jim Bonnor	Archaeological Advisor	Archaeological Advice
Norfolk Landscape Archaeology	David Robertson	Landscape Archaeologist	Planning Advice
English Heritage	Nigel Wilkins	NMR	Provision of NMR data
Network Archaeology Ltd	Chris Taylor	Company Director and Project Manager	Project Management
	David Bonner	Company Director and Project Manager	Project management
	Peter Sprenger	Project Supervisor	Report Writing
	Sarah Ralph	Project/Research Supervisor	Report writing
	Susan Freebrey	GIS Officer	Data collection and Report figures

9 BIBLIOGRAPHY

9.1 Primary sources

Table 9.1 Pre-OS maps

RO reference	document title	document type	year	scale
IR30/23/640	Map of East Winch parish	Tithe	1838	Unknown
IR29/29/640	Award for East Winch parish	Tithe	1838	Unknown
MC 2371/1	Estate map of West Bilney	Estate	1857	Unknown

Table 9.2 OS maps

OS 6"	1st edition	2nd edition
XLV NE, SE	1891	1907
XLVI NW, SW	1889	1906

Table 9.3 Oblique aerial photographs

Source	Sortie Number	Library Number	Frame	Date	Start NGR	End NGR	Network AP reference
NMR	TF7014/1	AAF 5415	34	10-Aug-78	570100	314100	AP. 03
NMR	TF7115/4	NLA 9890	TF7115D	16-Jul-75	571300	315200	AP. 04
NMR	TF7115/6	NLA 9876	TF7115J	25-Jun-74	571500	315300	AP. 06
NMR	TF7115/7	NLA 9876	TF7115K	25-Jun-74	571500	315300	
NMR	TF7115/9	NLA 1491	12	25-Jun-74	571400	315300	AP. 05
NMR	TF7115/10	NLA 1491	13	14-Jun-74	571400	315300	AP. 07
NMR	TF7115/11	NLA 1491	14	14-Jun-74	571400	315300	
NMR	TF7215/2	NLA 9871	TF7215B	14-Jun-74	572300	315600	AP. 02

Table 9.4 Vertical aerial photographs

Source	Sortie Number	Library Number	Frames	Date	Scale 1:	Start NGR	End NGR	Network AP Reference
NMR	MAL/76052	14067	147 - 147	29-Jun-76	10000	570400 316100	570400 316100	
NMR	MAL/76052	14067	148 - 148	29-Jun-76	10000	571300 316100	571300 316100	
NMR	OS/93314	15245	98 - 98	11-May-93	7600	571400 315900	571400 315900	
NMR	OS/93314	15245	99 - 99	11-May-93	7600	571800 315400	571800 315400	AP. 17
NMR	MAL/76044	7390	26 - 27	13-Jun-76	10000	571900 315900	572500 315200	
NMR	OS/71013	10187	96 - 97	12-Mar-71	7500	568000 314400	568000 313800	
NMR	OS/71021	10188	169 - 170	22-Mar-71	7500	567700 313800	567700 314500	
NMR	RAF/106G/UK/1427	323	4402 - 4404	16-Apr-46	9800	571700 315600	570200 315500	AP. 16
NMR	RAF/543/2409	2180	34 - 36	16-Sep-63	10000	569800 313500	567900 313500	AP. 12
NMR	OS/71013	10187	112 - 114	12-Mar-71	7500	570200 313700	570400 315100	AP. 14
NMR	OS/71021	10188	124 - 126	22-Mar-71	7500	570200 313800	570200 315200	
NMR	OS/71021	10188	157 - 159	22-Mar-71	7500	569200 314900	569200 313500	
NMR	OS/93314	15245	50 - 52	11-May-93	7600	568200 313500	569500 313400	
NMR	RAF/3G/TUD/UK/100	258	5261 - 5264	30-Mar-46	10000	567500 314100	569700 313700	AP. 08
NMR	RAF/3G/TUD/UK/100	258	5380 - 5383	30-Mar-46	10000	571400 314700	569200 314600	AP. 15
NMR	OS/76020	9941	200 - 203	19-Apr-76	7500	568300 313600	570200 313500	AP. 11
NMR	OS/76020	9941	194 - 198	19-Apr-76	7500	571500 314900	569100 314900	AP. 13
NMR	OS/92017	14604	28 - 33	06-Mar-92	7600	567600 313900	570400 313900	AP. 10
NMR	OS/93314	15245	91 - 96	11-May-93	7600	571000 314200	568000 314400	
NMR	RAF/106G/UK/1606	401	4310 - 4319	27-Jun-46	9800	571800 315400	567600 313900	AP. 09
NMR	RAF/106G/UK/1606	401	4309 - 4338	27-Jun-46	9800	572300 315500	559100 313300	AP. 01

