



The Sizewell C Project

6.3 Volume 2 Main Development Site Chapter 16 Terrestrial Historic Environment Appendices 16A - 16H - Part 3 of 3

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VOLUME 2, CHAPTER 16, TERRESTRIAL HISTORIC ENVIRONMENT, APPENDICES 16A – 16H

Documents included in Part 3 are:

APPENDIX 16E: UPPER ABBEY FARM HERITAGE ASSET ASSESSMENT

APPENDIX 16F: OFF-SITE DEVELOPMENTS ASSESSMENT

APPENDIX 16G: PEAT STRATEGY

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VOLUME 2, CHAPTER 16, APPENDIX 16E : UPPER ABBEY FARM
HERITAGE ASSET ASSESSMENT

Farm Buildings at Upper Abbey Farm, Leiston, Suffolk

Heritage Asset Assessment



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Farm Buildings at Upper Abbey Farm, Leiston, Suffolk

(TM 452 645)

Heritage Asset Assessment

This report provides an archaeological record and analysis at Historic England (2016) Level 2 of a complex of redundant farm buildings which includes a grade II-listed barn in the curtilage of a grade II-listed former farmhouse. It has been prepared to the standard specified by Suffolk County Council's Archaeological Service.

Introduction

The report is accompanied by a CD containing a full photographic record in the form of 128 Canon 5D digital images of 21 megapixels (Appendix 1), but also includes 24 photographs of key features to illustrate the text (Appendix 2). Each image is described in a separate schedule and wherever possible shows a scale rod with half-metre divisions in red and white. The site was inspected on 20th June 2019.

Summary

Upper Abbey Farm lies in open countryside approximately 800 m north-east of the ruins of Leiston Abbey. Until 1795, when it was replaced by a new house now called 'Leiston Old Abbey' 400 m to the south, the grade II-listed farmhouse was the centre of a large estate of some 1,500 acres that included the original location of Leiston Abbey (abandoned due to flooding in the mid-14th century). Known in the 18th century as 'Old Lady Abbey Farm' it may occupy the site of a monastic 'home farm'. The farmhouse is a late-17th or early-18th century timber-framed structure encased in red brick with a late-18th century brick addition to the south, and the farm buildings include a separately listed timber-framed and thatched double threshing barn. The latter is described in Historic England's Schedule as an 18th century structure in six bays with a later rear aisle on the north, but is in fact an historically important fully aisled barn in seven bays that was probably built in its present form in the mid-17th century. Barns with church-like aisles are notoriously rare in the eastern half of Suffolk, and the nearest examples at Snape and Letheringham both occupy monastic sites. The front aisle was removed in the mid-19th century along with a pair of entrance porches but the rest of the building is largely intact and forms one of the most unusual and visually impressive timber frames in the county. It contains numerous unique features, including a central roof truss with medieval-style soulaces, and a series of spandrel struts seemingly designed to reflect a medieval predecessor. Many individual timbers appear to have been salvaged from this earlier building, and the resulting structural anomalies are sufficient to occupy any timber-framing enthusiast for hours at a time.

The 19th century brick stable in the centre of the site remains unaltered externally and illustrates the scale and quality of such buildings on larger farms, but has been partly converted and largely stripped of its fixtures and fittings. The cart lodge at the southern entrance is a particularly good example of a traditional East Anglian building type which retains 19th century grain bins on its upper storey and a set of dated initials that probably commemorate its construction in 1797. The smaller brick sheds alongside are not of particular significance in themselves but were added as part of a mid-19th century refurbishment that included a now fragmentary cattle yard and illustrate the 'High Victorian' system of farming that once dominated Suffolk. A number of educational films were made here in the 1930s when the site was regarded as a complete traditional farmstead that had altered little since the mid-19th century. Most of the buildings featured still survive, albeit in some cases overgrown and in need of repair, and the entire farm is accordingly of particular historic interest.

Documentary Evidence and Map Regression

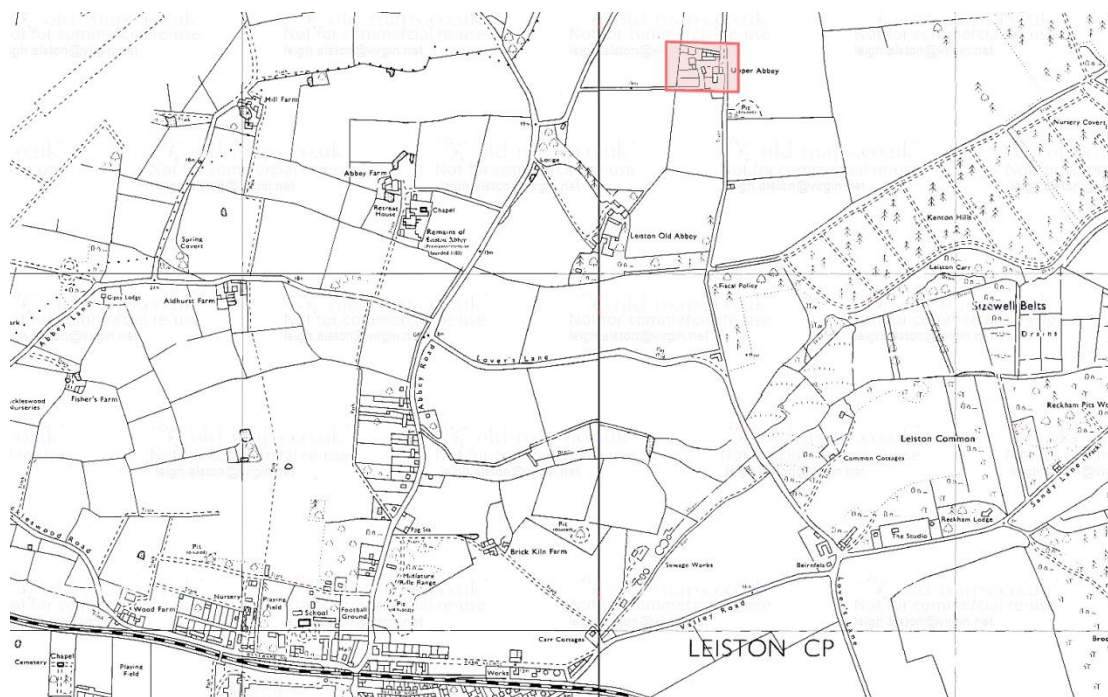


Figure 1. Site location plan highlighting Upper Abbey Farm's isolated position to the north of the town of Leiston with the ruins of Leiston Abbey to the south-west.

Upper Abbey Farm lies in open countryside approximately 2 km NNE of the town of Leiston and 800 m north-east of the ruins of Leiston Abbey. At the time of its sale in 1909 it formed the largest of four tenanted farms on the 1,596 acre 'Leiston Old Abbey' estate, with a total of 521 acres compared with 480 at Lower Abbey Farm 1.4 km to the north. The estate's main residence lay 400 m to the south at 'Leiston Old Abbey', which was described in the sales particulars as a 'miniature mansion house ... situate in a small but well-timbered park' (SRO HD 306/2/1-5). This house was built in 1795 for William Tatnall (Pevsner), and before this date Upper Abbey Farm was the property's principal dwelling. The building is accurately depicted on a rare manuscript map of 1786 by the Woodbridge surveyor Isaac Johnson, and described as the 'Mansion House of this Estate' (figure 3). 'Leiston Old Abbey' was conspicuous by its absence from this survey, its site shown as open fields, but it appeared on a slightly later plan of 1816 (figure 4). The property was named in 1786 only as 'an estate' belonging to W. Tatnall Esquire and occupied by George Doughty, gentleman, but it was labelled 'Old Lady Abby Farm' on Hodskinson's Map of Suffolk published in 1783. This name derives from the old Abbey of St Mary, i.e. Leiston Abbey, which originally lay within the farm's boundary some 2.5 km to the north-east before moving to its present location to avoid coastal flooding in 1363. The site on which it was founded in 1182 is now indicated by the ruins of a chapel near the entrance to Minsmere nature reserve, reputedly built after the demolition of the early medieval buildings and used as an anchorite cell by its penultimate Abbot in his retirement. At the Abbey's Dissolution in 1536 its lands passed to the Duke of Suffolk, including the cattle and corn of the home farm which accounted for three-quarters of the monastery's total value (Victoria County History of Suffolk). In 1653 the estate was acquired by Sir Thomas Bedingfield and described as 'being neere the chappell of the blessed Virgin Mary, commonly called or knowne by the name of the Lady Ould Abby' and then tenanted by Edmund and John Wincoppe (SRO HD/343/2, cited by Anthony Breen in his documentary study of the chapel site for Suffolk County Council Archaeological Service, SCCAS report. 2008/090). A later deed in the same collection notes that George Doughty, gentleman, acquired the lease in 1772.



Figure 2

Hodskinson's Map of Suffolk published in 1783, with a detail below. Upper Abbey Farm is marked as 'Old Lady Abby Farm' and an 'Old Chapel' is shown on the original site of Leiston Abbey to the north-east, with its subsequent site labelled 'Leiston Abby' to the west. This name suggests the farm may have formed the 'home farm' of the original abbey. The site was reached by the surviving lane on the east but the current entrance track from the west was already present as indicated by broken lines.



Figure 3

A map of the farm drawn by Isaac Johnson of Woodbridge in 1786, showing north to the right with 'The Ocean' at the bottom and vignettes of the house and chapel at the top. (Suffolk Record Office HD 306/1/1). For details see figures 3a-c below.

This land can be equated with the 'Leiston Old Abbey' estate, and although no early structures now survive it seems likely that the Abbey's medieval farm buildings lay in the immediate vicinity of Upper Abbey Farm, having possibly moved here in the 14th century from Lower Abbey Farm (which is closer to the original Abbey). Such an interpretation is speculative in the absence of archaeological and conclusive documentary evidence, but is supported by the 18th century name 'Old Lady Abbey Farm' and the fact that very few new farm sites were established in East Anglia after the 14th century.

Sales particulars of 1909 describe the property as a 'residential and sporting estate', 'the district being one of the best in England for partridges, wild fowl and other game' (Suffolk Record Office HD306/2/2), and George Doughty is likely to have built the southern range of the present house for his own use between 1772 and its depiction by Johnson in 1786. He married the daughter John Goodwin Esquire of Martlesham Hall and lived in Leiston for most of his life, but towards its end in 1792 he built another larger and more fashionable house in white brick nearby at Theberton Hall and served as High Sherriff of Suffolk the following year. It is rare for a relatively modest Georgian house such as Upper Abbey Farmhouse to be depicted on an estate survey, and rarer still for such a building to have survived almost entirely unaltered; a survival that is largely due to its downgrading within a generation of its construction from the chief residence of a large estate to a tenanted farm.



Figure 3a. The 1786 vignette of the ‘Mansion House of this Estate’ from the south-west.

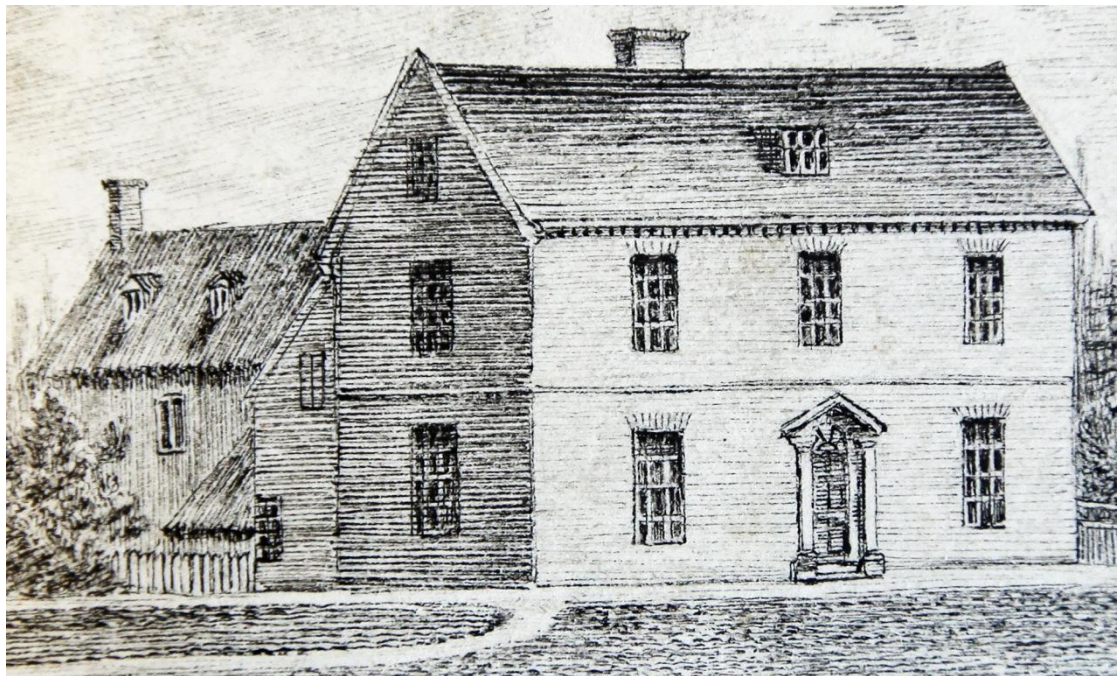


Figure 3b. A detail of Isaac Johnson’s drawing of George Doughty’s new house in 1786, looking remarkably as it did before the recent fire. The rear wing appears to be thatched and an additional lean-to shed adjoins the southern end of its western elevation. The imposing door case and splayed fanlight still survive within the later brick porch. It is rare for a relatively modest Georgian farmhouse to have been depicted in this way and to have survived almost completely unaltered.

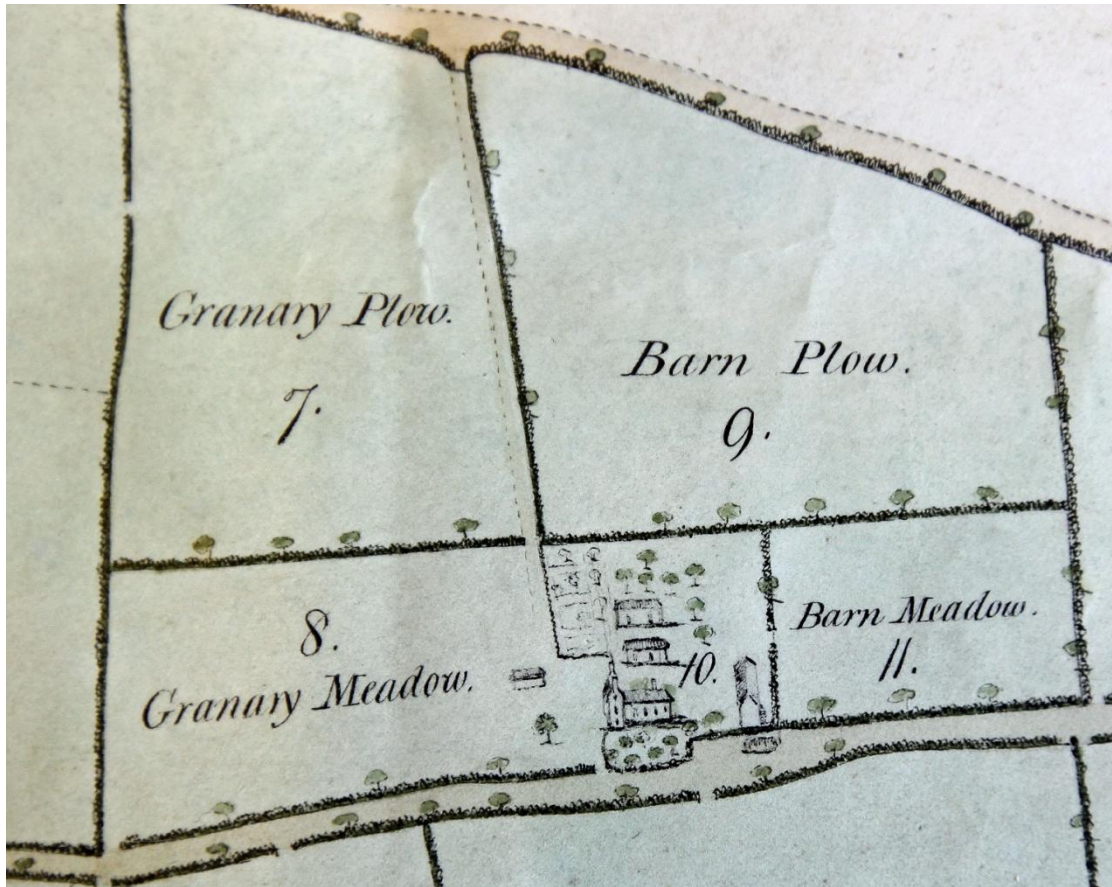


Figure 3c. Details of the farm on the 1786 map (viewed from the east). The listed barn lies on its present site to the right (no. 1 in figure 13), with two other substantial outbuildings to the west of the house, but these are stylised rather than depicted accurately. The central structure may well represent the predecessor of the existing stable (2). Note the demolished probable granary in 'Granary Meadow' to the south which is likely to have been replaced by the existing granary above the cart lodge (3).



Figure 4. The 'Mansion' on Isaac Johnson's draft map of 1786, re-oriented to show north at the top. (SRO HD 306/2/1-5). All four farm buildings are depicted with rectangular outlines much as on the finished map (figure 3). Note the name 'Barker' added in a later hand which probably refers to the 19th century tenant Daniel Barker whose initials appear on the fragmentary cattle yard (6).



Figure 5. A plan of William Tatnall's estate in 1816 showing a group of new farm buildings to the west (SRO HD 306/2/1-5). The barn is shown with two porches for which evidence survives in the present building. It seems unlikely that Johnson would have omitted them in 1786 – which suggests they were previously disguised by the front aisle – or that some major reconstruction had occurred in the interim. The L-shaped building occupies the site of the present stable (2) but probably represents a smaller predecessor – and appears (improbably) to adjoin the cart lodge of 1797 (3).

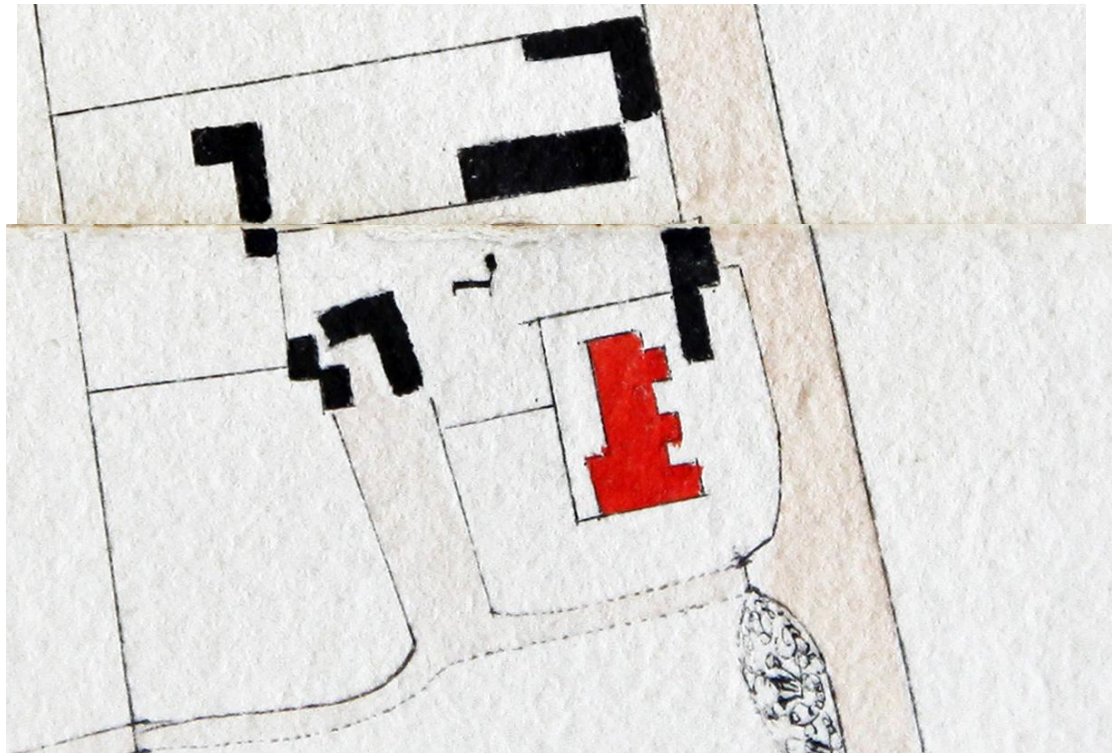


Figure 6. The farm in 1856, then owned by the Honourable S.M.A. Rose (SRO HD 306/2/1-5). The house in red remained much as in 1814 but the barn had lost its southern porches and a new L-shaped range of shelter-sheds had been built to the north (7). The L-shaped stable (2) is shown much as today, with the cart lodge (3) and the newly built cart shed (4) adjoining corner-to-corner. The tithe survey of 1841 omits the entire farm as it was not tithable (the Abbey would have owned the tithe).



Figure 7. The estate outlined on the Ordnance Survey of 1883 (SRO HD 306/2/1-5).

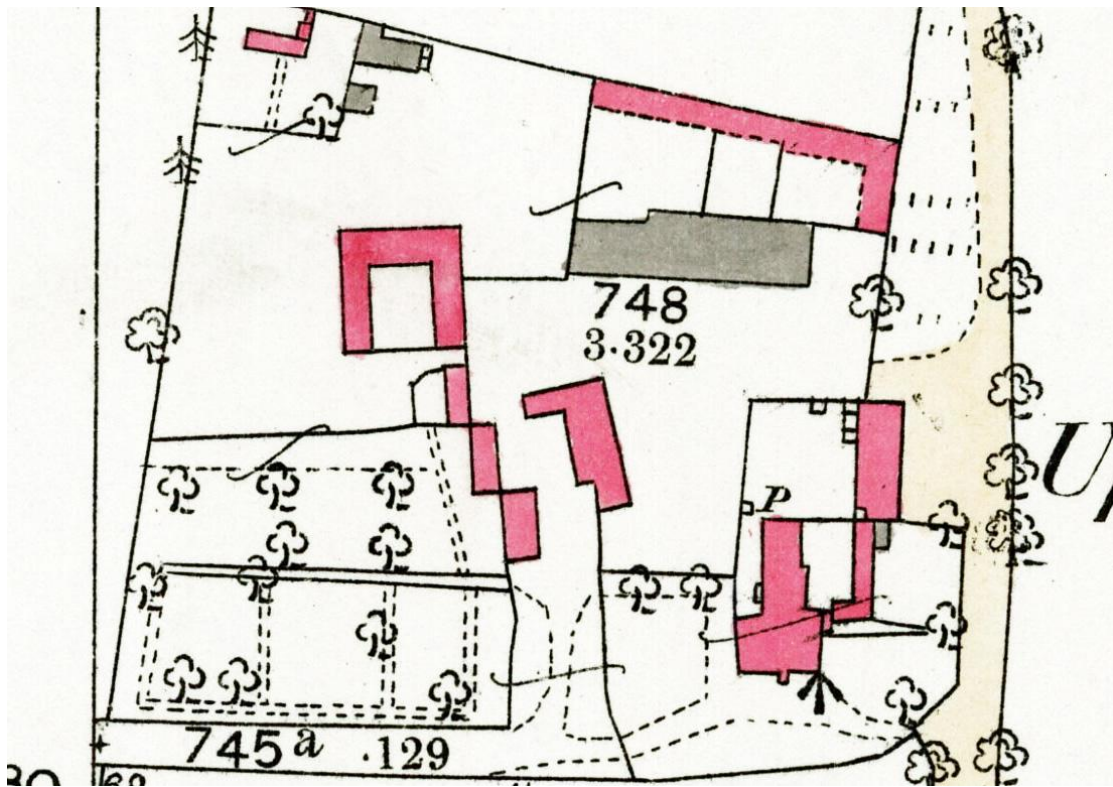


Figure 8. The highly accurate First Edition 25 inch Ordnance Survey of 1881. The house had been much modified since 1856 and the farm buildings had acquired their present layout with the smaller shelter-shed (5) added to the south of the new U-shaped cattle yard (6). The red-brick cottage had also been built to the north-west (shown in red). The eastern half of the U-shaped cattle yard (6) may have survived from 1856.

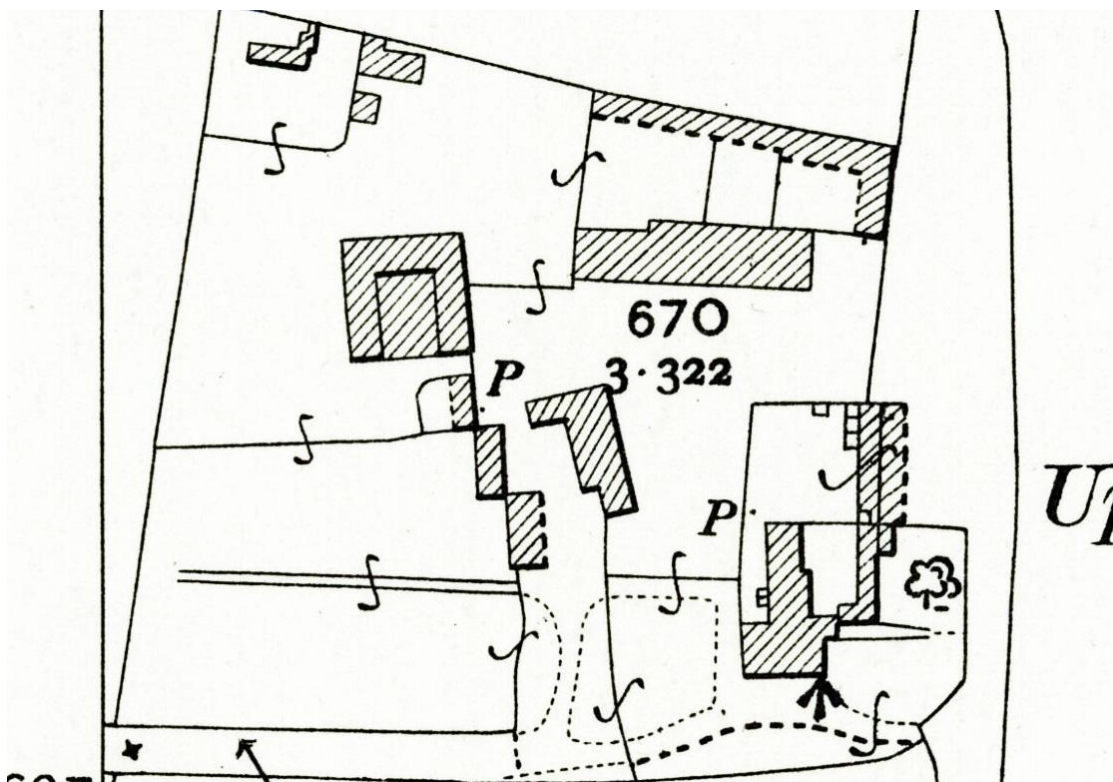


Figure 9. The Second Edition 25 inch Ordnance Survey of 1903 showing little change.