9.2 Secondary Sources

Table 9.5 Published and unpublished sources

Author	Year	Title	Journal/Publishers	Page Numbers
Archaeological Project Services	2006	Archaeological Fieldwalking of land between King's Lynn and near Wisbech, Norfolk		
Ashwin, T.	1993	From the beginning: Neolithic and Bronze Age Norfolk	Quarterly 10	3-13
Ashwin, T.	1996	Neolithic and Bronze Age Norfolk	Proceedings of the Prehistoric Society 62	1-22
Barringer, C.	1993	Heaths and Commons	In An Historical Atlas of Norfolk (ed. P. Wade-Martins)	
Black and Veatch	2006	King's Lynn to Wisbech Gas Pipeline: Geomorphological and Geotechnical Desk Study	Draft Version 1.0.	
British Geological Survey (BGS)	1995	1:50, 000 Series. King's Lynn and The Wash. Sheet 145. (Solid and Drift Geology)		
Brown, N.	1996	The Archaeology of Essex 1500 to 500 BC	In The Archaeology of Essex: Proceedings of the 1993 Writtle Conference	
Brown, N. and J. Glazebrook	2000	Research and archaeology: a framework for the Eastern Counties 2. research agenda and strategy	East Anglian Archaeology Occasional Paper 8	
Brown, P.	1984	Domesday Book: Norfolk 33		
Coad, J.G. and A.D.F. Streeten	1982	Excavations at Castle Acre, Norfolk, 1972-1977: Country House and Castle of the Norman Earls of Surrey	Archaeological Journal 139	138-301
Coad, J.G., A.D.F. Streeten and R. Warmington	1987	Excavations at Castle Acre Castle, Norfolk 1975-1982: the Bridges, Lime Kilns and Eastern Gatehouse	Archaeological Journal 144	256-307
Davies, J.	1996	Where Eagles dare: the Iron Age of Norfolk	Proceedings of the Prehistoric Society 62	63-92
Dymond, D.	1990	The Norfolk Landscape	Alastair Press, 2nd Ed.	
Ekwall, E.	1959	The Concise Oxford Dictionary of English Place Names	Oxford: Clarendon Press. 4th Ed.	
English Heritage	1991	Management of Archaeological Projects	Available at http://www.english-heritage.org.uk/upload/pdf/map2_20050131145759.pdf	

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Author	Year	Title	Journal/Publishers	Page Numbers
Gallois, R.W.	1979	Geological investigations for the West Water Storage Scheme	Rep. Inst. Geol. Scgi. 78/19	
Glazebrook, J.	1997	Research and archaeology: a framework for the Eastern Counties 1. resource assessment	East Anglian Archaeology Occasional Paper 3	
Godwin, H.	1938	The origins of roddons	Geographical Journal 91	241-50
Gregory, A.	1977	The Enclosure at Ashill	East Anglian Archaeology Report 5	9-30
Gregory, A.	1991	Excavations at Thetford, 1980-82, Fison Way	East Anglian Archaeology 53	
Gurney, D.	2003	Standards for Field Archaeology in the East of England	East Anglian Archaeology Occasional Paper 14	
Hall, D.N.	1978	Elm-a Field Survey	Proceedings of the Cambridge Antiquarian Society 68	21-46
Hall, D. and J. Coles	1994	The Fenland Survey: an essay in landscape and persistence	London: English Heritage Archaeological Report 1	
Healy, F. and R.A. Housley	1992	Nancy was not alone: human skeletons of the early Bronze Age from the Norfolk peat Fen	Antiquity 66	948-955
Lamb, H.H.	1981	Climate from 1000 BC to AD 1000	In The Environment of Man: The Iron Age to the Anglo-Saxon period (eds. G. Dimbleby and M. Jones) BAR 87	53-65
Lane, T.	1985	Lincolnshire: The western Fens II	Fenland Research 2	54-8
Lawson, A.	1984	The Bronze Age in East Anglia with particular reference to Norfolk	In Aspects of East Anglian Prehistory (ed. C. Barringer)	141-178
Lawson, A.	1986	Barrow Excavations in Norfolk, 1950-82	East Anglian Archaeology 29	70-103
Lawson, A., E. Martin and D. Priddy	1981	The Barrows of East Anglia	East Anglian Archaeology 12	
Liddle, P.	1982	Leicestershire Archaeology. The present state of knowledge. Part 1 to the end of the Roman period	Leicester: Leicestershire Museums Art Galleries and Records Service Archaeological Report No. 4	
Longworth, I.H., A. Ellison and V. Rigby	1988	Excavations at Grimes Graves, Norfolk, 1972-76, Fascicule 2. The Neolithic, Bronze Age and Later Pottery	London: British Museum Press	
Margary, I.D.	1957	Roman Roads in Britain	London: Phoenix House	