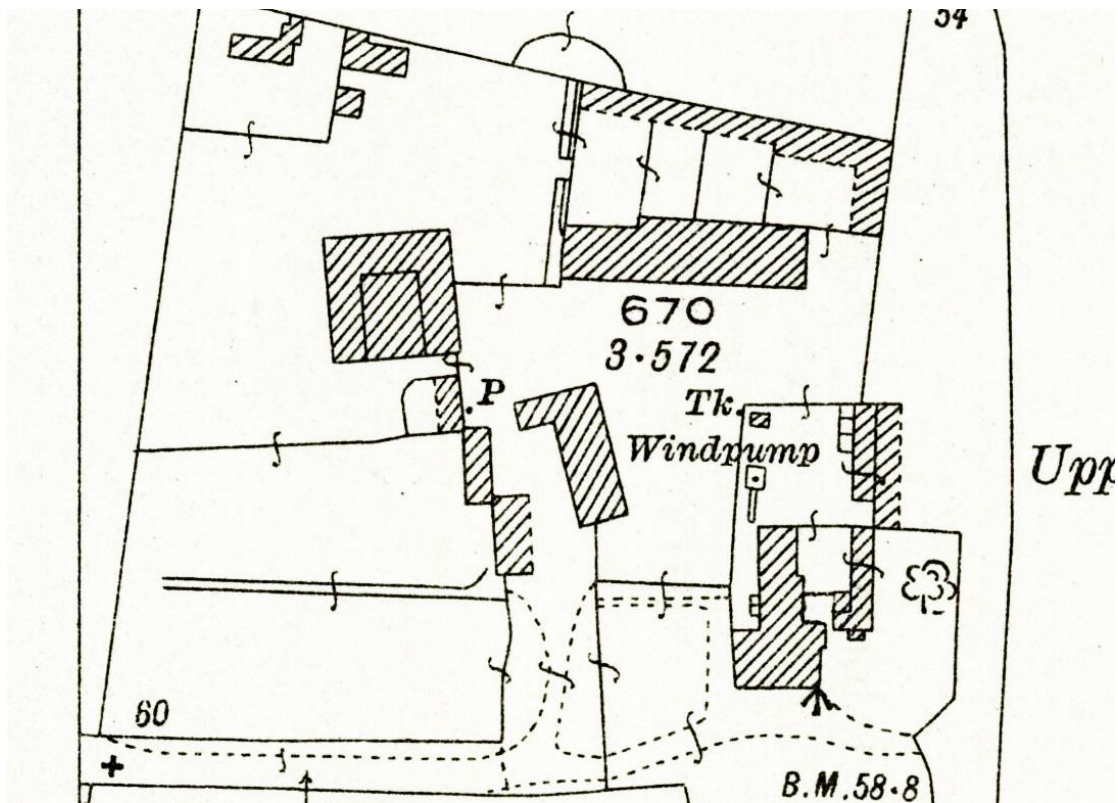


Figure 10. The Second Edition 25 inch Ordnance Survey of 1925 with a new wind pump.

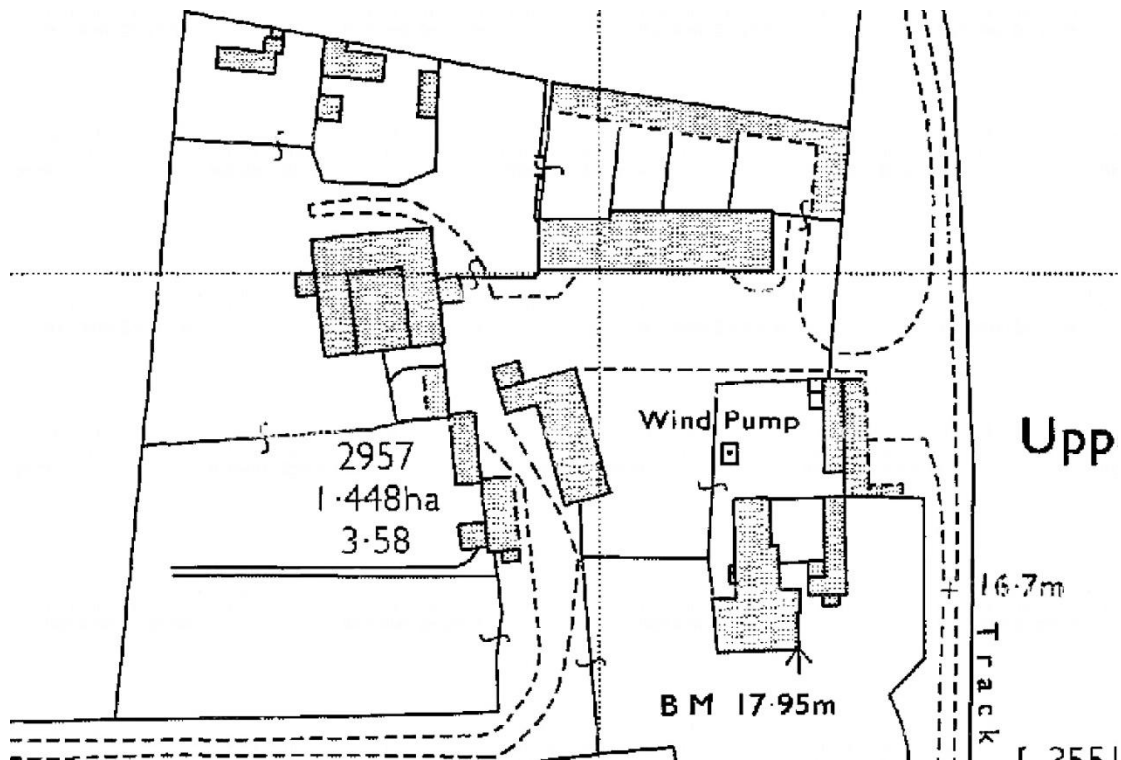


Figure 11. 25 inch Ordnance Survey of 1971. The buildings of 1881 still survived at this date, although the western half of the shelter-shed to the north of the barn (7) had been enlarged.

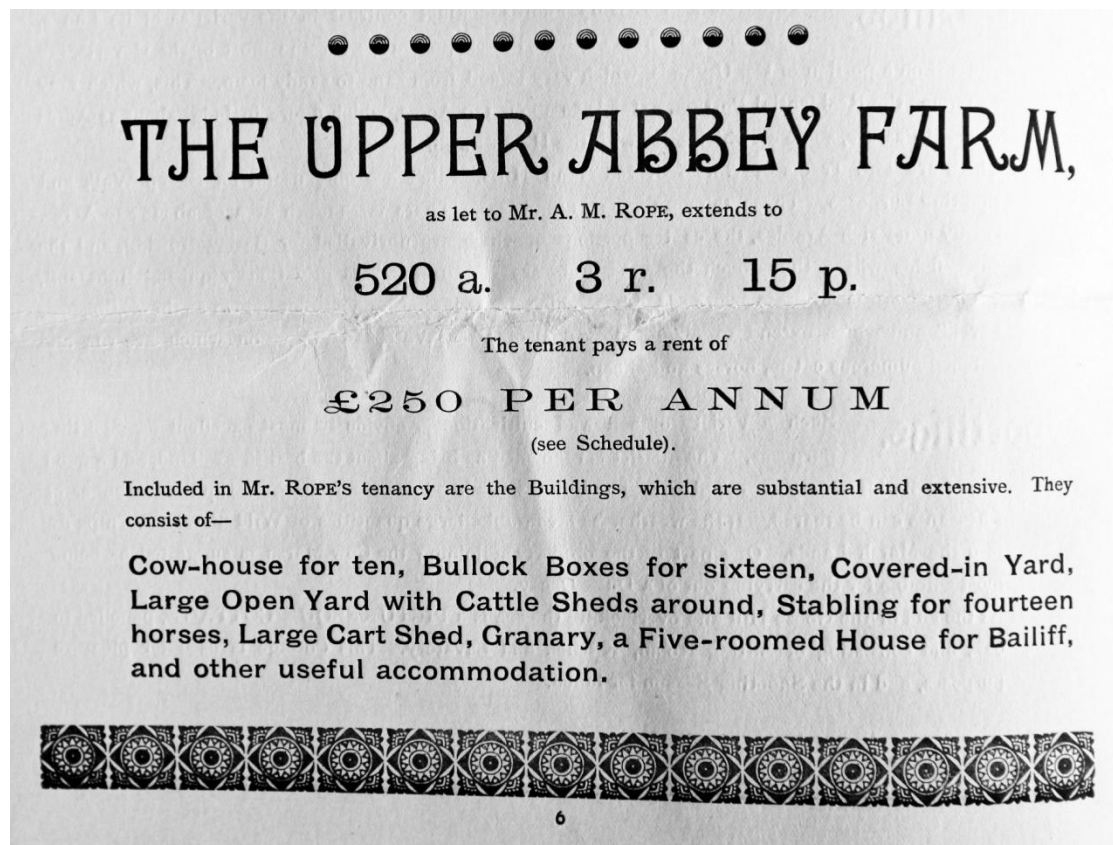


Figure 12. The description of the farm in the sale particulars of 1909 (Suffolk Record Office HD306/2/2). Part of the Upper Abbey Farm was said to be kept in hand together with ‘The Home Farm’ or Rookyard Farm and ‘worked for Home Farm purposes’ – which may explain the absence of the barn from the list of outbuildings.

The ‘Leiston Old Abbey’ estate of 1,596 acres, 1 rood and 23 perches was sold at auction in 1909 and bought by F. Egbert Hollond, J.P. Upper Abbey Farm comprised just under 521 acres let to Arthur Rope while George and Arthur Rope were joint tenants of Lower Abbey Farm which contained another 480 acres. The farm buildings were described as in figure 12, curiously omitting the barn, and the rear wing of the house was said to be occupied by a bailiff. The ‘Old Georgian Farmhouse’ was kept in hand by the estate’s owner and did not form part of Mr Rope’s tenancy. It consisted of two living rooms, an office, nine bedrooms, a kitchen, dairy and ‘some out-houses’, along with a coach-house and unspecified stabling. During the mid-1930s the farm was the focus of several short films produced by Gaumont British Instructional Films which sought to record the traditional method of farming in Britain before it disappeared in the wake of mechanisation. These films now form part of the East Anglian Film Archive and are available online. The farm was said to contain a thousand acres managed by G.A. Rope, described as the son of the owner, and the head stockman, Lacey Smith, was said to live in the northern range of the farmhouse. The second stockman occupied the brick cottage in the north-western corner of the site. The films focus on the surrounding landscape and use a strangely inaccurate model to illustrate the layout of the farm buildings. The threshing barn is described as an area for the storage and preparation of straw and feed for the cattle and pigs in the three stock yards adjoining on the north, and a lorry is shown reversing into the western doors with a delivery of sacks, but no interior views are included. Turnips and other root crops are shown being chopped for cattle food in a brick structure described as a barn, but this was located at the northern end of the demolished cattle yard to the west (structure 6 in figure 13).

Building Analysis

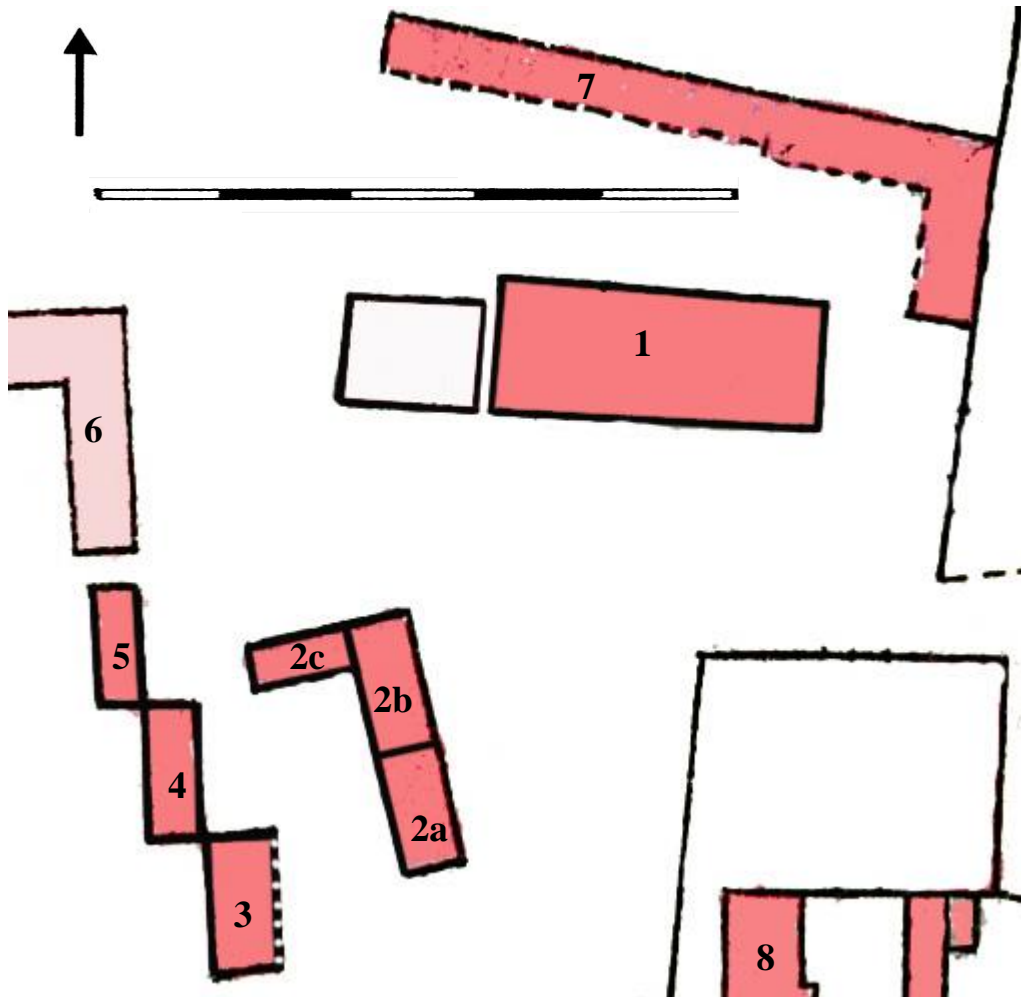


Figure 13

A block plan of the site adapted from the Ordnance Survey identifying the historic structures and their various compartments with a number for ease of reference in the text and photographic record. The detached building to the west of the barn (1) is a late-20th century replacement of an earlier structure that adjoined the barn's gable. 50 metre scale in blocks of 5 metres.

Key

1. **Double Threshing Barn.** A grade II-listed timber-framed, weatherboarded and thatched double threshing barn in 7 bays with an integral rear aisle to the north and evidence of a missing front aisle with twin entrance porches. The structure is otherwise exceptionally complete but contains a number of anomalies and highly unusual features including spandrel struts and soulaces to a unique central roof truss with double collars. In its present form the building probably dates from the mid-17th century but incorporates parts of a medieval aisled predecessor which it may have been designed to reflect. The external wall of the northern aisle was rebuilt in the late-18th or early-19th century and the front wall in the mid-19th century when the porches were removed. The carpentry of the principal timbers is more typical of the 18th century than the 17th, and the absence of porches from Isaac Johnson's depiction in 1786 raises the possibility that the 17th century framing was

substantially rebuilt or even entirely re-erected shortly afterwards. This barn is among the most impressive and structurally intriguing in Suffolk.

2. **Stable.** A large mid-19th century L-shaped red-brick and pantiled stable with a hay loft over the front range on the east and a single-storied range to the rear. The front range is currently divided into two compartments of which the southernmost has been converted into a farm office (2a) but a blocked additional door opened onto a missing central tack room.
3. **Cart Lodge.** A five-bay open-sided red-brick cart lodge flanking the southern entrance to the site with a weatherboarded granary above. The granary preserves 19th century boarded grain bins but was not accessible at the time of inspection. A series of initials to the northern gable are dated 1797 and probably commemorate the building's construction but the roof structure was renewed in the mid-19th century.
4. **Small Cart Shed and Stable.** A small, single-storied red-brick and pantiled mid-19th century cart shed with an integral stable to the south.
5. **Small Shelter Shed.** A single-storied shelter-shed of flint-rubble with red-brick dressing open on the west and formerly serving a small cattle yard as shown on the Ordnance Survey of 1881.
6. **Former Cattle Yard (now fragmentary).** The south-eastern corner of a large mid-19th century U-shaped range of brick and flint-rubble sheds forming a cattle yard – the rest of which has been demolished. A plaque bearing the initials D B (probably for the tenant in 1855, Daniel Barker) with an uncertain date (either 1838 or more probably 1858) survives on the southern wall. The eastern half of this complex may be shown on the map of 1856 but the rest appears for the first time on the 1881 Ordnance Survey.
7. **Range of Shelter-Sheds.** A long L-shaped range of 19th century shelter-sheds facing a cattle yard to the north of the barn. The narrower, pantiled eastern section was present by 1856 but was inaccessible at the time of inspection, and the western section was added before 1881 but rebuilt with a wider roof in the mid-20th century.
8. **Upper Abbey Farmhouse.** The former farmhouse consists of a late-18th century red-brick range to the south with a slightly older but heavily disguised timber-framed wing of the late-17th or early-18th century to the north. The latter has formed a separate dwelling for at least a century, with sales particulars of 1909 describing it as a five-roomed bailiff's house as opposed to the adjoining 'Old Georgian Farmhouse' which was occupied separately. This building is the subject of a separate survey dated 2013.

N.B. The site also includes a mid-19th century two-storied pantiled red-brick cottage laid in Flemish Bond with a symmetrical southern facade containing a central entrance flanked by windows and gable chimneys. Apart from the replacement of its windows this building remains little altered externally and was shown in the north-western corner of the site on the Ordnance Survey of 1881 but not the map of 1856. It was not inspected internally for the purpose of this report.

Introduction

The farm buildings at Upper Abbey Farm are arranged in an unusually scattered pattern to the north-west of the house as shown in figure 13. This stands in contrast to the unified courtyards grouped around threshing barns found on most local farmsteads, and may relate to a change of orientation in the 18th century. The site was probably approached initially by a meandering lane of medieval character on the east but is now entered from the south by a short, straight track that is not defined by substantial ditches and appears to have been inserted against a field boundary to provide a link with the road on the west. The older rear range of the house lies on the same axis as the lane to the east, with the timber-framed threshing barn adjoining at right-angles to form a farm yard to the north in the traditional manner. The western track was in existence by 1783 (figure 2) and is respected by the present southern facade of the house and by the brick buildings to the west of the site. Cart lodges were typically placed at the entrances to farm complexes and structure 3 in figure 13 was clearly intended to serve the ‘new’ southern approach. The following account of the individual buildings is intended to be read in conjunction with the descriptive captions to illustrations 1-24 in Appendix 2. The house is not discussed further but forms the subject of a separate Heritage Asset Assessment by the same author dated January 2013.

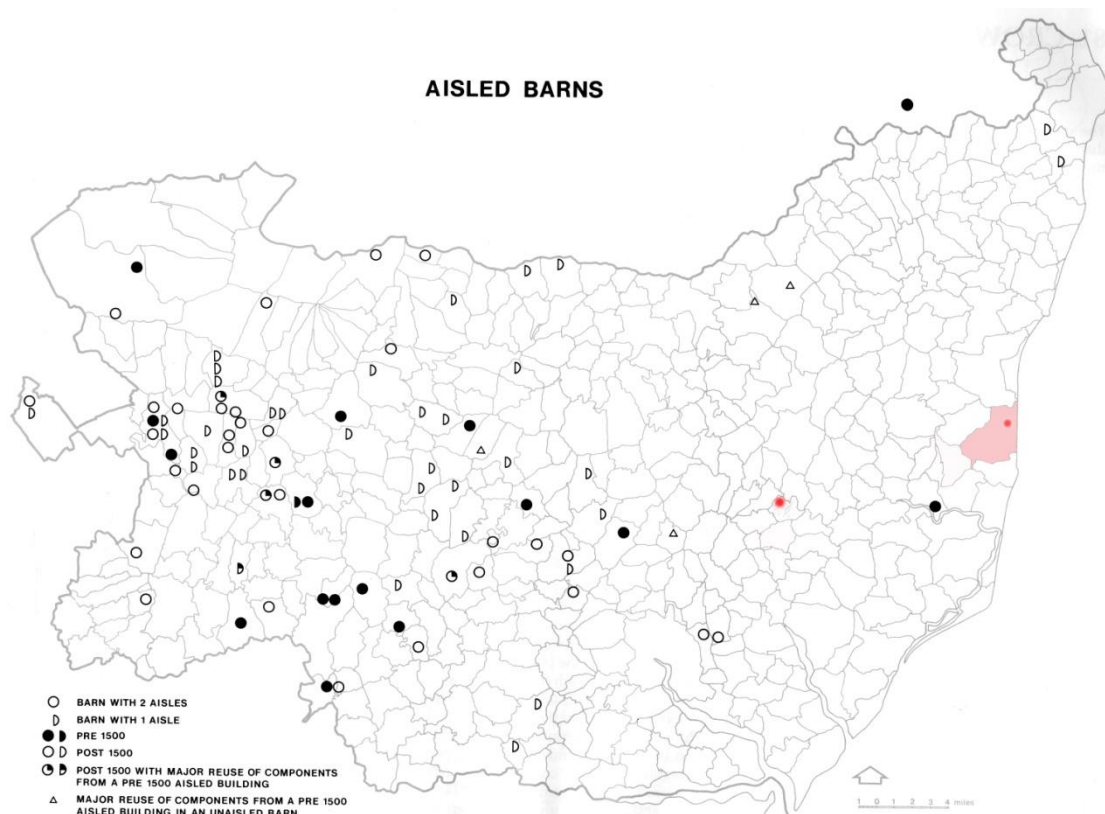


Figure 14a

A distribution map of aisled barns in Suffolk, showing the great majority in the western half of the county (Historical Atlas of Suffolk, ed. Dymond & Martin, Suffolk County Council, 1999). The example at Upper Abbey Farm was omitted as its surviving aisle was wrongly described by Historic England as a later extension – but has been added here in red with Leiston parish highlighted in pink. The nearest example to the south-west is at Abbey Farm Snape (formerly a Benedictine Priory), and another recent discovery at Letheringham Abbey has also been added in red.

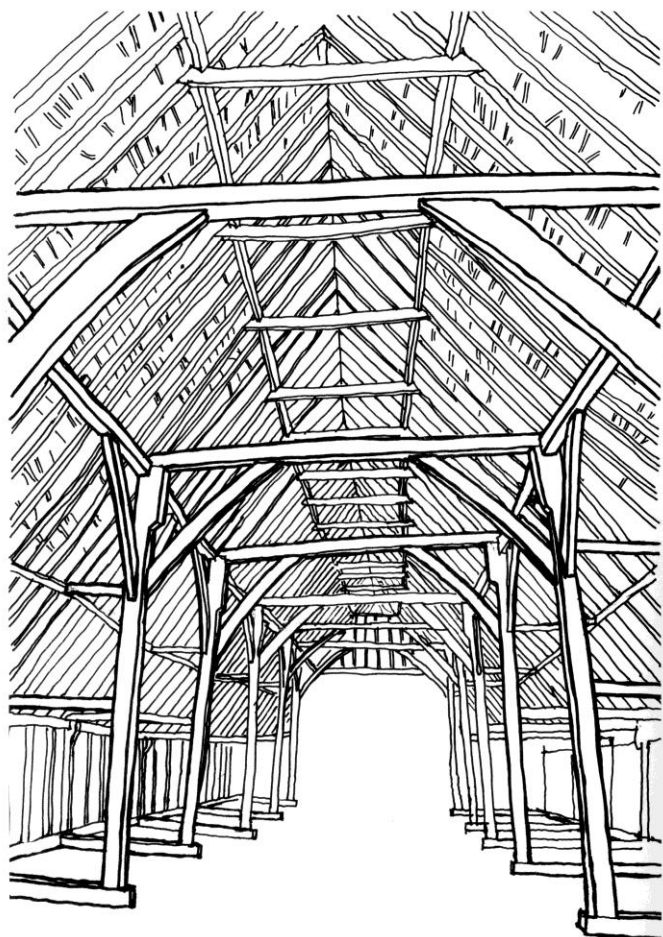
Listing Descriptions

Two of the buildings on the site are listed at grade II, with the house and barn described as follows in Historic England's Schedule (nos. 8 and 1 respectively in figure 13):

Leiston-cum-Sizewell. Upper Abbey Farmhouse. First listed 13 March 1951. Last amendment 15 March 1983. Farmhouse. 17th century rear, late-18th century front facing south. Earlier part is timber framed, partly encased in brick with plastered gable end; pantiled roof. 2-storeys and attic. Casement windows with small panes, plain boarded doors. 18th century front of red brick, with brick band at first floor level and brick modillion cornice; slated roof with plain tiles at rear. 2-storeys plus attic. 3 window range, sashes with glazing bars, flat arches. Central doorway with recessed 6-panel door, pilasters and broken pediment, panelled reveals. Semi-circular fanlight with radiating and circular glazing bars. 20th century brick porch.

Leiston-cum-Sizewell. Barn 40 m north of Upper Abbey Farmhouse. First listed 2 August 1983. Barn. 18th century. Timber framed and weatherboarded, thatched. 6 bays. Aisle extension to north.

The limited description of the barn is inaccurate as the timber frame is in 7 bays rather than 6 and the northern aisle is an original feature as opposed to a later extension. Its exact date is open to question as noted below.



Illus. 14b
A fully aisled barn at
Rectory Farm Gazely,
demolished in 1965.
(From the Historical Atlas
of Suffolk.)
The front aisle at Upper
Abbey Farm has been
removed.

The Timber-Framed Threshing Barn (1)

Layout and cladding

The timber-framed, thatched and weatherboarded barn of 7 bays to the north of the site forms a double threshing barn of standard layout with twin entrances facing a large yard to the south entered from the lane on the east. The entrances lie in the third bay from the east and the second bay from the west but the brick or boarded threshing floors have been removed and the interior now consists only of 20th century concrete and loose earth. The full-height southern doors are of traditional half-hung form but lack retaining boards and are 20th century replacements, but the low, half-hung rear doors, which span the length of their respective bays, probably survive in part from the 19th century. They are heavily tarred and their retaining boards remain *in situ*, but they are blocked externally with recent weatherboarding that extends along the entire northern elevation and contrasts with the late-19th or early-20th century cladding of the southern elevation and gables. The thatch is confined to the main roof structure with the northern aisle renewed in corrugated asbestos. The two rear doorways are uniform but the main eastern entrance contains original arch-braces in its upper corners while its counterpart on the west retains a fully tenoned lintel beneath its roof-plate with no evidence of arch-braces. This is one of many structural anomalies in the barn for which the reasons are unclear. The present lower door lintels are later insertions that were probably added when the original porches shown on the map of 1816 were removed in the mid-19th century.

Proportions

In contrast to its standard layout the barn's timber frame is highly unusual and contains several unique features. It extends to an impressive 27.9 m in length by 9.75 m in total width (91.5 ft by 32 ft), with the latter consisting of a main span or nave of 7.3 m and a rear (northern) aisle of 2.4 m (24 ft and 8 ft respectively). This aisle is fully original to the building and it is unclear why the listing inspector regarded it as a later addition. The storey posts of the southern wall all contain empty pegged mortices for the tie-beams and braces of a matching aisle which was subsequently removed and replaced by the present wall timbers (which are nailed insertions), so the barn was initially fully aisled and would have extended to 12.2 m in width (40 ft). The empty mortices of the four posts flanking the main entrances differ in height from those elsewhere (illus. A2. 12), and secured the walls of original gabled entrance porches that were still present in 1816 but had been removed by 1856 (figures 5 and 6). At 3.6 m in length (12 ft) both threshing bays are slightly narrower than the barn's remaining five bays of 3.9 m (13 ft) confirming that the asymmetrical layout remains unaltered. The front wall rises to 5.1 m in height at its roof-plate (16.75 ft) and the rear aisle to 2.1 m (6.75 ft), with the roof steeply pitched at approximately 55 degrees for thatch. Increasing the width of a barn by the use of aisles like those of a church is a practice rarely found in the eastern half of Suffolk as shown by the distribution map in figure 14a. This may reflect the greater emphasis on cereal rather than dairy production in the west of the county, and may also relate to the influence of larger monastic estates such as those of Bury Abbey. Smaller, secular farmsteads were less likely to require such buildings. This link between monastic estate farming and aisled barns is supported by the three recorded instances in the vicinity of Leiston which include this example (ostensibly a reconstruction of a Pre-reformation structure) and others at Snape and Letheringham Abbeys (the latter now in the parish of Hoo). The notorious inadequacy of the listing survey in East Suffolk may also play a role, with others awaiting discovery.