KLW32/v2.0
Fox Hill Proposed Pipeline Re-Route
Desk-Based Assessment

Author	Year	Title	Journal/Publishers	Page Numbers
Margeson, S., B. Ayers and S. Heywood	1996	A Festival of Norfolk Archaeology	Norwich: Norfolk and Norwich Archaeological Society	
Martin, E.	1988	Burgh, the Iron Age and Roman Enclosure	East Anglian Archaeology 40	
Martin, E. and P. Murphy	1988	West Row Fen, Suffolk: a Bronze Age fen-edge settlement site	Antiquity 62	353-357
Mercer, R.J.	1981	Grimes Grave, Norfolk: Excavations 1971-2	London: HMSO, DOE Excavation Report 11.	
Midmer, R.	1979	English Medieval Monasteries 1066-1540: A Summary		
Needham, S.P.	1993	The structure of settlement and ritual in the late Bronze Age of southeast Britain	In L'habitat et l'occupation du sol à l'âge du Bronze en Europe (eds. C. Mordant and A. Richard). Paris: Actes du Colloque International de Lons-le-Saunier 16-19 mai 1990	49-69
Network Archaeology	Forthcoming	Bacton to King's Lynn – East Walton		
Network Archaeology	2006a	King's Lynn to Wisbech Proposed Natural Gas Pipeline: Archaeological Desk Based Assessment		
Network Archaeology	2006b	King's Lynn to Wisbech Proposed Natural Gas Pipeline: Archaeological Reconnaissance, Fieldwalking, Metal Detecting and Geophysical Survey		
Norfolk County Council (NCC)	2004	Minerals Local Plan	Adopted Version January 2004.	
Pevsner, N.	1990	North-west and South Norfolk. The Buildings of England		
Rogerson, A.	1995	Fransham: an archaeological and historical study of a parish on the Norfolk boulder clay	Unpublished PhD University of East Anglia	
Rogerson, A. and N. Adams	1978	A moated site at Hempstead, near Holt	East Anglian Archaeology Report 8	55-72
Rogerson, A. and S.J. Ashley	1985	A Medieval pottery production site at Blackborough End, Middleton	Norfolk Archaeology 39(2)	
Sawyer, P.H.	1968	Anglo-Saxon Charters		
Silvester, R.J.	1988	The Fenland Project No. 3: Marshland and the Nar Valley, Norfolk	East Anglian Archaeology 45	
Silvester, R.J.	1989	Ridge and Furrow in Norfolk	Norfolk Archaeology 60(3)	286-295

KLW32/v2.0
Fox Hill Proposed Pipeline Re-Route
Desk-Based Assessment

Author	Year	Title	Journal/Publishers	Page Numbers
Wade-Martins, P.	1977	The Linear Earthworks of West Norfolk	Norfolk Archaeology 36	23-32
Wade-Martins, P.	1980	Fieldwork and Excavations on Village Sites in Launditch Hundred, Norfolk	Gressenhall: East Anglian Archaeology Report 10	
Wade-Martins, P.	1993	An Historical Atlas of Norfolk	Norwich: Norfolk Museums Service	
Wainwright, G.	1979	Mount Pleasant, Dorset: Excavations 1970-71	London: Society of Antiquaries	
Wallis, H.	2002	Roman routeways across the Fens: excavations at Morton, Tilney St Lawrence, Nordelph and Downham West	East Anglian	
Williamson, T.	1993	The Origins of Norfolk. The Origins of the Shire	Manchester: Manchester University Press	
Wymer, J.J.	1996	Barrow excavations in Norfolk, 1984-88	East Anglian Archaeology Report 77	