Structure

Apart from the loss of its front aisle the timber frame is exceptionally well preserved, with a full complement of arch-braces to its arcade plates and tie-beams matched by wind-braces in its roof of double linear butt-purlins. Arch-braces were routinely replaced by bolted knee-braces in the 19th century to increase headroom, and the intact display here is among the most

impressive and picturesque to survive in Suffolk (illus. A2. 6). The structure contains several unusual features including vertical spandrel struts pegged between the tie-beams and arch-braces of every open truss in a manner normally found only in domestic open halls of the late-14th and early-15th centuries. Curiously, two of the rear arcade braces are provided with identical struts, both associated with scarf joints in the arcade-plate to which they may have been intended to offer support (illus. A2. 8). There are no such struts to the front plate, but one of its two joints lies above an additional inner brace that may have been provided for the same purpose (illus. A2. 10). Neither of these features has any parallel elsewhere. Further anomalies include the central truss of the roof which contains two horizontal collars instead of the usual one, along with a pair of diagonal soulaces to the lower collar in the style of the 13th and 14th centuries. The easternmost truss also contains double collars, albeit without soulaces, and forms a clasped-purlin structure in contrast to the two tiers of butt-purlins in the rest of the roof (illus. A2.7). It is very difficult to believe that any carpenter would have designed a roof in this eccentric way, and there is extensive evidence to indicate the barn consists of components salvaged from one or more earlier buildings. Several rafters contain irrelevant mortices such as those flanking the central truss (A2. 7), the principal rafters of which are stepped above the upper collar and were clearly cut for a clasped-purlin roof. The most obvious evidence of second-hand timber lies in the rear aisle where the tie-beams, central studs and the lower of the two sets of braces that descend from the arcade posts are completely different in character from the rest of the frame (illus. A2. 9). Their large size, with the studs measuring 19 cm by 15 (7.5 ins by 6), and roughly hewn edges are typical of the Middle Ages, contrasting with the sharp edges and much smaller sections of the upper braces and the main timbers elsewhere. The outer ends of the aisle tie-beams all contain truncated mortices for jowled wall posts but now simply abut the inner face of the existing roof-plate. The framing of the two gables is also oddly mismatched, with an additional asymmetrical post interrupting the mid-rail to the east but not the west.

Date

The combination of features and timbers of different periods makes the barn difficult to date closely in its present form. The curved wind-braces to the upper tier of purlins coupled with face-halved and bladed scarf joints in the arcade plates would normally point towards the mid-17th century, but the sharply sawn character of the principal posts and arcade plates is more typical of the 18th century or even the beginning of the 19th. The plinths of uniform red brick beneath the ground sills also indicate a relatively recent origin, as does the framing of the back wall which consists of short studs without braces that are tenoned to both the roof-plates and sills but with only every third stud secured by pegs. Framing of this kind would not be expected before the 18th century, and contrasts with the fully pegged studwork of the two gables which contain heavy, internally trenched braces in the manner of the 17th century and before. The entire back wall was probably rebuilt in the late-18th century with a new brick sill to accommodate the existing wide doors. Small rear doors had been the norm hitherto – sufficient to create a through-draught for threshing and winnowing but not to admit vehicles. The rest of the barn was probably built in the mid-17th century re-using timbers from a 14th or 15th century aisled barn. Many post-medieval aisled barns in Suffolk consist of re-used material in this way, as noted in figure 14a. The unique spandrel struts are second-hand timbers with visibly different surface textures to the tie-beams and braces they link, and were presumably intended to replicate the appearance of this older barn that may well have occupied the same site. There is some evidence of re-use from non-agricultural buildings, including at least one moulded 16th century example in the western gable, but most are plain. The roof purlins also show evidence of re-use, with a mottled texture that differs from the rest of the timber and an additional set of rafter pegs that does not belong to the current structure. This may relate to the replacement of the common rafters in the 19th century, but also raises the possibility that even the 17th century features of the barn were recycled as part of an 18th century refurbishment – perhaps soon after Johnson's survey of 1786 which appears to omit both the aisles and porches. It is not unknown for entire barns to be disassembled and re-erected on new sites, and such a scenario would explain the 18th century appearance of the

principal timbers, but the earlier features are more likely to have been salvaged from Johnson's barn. It seems somewhat unlikely that a medieval barn with a 17th century roof could have been provided with new aisles and porches after 1786 only to lose the front aisle and porches again within 70 years. The present southern wall consists of more randomly re-used studs interrupted by diagonal primary braces with nailed rather than tenoned joints in the typical style of the mid-19th century, confirming the cartographic evidence which indicates the front aisle and porches were removed between 1816 and 1856.

The Stable (2)

The main stable in the centre of the complex is a substantial red-brick building with fully hipped pantiled roofs that faces east towards the main yard north of the house. It consists of a 1.5 storey range laid in Flemish Bond on an approximately north-south axis (2a & 2b) and a possibly slightly later single-storied rear range in Monk Bond which projects at right-angles from the northern end of its back wall to form an L-shaped outline (2c). The main structure extends to 22.1 m in length by 5.1 m in total width (72.5 ft by 16.75 ft) with an internal ceiling clearance of 2.5 m (8.25 ft), while the rear wing is 10.6 m long by 5.2 m wide (35 ft by 17 ft). The roof structures both consist of clasped-purlins with nailed collars, a ridge-board and uniform tall-sectioned rafters with some evidence of re-use (illus. A2. 18) – in the typical manner of the mid-19th century. The rear wing forms a single space, open to its roof, but may have been sub-divided initially as it is accessible by two doors in the centre of its northern wall and to the north of its western gable – both of which are respected by closers (quarter-bricks) in the bonding. The gable has been reinforced with massive concrete buttresses but these seem unnecessary as there is no sign of movement in the brickwork and they may have been part of a WWII system of tank traps. A detached rectangular block immediately to the north bears the marks of shutters to all four sides and was probably part of the same defensive system. The level beaches of East Anglia were considered ideal for tank invasion and substantial defences of this kind survive throughout the area.

The main stable is now divided into two compartments, 2a and 2b, of which the former operates as a farm office, but there is evidence of an additional central door in the eastern facade (illus. A2 15 & 16). This door appears to have opened into a narrow tack room that was probably also linked to the stable on the north, but may have served a missing internal stair to the loft as the present joists are jointed above a series of empty partition mortices (illus. A2. 16). An identical series of mortices indicates a missing tack room against the southern gable, although some of the ceiling timbers have been re-used and some empty mortices elsewhere relate only to previous buildings. The two main stables were arranged in the usual manner, with central entrances flanked by windows in the facade and hay racks above mangers against the 'blind' rear wall. The racks and mangers have been removed but the positions of the hay drops in the ceiling which allowed the racks to be filled from the loft are indicated by the short inserted boards with which they are blocked – the joints of which are misaligned with those in the rest of the ceiling. These inserted boards are secured by the rails of hay racks with holes for missing tines. Original wooden harness hooks still project from the gable and eastern wall of the well preserved northern stable (2b), secured by wooden rails set into the brickwork (illus. A2. 16). Ostensibly original internal loft ladders also survive in the front internal corners of both stables (illus. A2. 17), but the present internal partition is a later insertion that probably relates to the office conversion. Original hatches lie above each of the stable doors allowing the loft to be loaded from the exterior, and the paint scar of a demolished lean-to shown on late-19th century maps is visible against the back wall. This lean-to was not keyed to the brickwork and was probably a later addition.

The Cart Lodge (3)

The red-brick cart lodge flanking the southern entrance to the site on the west is of typical East Anglian form with an open arcade of five bays to the east and a granary with a

weatherboarded facade above (illus. A2. 1 & 19). It extends to 12.5 m in length by 5.5 m in total width and rises to 3.1 m at its roof-plates (41 ft by 18 by 10). The granary is reached by an external brick stair against the southern gable but this was overgrown at the time of inspection and the first-floor door blocked by modern boarding leaving the loft inaccessible. An original loading door or window in the northern gable was similarly blocked and the image of the loft in illustration A2. 21 was taken through a small hole in its floorboards. This image reveals a substantially framed front wall and a series of intact boarded grain bins in a southern compartment along with an ostensibly rebuilt roof of tall-sectioned softwood. Pantiles survive to the rear, although the roof has partly collapsed, but the front slope is now covered with corrugated iron. The roughly-hewn, tall-sectioned joists of the ground-floor ceiling are tenoned to the principal joists and are consistent with a series of initials carefully incised into the external brickwork of the northern gable and all dated 1797: 'Z K', 'M B' and 'R B'. Initials of this kind usually relate to builders or farmworkers rather than owners, and it is probably not coincidental that no fewer than four farmers with surnames beginning with the letter B were recorded in White's Suffolk Directory for 1844: Backhouse, Barker, Barley and Baxter. The name 'Barker' has been added to the 1786 map and Daniel Barker was the only farmer with initials matching those of cattle shed's plaque in White's editions for both 1844 and 1855. A further name, B Button, is visible to the south of the door to the southern stable (2a), but its script appears to date only from the 20th century.

The Small Cart Shed and Stable (4)

The small red-brick and pantiled shed in the centre of the stepped range of three buildings to the west of the main stable (2) is divided into two compartments with a cart shed on the north and a stable for the cart horse to the south (illus. A2. 19 & 22). It extends to a total of 10 m in length by 4.25 m in width (33 ft by 17 ft) and rises to 2 m (6.75 ft) at its eaves, with the cart shed also 4.25 m long and the stable 5.8 m (19 ft). The former is entered by double doors from the track on the east and the latter by a central half-hung door with a glazed window on the south. A second window overlaps the cart shed and a narrow central bay that probably formed a tack room but of which only a short section of wall survives. An original doorway links the two remaining areas and the interior has been stripped of historic fixtures and fittings - apart from a good brick floor with a central lateral drain in the stable and a 20th century iron manger. The roof structure is concealed by 20th century boarding but the uniform nature of the red brick-work laid in Monk Bond indicates a date in the mid-19th century.

The Small Shelter-Shed (5)

The northernmost of the three buildings adjoining corner-to-corner to the west of the site forms a small shelter-shed with an open-sided elevation to the west (illus. A2. 22). In contrast to its brick neighbours this consists of flint-rubble with red-brick dressing, although both gables are of red-brick laid in Monk Bond (the northern gable largely rebuilt in the 20th century). The pantiled roof is fully hipped and the building extends to 8.9 m in length by 4 m in width with eaves of 2 m (29 ft by 13 by 6.75). The western wall was heavily overgrown at the time of inspection but appears to retain a full complement of timber arcade posts with a clasped-purlin roof of tall-sectioned softwood with nailed collars and a ridge-board - all typical of the mid-19th century. This shed was first shown on the Ordnance Survey of 1881 adjoining a small, irregular enclosure on the west and probably served a bullock yard in close proximity to the main cattle yard on the north (6).

Fragmentary Cattle Yard (6)

A large U-shaped range of sheds enclosing a single yard with a southern entrance was shown on the historic Ordnance Surveys, but only overgrown fragments now survive in its south-

eastern corner (illus. A2. 23). The eastern wall consisted of flint-rubble with red-brick dressing, and the southern of red brick laid in Monk Bond with an original door on the east (respected by closers). The yard was provided with a roof between 1881 and 1903, and is likely to have contained the 'cow-house for ten' and 'bullock boxes for sixteen' listed in the sales particulars of 1909. The principal interest of the remaining fragment lies in the dated plaque set into the southern wall which bears the initials 'D B' along with an unfortunately weathered and illegible date ending in '8'. The penultimate numeral is possibly a '3' but probably a '5', and a date of 1858 is consistent with the fabric and the appearance of the U-shaped range in its final form in 1881 but not 1856. Enclosed cattle yards of this kind were built on many East Anglian farmsteads in the 1850s and 60s with the widespread introduction of the yard-based system of mixed animal husbandry known today as Victorian High Farming. The initials are probably those of Daniel Barker who was named as a farmer in the parish in White's Directories for 1844 and 1855.

The Shelter-Sheds to the North of the Barn (7)

A large range of open-sided shelter-sheds lies to the north of the threshing barn, much as depicted on the Ordnance Survey of 1881 and probably incorporating a smaller L-shaped range shown to the east on the map of 1856 (to the left in illus. A2. 4). This eastern range was overgrown and inaccessible at the time of inspection, but retained a pantiled roof in contrast to the wider range on the west which is now covered in 20th century corrugated iron. The latter's roof structure and the timber posts of its open southern elevation also date only from the mid-20th century, consisting of uniformly sawn softwood, and the structure shown on the 19th century maps has evidently been substantially rebuilt. The rear (northern) wall retains a 19th century red-brick plinth but its post-and-rail fabric has also been renewed and is now clad externally in corrugated iron. An internal partition of red-brick terminates approximately 2 m short of the present southern wall suggesting the building has been enlarged, and this is consistent with the Ordnance Survey of 1971 which shows it significantly wider than the potentially older section to the east - unlike the Ordnance Survey of 1925 which shows it narrower. This western section is now 6.4 m in width with eaves of 2 m (21 ft by 6.75). No historic fixtures or fittings appear to survive, but similar shelter-sheds were often built in the mid-19th century to serve cattle yards adjoining barns and the structures must have formed the 'large open yard with cattle sheds around' described in 1909.

Historic Significance

The farm buildings at Upper Abbey Farm are of considerable historic interest for a number of reasons. When filmed in the 1930s the site was used to illustrate a method of farming that was already perceived as outmoded, and it was regarded as a complete traditional farmstead that had altered little since the mid-19th century. Unfortunately several of the key structures highlighted have since been demolished, and this is no longer the case. Part of the covered cattle yard to the north-west of the site was shown in the films as a 'barn' in which cattle-feed was prepared, but has now vanished without trace, and a large structure of uncertain purpose to the west of the threshing barn has also been replaced. The brick stable in the centre of the site remains unaltered externally and illustrates the scale and quality of such buildings on larger farms, but has been partly converted and largely stripped of its fixtures and fittings. The cart lodge at the southern entrance is a particularly good example of a traditional East Anglian building type which retains 19th century grain bins on its upper storey and an unusual set of inscriptions that probably commemorate its construction in 1797. The smaller brick sheds alongside are not of special significance in themselves but were added as part of the same mid-19th century phase that included the missing cattle yard and illustrate the 'High Victorian' remodelling found on so many local farms. Their uniform pantiled roofs and corner-to-corner abutments lend a picturesque appearance to the site. By far the most historically important

building of the complex is the grade II-listed threshing barn which contains one of the most unusual and visually impressive timber frames in Suffolk. Although not of great age relative to other barns in the county its aisled structure is of special significance, reflecting a medieval tradition rarely seen in East Suffolk and probably directly influenced by a monastic predecessor – of which key elements appear to have been re-used in its framing. This evidence of an early aisled barn of the type expected on a monastic site increases the likelihood that Upper Abbey Farm originated as an estate farmstead of Leiston Abbey – which is also indicated by its 18th century name and the lack of evidence for newly established post-medieval sites elsewhere in the region. The apparent absence of aisles and porches from Isaac Johnson’s two depictions of 1786 is worrying, but even if a major reconstruction occurred shortly afterwards the key medieval and 17th century features are far more likely to have originated in the barn he saw than to have been imported from another site. Apart from the subsequent loss of its front aisle in the mid-19th century the barn’s structure remains exceptionally intact, with a fine array of original braces and a remarkable series of curious structural anomalies guaranteed to entertain any timber-framing enthusiast for hours at a time.

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Schedule of full photographic record follows (pp. 22-29)

Appendix 1 (on accompanying CD): Full Photographic Record

Descriptions of Photographs in Appendix 1

1. A general view of the site from the entrance track to the south-west showing the house on the right with the farm buildings in the rear.
2. A general view of the farm buildings from the site entrance to the south showing the stable (2) in the centre with the cart lodge (3) to left & the barn (1) right.
3. A general view from the south-east showing the cart lodge (3) to the left of the brick stable (2) with the barn (1) on the right.
4. A general view from the south showing the brick stable (2) on the left with the thatched barn (1) in the rear to the right.
5. A general view of the cart lodge (3) at the southern entrance to the site with the cart shed (4) and shelter-shed (5) in the rear to the right.
6. A general view from the north showing the shelter-shed (5) on the right with the cart shed (4) and cart lodge (3) in the rear.
7. A general view of the site from the barn (1) to the north showing the house on the left with the stable (2) in the centre and the shelter-shed (5) to the right.
8. A general view from the west showing the stable (2) on the right and the barn (1) to the left with the eastern site entrance in the centre.
9. A general view from the eastern site entrance showing the stable (2) on the left with the barn (1) on the right.
10. A general view of the site from the north showing the stable (2) on the left and the stepped arrangement of the cart lodge, cart shed & shelter-shed (3-5).
11. The exterior of the weatherboarded and thatched formerly fully aisled double threshing barn (1) from the south-east with the stable (2) on the left.
12. The southern facade of the barn (1) from which a front aisle and projecting porches have been removed showing its 19th century deal weatherboarding.
13. A detail of the eastern doors in the barn's southern facade (1), the fine condition of which suggests they are 20th century replacements.
14. The yard to the rear (north) of the barn showing the largely overgrown and inaccessible shelter-shed (7) to the left with the barn (1) on the right.
15. The rear exterior of the barn (1) from the north-west showing its intact aisle clad in modern boarding with an asbestos roof.
16. A detail of the wide western doorway in the barn's northern exterior (1) which is respected by the brick plinth but blocked with modern boarding.
17. The eastern external gable of the barn (1) showing the profile of its rear aisle on the right which was originally replicated on the left.

18. A general view of the barn's interior from its south-western corner (1) showing its 7 bays with the intact rear aisle on the left.
19. A general view of the barn's roof (1) from the west showing its complete array of tie-beam & arcade-plate braces with wind-braces to the butt-purlin roof.
20. A general view of the barn's interior from its south-eastern corner (1) showing its 7 bays and earth floor with the two southern entrance on the left.
21. The rear aisle of the barn (1) showing its six arcade plates and substantial remains of wattle-and-daub infill in the back wall.
22. A detail of the barn's arch-braced tie-beams from the east (1) showing their unusual vertical spandrel struts consisting of re-use timber with lath nails.
23. The western end of the barn's intact roof structure (1) showing its two tiers of butt-purlins with a full complement of wind-braces to the upper tier.
24. The barn's roof from the west (1) showing its unique central truss with double collars and soulaces to the chamfered lower collar.
25. A detail of the barn's unusual medieval-style central roof truss with double collars and soulaces (1) showing the only missing tie-beam arch-brace at bottom right.
26. A detail from the west of the barn's southern central soulace and chamfered lower collar (1) showing the re-used principal rafter from a clasped-purlin roof.
27. A detail from the west of the barn's only clasped-purlin truss at the eastern end of the roof (1) with an additional collar below.
28. A detail of a typical roof truss in the barn (1) with two tiers of linear butt-purlins with reduced ends, square principals, single collars and wind-braces.
29. The western end of the barn's northern wall showing the rear door and arcade-brace spandrel strut in the second bay from the gable.
30. The eastern end of the barn's northern wall showing the rear door & smaller braces in the third bay from the gable & the arcade-brace spandrel strut in the second.
31. A detail of the easternmost of the two spandrel struts to the barn's arcade plate (1) both apparently designed to support scarf joints.
32. A detail of the easternmost face-halved and bladed scarf joint in the northernmost arcade plate of the barn (1).
33. The barn's asymmetrical eastern internal gable (1) with an additional post interrupting the mid-rail to left of centre & a primary wall brace in the aisle.
34. The southern interior of the barn's eastern bays (1) showing its arcade braces with inserted nailed narrow studs interrupted by diagonal primary braces.
35. The eastern end of the barn's intact roof structure (1) showing the single clasped-purlin truss with two collars on the left.

36. The northern interior of the barn's eastern bay (1) showing only every third stud pegged to the roof-plate with wattle-and-daub infill above a half-height rail.
37. The easternmost truss of the barn's aisle (1) from the east showing the arcade brace with a single stud of heavy scantling beneath the tie.
38. The tie-beam of the easternmost truss of the barn's aisle (1) from the east with a truncated jowl mortice proving the wall has been rebuilt or the tie re-used.
39. The easternmost truss of the barn's aisle (1) from the west showing the heavy ostensibly medieval stud and brace pegged to the ground sill.
40. The easternmost truss of the barn's aisle (1) from the west showing the straight upper aisle brace with a nailed strut supporting the aisle through-purlin.
41. The northern interior of the barn's penultimate eastern bay (1) showing only every third stud pegged to the roof-plate.
42. The 19th century rear doors in the barn's third bay from the east (1) showing the lack of stud pegs in the roof-plate proving the doorway is original to the wall.
43. The interior from the east of the early-20th century boarded grain store in the central bay of the barn's aisle (1).
44. The barn's southern entrance in the third bay from the east (1) showing its original high corner braces to which a later door lintel has been lapped and pegged.
45. A detail of the barn's eastern entrance (1) showing the apparently re-used timber lapped and pegged to the original corner braces.
46. The central bays of the barn's southern interior (1) showing inserted studwork with an additional small arcade brace adjacent to a scarf joint.
47. A detail of the asymmetrical additional inner arcade-plate brace in the centre of the barn's southern interior (1).
48. The western end of the barn (1) from the east showing the single missing tie-beam brace and spandrel strut on the left.
49. The barn's southern entrance in the second bay from the west (1) showing its original high lintel with no corner braces and three pegged studs above.
50. A detail of the barn's western entrance (1) showing its original door lintel pegged to the storey posts with a later nailed replacement beneath.
51. The barn's symmetrical western internal gable (1) with a waney tie-beam, trenched braces and chiselled joint numbers.
52. The rear doors in the barn's second bay from the west (1) showing the ground sills of the northern wall pegged to the jambs.
53. The early-20th century boarded grain store to the east of the barn's western rear door (1) cutting the aisle brace and stud.

54. A detail of the truncated jowl mortice in the aisle tie-beam to the east of the barn's western rear door (1).
55. The barn's eastern internal gable (1) showing the 19th century-style framing of the northern aisle to the left with narrow studs cut by a diagonal primary brace.
56. The central southern storey post of the barn's two easternmost bays (1) showing pegged mortices for the two braces of a missing front aisle.
57. A detail of the central southern storey post of the barn's two easternmost bays (1) showing a pegged mortice for the upper brace of a missing front aisle.
58. The eastern storey post of the barn's eastern entrance (1) showing pegged mortices at different heights to the rear posts probably for a missing porch.
59. A detail of a mortice peg in the eastern storey post of the barn's eastern entrance (1) with a chiselled numeral probably for a missing porch.
60. The western storey post of the barn's eastern entrance (1) showing pegged mortices at different heights to the rear posts probably for a missing porch.
61. A detail of the barn's south-western corner post (1) showing two mortice pegs for the upper brace of a missing aisle.
62. A detail of the barn's south-western corner post (1) showing a single numbered mortice peg for the tie-beam of a missing front aisle.
63. A detail of the double arcade braces in the centre of the barn's southern interior (1) showing chiselled Roman carpenters' numerals to both.
64. The central storey post of the barn's central bays (1) showing double-pegged mortices for the upper and lower braces of a missing front aisle.
65. A detail of the eastern storey post of the barn's western entrance (1) showing double mortice pegs probably for a missing porch.
66. A detail of the western storey post of the barn's western entrance (1) showing double mortice pegs probably for a missing porch.
67. A detail of the barn's south-eastern corner post (1) showing two mortice pegs for the upper brace of a missing aisle.
68. A detail of the barn's south-eastern corner post (1) showing a single mortice peg for the tie-beam of a missing front aisle.
69. The barn (1) from the south-west showing the outline of a demolished adjoining structure replaced by the late-20th century grain store to the left.
70. The eastern facade of the brick stable (2) showing its symmetrical twin entrances & loft hatches with a blocked central door to an additional narrow central shed.
71. A detail of the brickwork to the left of the stable's southern entrance (2a) showing the incised name 'B Button'.

72. The stable from the north showing the original door to the rear range (2c) respected by closers with a possible WWII anti-tank obstacle in the foreground.
73. The possible WWII anti-tank obstacle to the north of the stable (2) as seen from the west with the barn (1) in the rear.
74. The western exterior in the stable's rear range (2c) showing its doorway respected by closers & large concrete buttresses possibly designed as tank barriers.
75. The stable (2) from the south-west showing the whitewashed rear wall of the front range from which a lean-to shed has been removed.
76. The stable (2) from the west showing the whitewash to the rear wall indicating the position of a demolished lean-to shed.
77. The interior of the southern section of the stable (2a) from its eastern entrance showing evidence of a narrow tack room against the gable to the left.
78. The ceiling of the stable's southern section (2a) from the south showing the inserted boards of a hay drop against the back wall to left.
79. The eastern interior of the stable's southern section (2a) now converted into a farm office showing its original central entrance.
80. The southern section of the stable (2a) showing empty ceiling mortices for a narrow tack room against the gable with the blocked hay rack to the right.
81. The northern section of the stable (2b) from the south showing original wooden harness hooks lining the walls with a blocked hay drop to the left.
82. The rear (western) wall of the northern section of the stable (2b) showing the inserted hay-rack rail and boards blocking the hay drop.
83. A detail of the original wooden harness hooks projecting from wooden rails set into the stable's northern gable (2b).
84. The northern section of the stable (2b) from the north showing original wooden harness hooks lining the walls with a blocked hay drop to the right.
85. The eastern interior of the stable's northern section (1b) showing the blocked door to a missing central section with mortices for its partition to the left.
86. The stable's northern section from the north (2b) showing the two original loft ladders to the left with ceiling mortices for a missing partition.
87. The undivided loft above the stable (2) looking south from the northernmost of its two internal loft ladders with the southern ladder on the left.
88. The clasped-purlin roof of the stable (2) from the north showing its uniformly sawn rafters, ridge-board and nailed collars of softwood.
89. The clasped-purlin roof of the stable (2) from the south showing its uniformly sawn rafters, ridge-board and nailed collars of softwood.

90. The stable's rear (western) range from the west (2c) showing its clasped-purlin roof of uniform tall-sectioned softwood.
91. The stable's rear (western) range (2c) from the west showing its two entrances with no indication of an internal partition.
92. The eastern facade of the cart lodge (3) showing its five open bays and weatherboarded first-floor granary.
93. The granary (3) from the south-east showing the heavily overgrown original brick external stair against its southern gable.
94. A detail of the heavily tarred weatherboarding to the granary in the cart lodge's eastern facade.
95. The cart lodge (3) from the north-east showing its blocked granary loading hatch or louver with dated inscriptions to the brickwork beneath.
96. The northern external gable of the cart lodge (3) showing its Flemish Bond brickwork with three central dated inscriptions.
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Appendix 2 (pp. 30-41): Selected Photographs to Illustrate the Text



Illus. 1. A general view of the farm buildings from the site entrance to the south showing the brick stable (2) in the centre with the cart lodge and granary (3) to the left and the barn (1) in the rear to the right.



Illus. 2. The main yard from the south showing the brick stable (2) and the thatched and weatherboarded barn (1). Note the asymmetry of the barn's facade, with one of its two sets of entrance doors in the second bay from the left and the other in the third bay from the right. Although of traditional braced construction both doors are in excellent condition and appear to be 20th century replacements. The steel-framed shed to its left is modern.



Illus. 3. A general view of the site from the barn (1) to the north showing the L-shaped brick stable flanked on the left by the house (8) and on the right by the uniformly pantiled small brick cart-shed (4) and the open-sided flint-rubble shelter-shed (5). The large building in the rear to the right is a late-20th century covered cattle yard.



Illus. 4. The narrow yard to the rear (north) of the barn as seen from the west. The long shelter-shed (7) is overgrown and largely inaccessible but the section to the left was largely rebuilt in softwood and corrugated iron during the 20th century. The barn's rear aisle has been re-roofed in corrugated asbestos and clad in modern softwood but original thatch survives above. The outline of a blocked rear doorway opposite the western entrance is visible to the left of the scale rod with another hidden by vegetation in the rear.



Illus. 5. A general view of the barn's interior from its south-eastern corner (1). All seven bays are visible along with the floor of loose earth with no trace of the threshing floors onto which the two southern entrances would have opened. The rear aisle to the right was initially replicated on the left but the structure is otherwise exceptionally intact with only one missing tie-beam brace. The aisle is not a later addition as stated in the listing as there are no stud mortices for an earlier back wall in the arcade-plate.



Illus. 6. A general view of the barn's impressive roof (1) from the west showing its complete array of tie-beam and arcade-plate braces with a full complement of wind-braces in the two-tier roof of linear butt-purlins.



Illus. 7. A detail from the west of the unique central truss of the barn's roof, with double collars and a pair of diagonal soulaces. Trusses of this kind are normally found only in high quality 13th and 14th century roofs. Note the step in the principal rafter above the upper collar which indicates it was re-used from a clasped-purlin roof, and the empty mortices in the common rafter to the left which also indicate re-use.



Illus. 8. The arcade post to the right of the easternmost entrance showing its exceptional spandrel struts and the smaller arcade brace to the threshing bay. Every tie-beam brace contains identical struts but the barn contains only two arcade-brace struts – both beneath scarf joints and both flanking a threshing bay. The struts are re-used timbers.



Illus. 9. The easternmost truss of the barn's aisle (1) as seen from the west. The single, large stud and thick, slightly waney aisle brace and tie-beam with hewn surfaces are typical of the Middle Ages and contrast with the sharp-edged, uniform timber of the upper braces and other key elements such as the arcade-plates. A truncated mortice for a jowled wall post in the left-hand end of the aisle tie proves that the wall framing has been rebuilt or the timbers have been re-used – or both.



Illus. 10. The central bays of the barn's southern wall (1) showing the arcade braces of a missing front aisle. The framing beneath consists of mid-rails and vertical studs cut by diagonal primary braces all nailed in place in the style of the 19th century. Note the unique inner brace to the left of the central post, possibly designed to support a scarf.



Illus. 11. The barn's symmetrical western internal gable (1) with a waney mid-rail, trenched braces and chiselled carpenter's numerals. This contrasts with the eastern gable where the mid-rail is interrupted by an additional post to the rear of its centre. The corner post on the left contains pegged mortices for an identical aisle tie-beam and brace to those on the right.



Illus. 12. The eastern storey post of the barn's eastern entrance (1) showing pegs for three mortices in the external face of the timber – two of which bear crescent-shaped carpenter's numerals reflecting that of the tie-beam brace. These mortices are at different heights to those of the rear arcade posts and the rest of the southern posts but match those of the other three door posts –indicating they secured missing porches. Crescent-shaped numbers were cut with a curved race-knife and are not uncommon.



Illus. 13. The back wall of the easternmost bay (1). The narrow studs are tenoned to the roof-plate and sill but only every third stud is pegged. Framing of this kind indicates a date in the 18th century, as does the uniform brickwork of the tall brick plinth, although the diagonal primary brace in the gable to the right is more consistent with the 19th – as is the fact that the internal aisle tie-beams are butt-jointed and strapped to the roof-plates. The wattle-and-daub between the studs is an original feature.



Illus. 14. The unique double collared truss in the centre of the roof with medieval-style diagonal soulaces to the chamfered lower collar. The roof is otherwise typical of the mid-17th century but the principal rafters are stepped for clasped rather than butt-purlins and the purlins themselves contain irrelevant peg and nail holes indicating re-use.



Illus. 15. The eastern facade of the pantiled brick stable (2) showing its symmetrical twin entrances, loft hatches and windows. The outline of a third blocked door is visible in the centre. This would normally have opened onto an internal loft stair, but there is no obvious evidence of this in the ceiling and it probably served a tack room.



Illus. 16. The eastern interior of the stable's northern section (1b) showing the blocked central door between the two ostensibly original loft ladders with original wooden harness hooks on the left (and wooden rails set into the brickwork for others on the right). The principal joist to the left of the door contains empty mortices for a missing partition but there is no counterpart to the right.



Illus. 17. The northern section of the stable (2b) as seen from the south showing a good series of original wooden harness hooks lining the walls with a blocked hay drop to the left. The floorboards above this drop are short insertions that are aligned differently to the boards elsewhere in the ceiling. The hay racks and mangers have been removed. The bind joist in the rear is a re-used timber with irrelevant empty mortices.



Illus. 18. The undivided hay loft above the stable looking towards its northern gable (2). A number of probably original iron tie-rods span the walls and secure the roof-plates to the floor joists in the absence of tie-beams. The clasped-purlin roof structure consists of uniformly sawn softwood with a ridge-board and nailed collars in the manner of the mid-19th century.



Illus. 19. The cart lodge (3) from the north-east showing the blocked granary loading hatch or louver in its gable with the small cart shed and stable (4) on the right. Four sets of initials lie at vertical intervals to the right of the scale rod, three of which are dated 1797.



Illus. 20. A detail of the third of the three sets of initials neatly incised into the brickwork of the cart lodge's northern external gable (3), all dated 1797: From top to bottom 'Z K', 'M B' and 'R B' (the latter shown here). A fourth set, 'S P' is followed by what appears to be the number '3'. The style of lettering is convincing and the structure probably dates from this year. 'M B' and 'R B' may be Daniel Barker's antecedents.



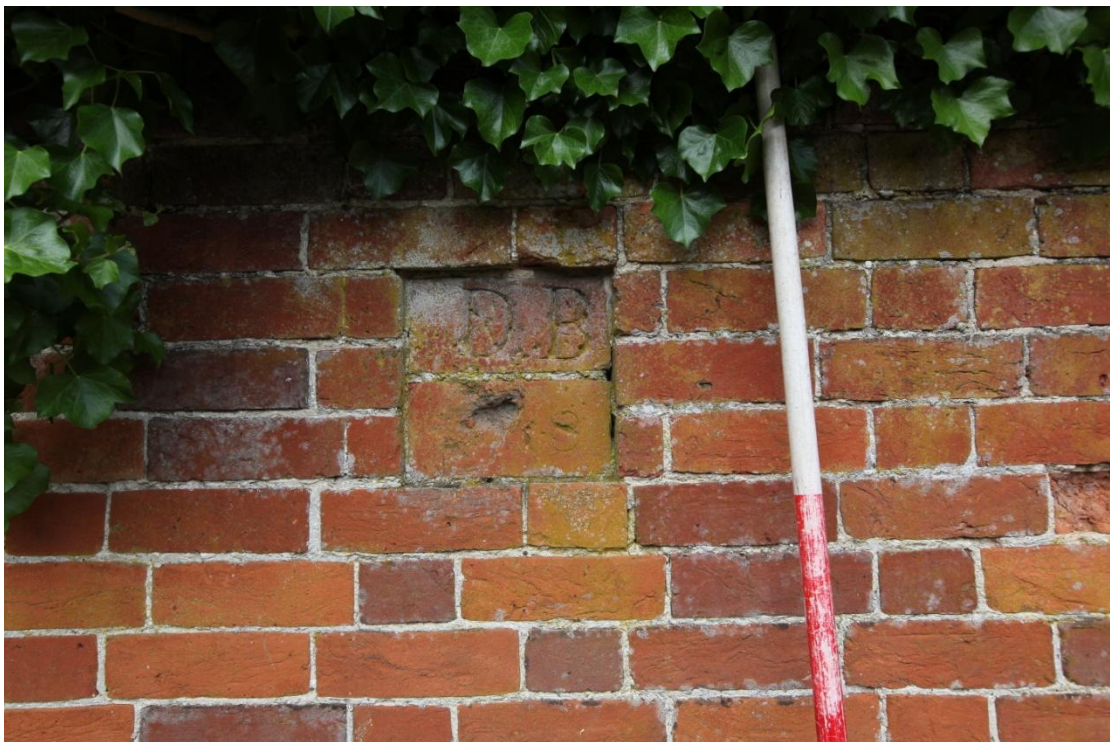
Illus. 21. The cart lodge's loft seen from the north (3) showing a boarded partition with grain bins visible through the door and substantial studs pegged to the roof-plate on the left. The narrow softwood rafters of the clapsed-purlin roof with nailed collars are typical of the mid- to late-19th century and appear to be replacements. The loft was inaccessible at the time of inspection and this image was taken through the floorboards.



Illus. 22. A detail of the partly rebuilt northern external gable of the small shelter-shed (5) with the cart lodge (3) and cart shed (4) in the rear. The shed's eastern wall consists of flint-rubble with red-brick dressing but the gable has always been of brick. The open-arcade to the west (right) is overgrown and was not fully accessible.



Illus. 23. The largely collapsed northern cattle shed viewed from the south-east (6) with its dated plaque to the left. Fragments of a flint-rubble eastern wall with red-brick dressing are hidden in the undergrowth and the doorway to the right of the scale rod is an original feature respected by closers – as is the former gateway on the left.



Illus. 24. A detail of the plaque to the southern exterior of the largely collapsed northern shed (6) showing the initials 'D B' with an illegible date ending in '8' – probably 1858 but possibly 1838. The initials are probably those of Daniel Barker was listed as a farmer in Leiston in White's Directory for 1844 and 55 and whose surname was added to the 1786 map.



VOLUME 2, CHAPTER 16, APPENDIX 16F : OFF-SITE DEVELOPMENTS
ASSESSMENT

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- Annex 16F.2 Geophysical Survey Report

1. Off-site Developments Terrestrial Historic Environment Assessment

1.1 Introduction

1.1.1 This appendix of **Volume 2** of the **Environmental Statement (ES)** presents an assessment of the Terrestrial Historic Environment effects arising from the construction and operation of the proposed off-site developments, including the the off-site sports facilities at Leiston, fen meadow compensation sites south of Benhall and east of Halesworth and, if required, the marsh harrier habitat improvement area (Westleton). They are referred to throughout this appendix as the ‘off-site developments’ or ‘the proposed development’.

1.1.2 Detailed descriptions of the proposed development sites (referred to throughout this volume as the ‘site’ as relevant to the location of the works), the proposed off-site development works and different construction and operational phases are provided in **Chapters 1 to 4** of this volume of the **ES**. A glossary of terms and list of abbreviations used in this chapter is provided in **Volume 1, Appendix 1A** of the **ES**.

1.1.3 This assessment has been informed by data from other assessments, as follows:

- **Volume 2, Chapter 12:** Noise and vibration.
- **Volume 2, Chapter 13:** Landscape and visual impact assessment.

1.1.4 This assessment has been informed by data presented in the following technical annexes:

- **Annex 16F.1:** Gazetteer of heritage assets.
- **Annex 16F.2:** Geophysical Survey Report. Please note that the red line boundary was amended after this survey was undertaken and therefore does not reflect the exact boundary in respect of which development consent has been sought in this application. However, the amendment to the red line boundary does not have any impact on the findings set out in this document and all other information remains correct.

1.2 Legislation, policy and guidance

1.2.1 **Volume 1, Appendix 6L** identifies and describes legislation, policy and guidance of relevance to the assessment of the potential Terrestrial Historic Environment impacts associated with the Sizewell C Project.

1.2.2 Furthermore, **Volume 2, Chapter 16** provides a description of legislation, policy and guidance relevant to the assessment of effects for the main development site of the Sizewell C Project.

1.2.3 There is no further legislation, policy and guidance over and above that described in **Volume 1, Chapter 6** and **Volume 2, Chapter 16** that is deemed relevant to the assessment of effects associated with the off-site development works.

1.3 Methodology

a) Scope of the assessment

1.3.1 The generic Environmental Impact Assessment (EIA) methodology is detailed in **Volume 1, Chapter 6**. The full method of assessment for Terrestrial Historic Environment that has been applied for the Sizewell C Project is included as an appendix to **Volume 1, Chapter 6 (Volume 1, Appendix 6L)**.

1.3.2 The scope of this assessment has been established through a formal EIA scoping process undertaken with the Planning Inspectorate. A request for an EIA scoping opinion was initially issued to the Planning Inspectorate in 2014, with an updated request issued in 2019. Comments raised in the EIA scoping opinion received in 2014 and 2019 have been taken into account in the development of the assessment methodology. These are detailed in **Volume 1, Appendices 6A and 6C**.

1.3.3 This section provides specific details of the Terrestrial Historic Environment screening exercise, as detailed below, methodology applied to the assessment of the proposed off-site development works screened in, and a summary of the general approach to provide appropriate context for the assessment that follows.

1.3.4 Where the proposed off-site development works are considered to have the potential for likely significant effects, these have been screened in for further assessment. The scope of assessment considers the impacts of the construction and operational use of the proposed off-site developments.

b) Consultation

1.3.5 The scope of the assessment has also been informed by ongoing consultation and engagement with statutory consultees throughout the design and assessment process. A summary of the comments raised regarding the assessment of off-site developments and EDF Energy's responses are detailed in **Table 1.1**.

Table 1.1: Summary of consultation responses that have informed the scope and methodology of the Terrestrial Historic Environment assessment.

Consultee	Date	Comment	EDF Energy Response.
Suffolk County Council Archaeological Service (SCCAS).	August 2019.	Sports facilities at Leiston require further evaluation to inform agreement of scheme of mitigation.	Geophysical survey has been undertaken and a scheme of mitigation will be agreed with SCCAS.
SCCAS	August 2019.	Fen meadow compensation sites require further evaluation to inform agreement of scheme of mitigation. Further information on likely disturbance would allow mitigation requirements to be refined.	Geophysical survey will be undertaken and a scheme of mitigation will be agreed with SCCAS.
SCCAS	August 2019.	The marsh harrier habitat improvement area (Westleton) includes significant recorded remains. Further evaluation works would be required where intrusive works are planned, though removal of areas from cultivation could be positive.	No intrusive works are planned at the marsh harrier habitat improvement area (Westleton) which would be over and beyond normal farming operations.

c) Environmental screening

1.3.6 An environmental screening exercise was undertaken to identify which of the off-site development works may give rise to environmental effects that could potentially be significant. This concluded that three off-site development works should be taken forward to the assessment of likely effects on Terrestrial Historic Environment.

1.3.7 Three of the off-site development works have been screened out of the Terrestrial Historic Environment assessment as they are not likely to give rise to significant environmental effects.

1.3.8 **Table 1.2** provides a summary of the environmental screening exercise.

Table 1.2: Summary of environmental screening exercise.

Proposed Off-site Developments.	Summary of Potential Effects.	Screened In or Out of the Assessment.
Sports facilities at Leiston.	It is not anticipated that the setting of any designated assets or historic landscape character would be affected. Known heritage assets in the immediate vicinity of the proposed development indicate the potential for surviving below-ground remains on site. Geophysical survey has been conducted to further investigate this potential. The results are pending. If archaeological	Screened in.

Proposed Off-site Developments.	Summary of Potential Effects.	Screened In or Out of the Assessment.
	remains are present, groundworks associated with the proposed development could adversely affect these remains, reducing or removing their ability to be further interpreted, resulting in a loss of archaeological interest.	
Fen meadow compensation site south of Benhall.	<p>It is anticipated that the work required for the proposed change to land management regime would not affect the setting of the listed building (LB II 1278152, Watering End) and historic landscape character would remain unaffected.</p> <p>Known heritage assets indicate the presence of prehistoric, Romano-British, and medieval activity in the vicinity of the site. There is the potential for surviving below-ground remains on site. It is anticipated that intrusive groundworks associated with the proposed development will be limited, and there is potential for groundworks to cause localised disturbance to sub-surface archaeological remains which may be present.</p>	Screened in.
Fen meadow compensation site east of Halesworth.	<p>It is not anticipated that the setting of any designated assets or historic landscape character would be affected.</p> <p>Known heritage assets indicate the presence of prehistoric, Romano-British, and medieval activity in the vicinity of the site, suggesting. There is a potential for surviving below-ground remains. It is anticipated that intrusive groundworks associated with the proposed development will be limited, and there is potential for groundworks to cause localised disturbance to sub-surface archaeological remains which may be present.</p>	Screened in.
Marsh harrier habitat improvement area - west of Westleton.	<p>It is not anticipated that the setting of any designated assets or historic landscape character would be affected.</p> <p>It is anticipated that there would be no intrusive groundworks associated with the proposed development. There is, therefore, no potential for groundworks to adversely affect any surviving sub-surface archaeological remains.</p> <p>The proposed development to preclude further damage to archaeological remains which may be present by removing them from ploughing. This could be positive but of insufficient magnitude to give rise to a significant effect.</p>	Screened out.

d) Study area

1.3.9 The study area includes the proposed off-site development sites and land immediately beyond them to a distance of 500 metres (m) (refer to **Figure 16F.1-3**).

e) Assessment scenarios

1.3.10 The Terrestrial Historic Environment assessment comprises the assessment of the entire construction and operational phases of the proposed development, rather than specific assessment years.

f) Assessment criteria

1.3.11 As described in **Volume 1, Chapter 6**, the EIA methodology considers whether impacts of the proposed off-site developments would have an effect on any resources or receptors. Assessments broadly consider the magnitude of impacts and value/sensitivity of resources/receptors that could be affected in order to classify effects.

1.3.12 A detailed description of the assessment methodology used to assess the potential effects on Terrestrial Historic Environment arising from the proposed off-site developments is provided in **Volume 1, Appendix 6L**.

g) Assessment methodology

1.3.13 Heritage assets were identified through:

- a search of the records held at the National Monuments Record and the Suffolk County Council (SCC) HER. The data search also included Portable Antiquities Scheme (PAS) information, these are only referred to in broad terms given their sensitive nature. These searches were conducted in August 2019;
- a search of the National Heritage List for England, which identifies all designated heritage assets in England, carried out in June 2019;
- analysis of the Historic Landscape Characterisation data for Suffolk, conducted in August 2019;
- a review of the two available Suffolk National Mapping Programme (NMP¹) data sets which had already been amalgamated into the Suffolk HER; and
- a review of the available Light Detecting and Ranging (LiDAR) data from Environment Agency Geomatics, obtained in April 2018.

1.3.14 Site investigations were carried out at the site in order to identify both known and previously unrecorded heritage assets (e.g. historic landscape features, extant earthworks). These surveys included:

¹ Project comprising large area archaeological survey, which mapped and recorded archaeological features using aerial photographs and airborne laser scanning (LiDAR) as the main sources.

- site visit (included within this assessment); and
 - detailed geophysical magnetometry survey for the sports facilities at Leiston (**Annex 16F.2**).
- 1.3.15 The full list of identified archaeological and historical sites, features and finds identified within the study area is presented in the gazetteer (**Annex 16F.1**) and illustrated on **Figures 16F.1-3**.
- 1.3.16 Direct effects on heritage assets are those which result from physical damage or disturbance which give rise to a loss of heritage significance. Consequently, it is only those assets which might be physically disturbed by (i.e. within the footprint of) the site which are potentially subject to direct effects. As archaeological features are not always evident, a Desk Based Assessment (DBA) was undertaken in 2019, to examine the potential presence of archaeological heritage assets within the proposed development layout and to ascertain the potential for heritage assets to be affected.
- 1.3.17 As conclusions from DBAs are predictive, there are some cases where the potential presence of heritage assets or their heritage significance remains difficult to state with confidence.
- 1.3.18 The results of further survey work, comprising geophysical survey (**Annex 16F.2**) in 2019 has also been incorporated into the assessment of effects of the sports facilities at Leiston.
- 1.3.19 Indirect effects have been defined as those which result in impact to heritage significance but do not give rise to physical damage or disturbance to the asset. In this context, these effects would generally arise through change to the settings of heritage assets. Historic England guidance (Ref 1.1) sets out a methodology for considering any effects on the heritage significance of heritage assets arising from changes to their setting. This is summarised in **Volume 1, Appendix 6L**.
- 1.3.20 The heritage assets identified within the data search comprise a number of different asset types with differing characteristics. These off-site development areas were identified after the Settings Assessment Scoping report (**Volume 1, Annex 6L.1**) was agreed. As a result, data searches included off-site heritage assets and the screening exercise summarised in **Table 1.2** has had regard to the specific nature of the setting of assets within the study area, and considers factors such as visibility of the proposed development in views of and from heritage assets as well as other potential perceptual change such as increased traffic movements and noise.

h) Assumptions and limitations

- 1.3.21 The following limitations have been identified:

- It has not been possible to agree access to all the off-site developments for survey at the time of writing. The proposed sports facilities at Leiston have been subject to magnetometry survey. DBA has been carried out for all the off-site developments and is included within this report.
- DBA is a predictive tool and relies on a series of assumptions and extrapolations to develop an understanding of the potential extent and character of archaeological remains within the site.
- Geophysical survey is based on taking physical measurements that may have a number of causes, and conclusions from this type of survey remain predictive, but allows more refined inferences to be drawn on the basis of the nature and morphology of discrete anomalies.
- Where assessment conclusions are based on desk-based or geophysical survey, the implications for the robustness of conclusions based on a reasonable worst-case is provided.

1.4 Assessment of effects

1.4.1 As identified in **section 1.3(c)**, sports facilities at Leiston and fen meadow compensation sites south of Benhall and east of Halesworth are considered to have the potential to result in significant environmental effects and have therefore been assessed in further detail.

1.4.2 **Table 1.3** summarises the outcome of the assessment of the likely effects of the off-site development works screened into the assessment. For each site the baseline environment is described and any environmental design and embedded mitigation is outlined, and a summary of the likely effects, before and after any additional mitigation and monitoring (if required) is provided.

Table 1.3: Summary of the assessment of effects for off-site developments.

Baseline Environment.	Environmental Design and Embedded Mitigation.	Assessment of Effects.	Additional Mitigation and Monitoring.	Residual Effect.
Sports facilities at Leiston.				
Current baseline There are no designated heritage assets in the site. Prehistoric remains are recorded to the south-east of the site (LCS	Construction None Operation None	Construction The proposed works could give rise to disturbance of archaeological remains, resulting in a high	Construction Adoption of an agreed written scheme of investigation. Operation None required.	Construction Minor adverse effect, which would be not significant. Operation No effect.

Baseline Environment.	Environmental Design and Embedded Mitigation.	Assessment of Effects.	Additional Mitigation and Monitoring.	Residual Effect.
<p>218 and LCS 175). Field systems have been identified at this site and c.520m east of the site (LCS 209). There is potential for archaeological remains of low to medium heritage significance, on the site.</p> <p>Future baseline There are no committed development(s) or forecasted changes that would materially alter the future baseline.</p>		<p>magnitude impact to remains of medium heritage significance resulting in a major adverse effect which would be significant in the absence of mitigation</p> <p>Operation No effect.</p>		
Fen Meadow compensation site south of Benhall.				
<p>Current baseline There are no designated heritage assets in the site. HER records of Neolithic, Bronze Age, Romano-British and medieval activity in the vicinity of the site (BNL004-5, SNF004, 006-009, FNM002) suggest a potential for remains of at most medium heritage significance to be present.</p> <p>Future baseline There are no committed development(s) or forecasted changes that would materially alter the future baseline.</p>	<p>Construction None</p> <p>Operation None</p>	<p>Construction The proposed works could give rise to disturbance of archaeological remains, resulting in, at worst, a medium magnitude of change to remains of at most medium heritage significance. This would represent a moderate adverse effect which would be significant in the absence of mitigation.</p> <p>Operation No effect.</p>	<p>Construction Adoption of an agreed scheme of archaeological investigation.</p> <p>Operation None required.</p>	<p>Construction Minor adverse effect, which would be not significant.</p> <p>Operation No effect.</p>

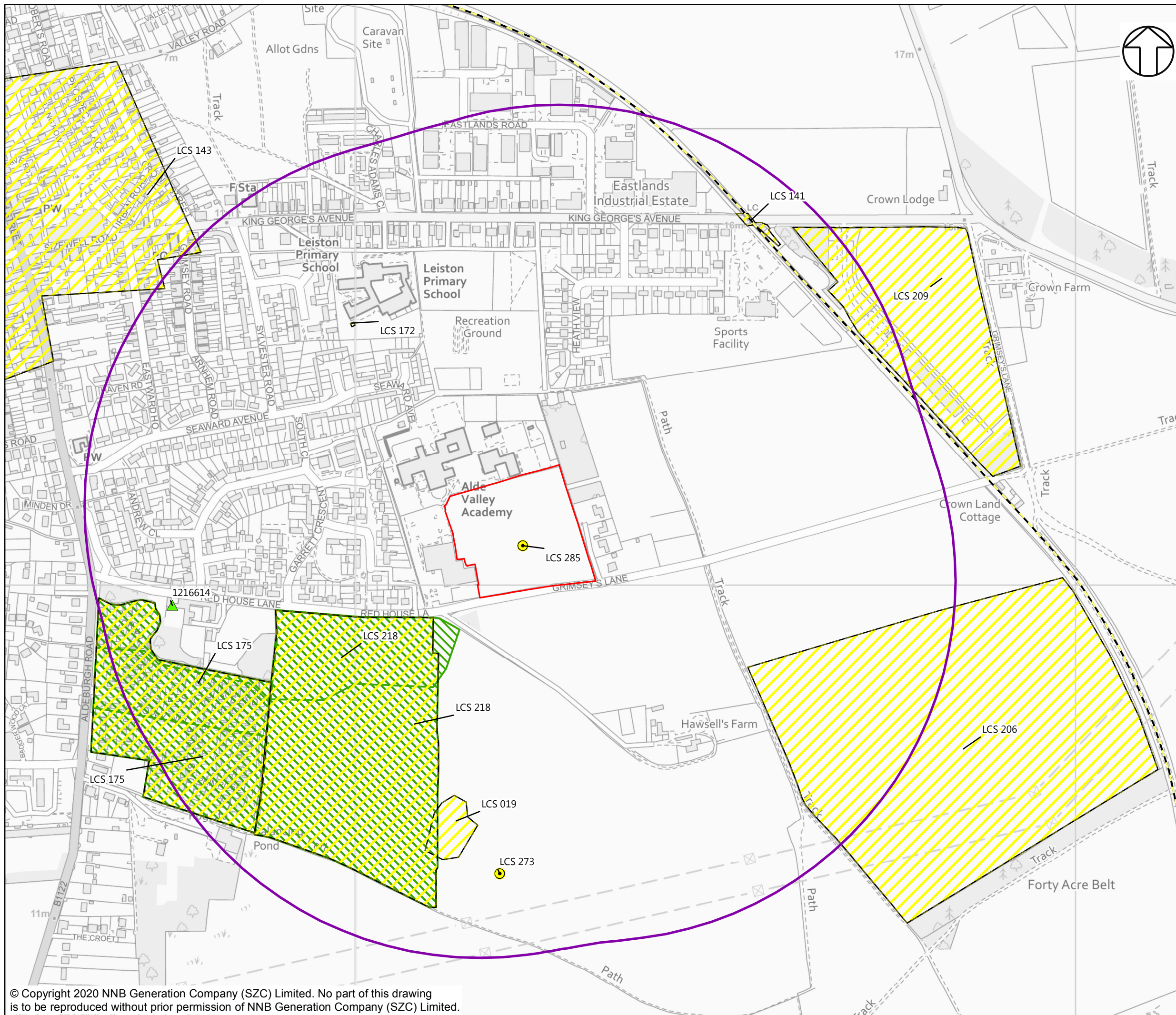
Baseline Environment.	Environmental Design and Embedded Mitigation.	Assessment of Effects.	Additional Mitigation and Monitoring.	Residual Effect.
Fen Meadow compensation site east of Halesworth.				
<p>Current baseline There are no designated heritage assets in the proposed development. Finds of flint flakes and Roman and medieval pottery are recorded at western and southern site boundaries (ESF23091), indicating a potential for remains of low or medium heritage significance.</p> <p>Future baseline There are no committed development(s) or forecasted changes that would materially alter the future baseline.</p>	<p>Construction None</p> <p>Operation None</p>	<p>Construction The proposed works could give rise to disturbance of archaeological remains, resulting in, at worst, a medium magnitude of change to remains of at most medium significance. This would represent a moderate adverse effect which would be significant in the absence of mitigation.</p> <p>Operation No effect.</p>	<p>Construction Adoption of an agreed scheme of archaeological investigation.</p> <p>Operation None required.</p>	<p>Construction Minor adverse effect, which would be not significant.</p> <p>Operation No effect.</p>

References

- 1.1 Historic England. Good Practice Advice in Planning Note 3: The Setting of Heritage Assets. 2017. (Online). Available from: <https://historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/>. (Accessed 27 August 2019).



VOLUME 2, CHAPTER 16, APPENDIX 16F, FIGURES 6F.1 - 6F.3



- NOTES**
SEE GAZETTEER (ANNEX16F.1) FOR HERITAGE ASSET RECORD NUMBERS AND DESCRIPTIONS
- KEY**
- OFFSITE SPORTS PITCHES
 - DEVELOPMENT SITE BOUNDARY
 - 500M STUDY AREA
 - ▲ GRADE II LISTED BUILDING
 - HER MONUMENT RECORD
 - ⊖ HER MONUMENT RECORD
 - HER MONUMENT RECORD
 - HER EVENTS RECORD
 - HER EVENTS RECORD

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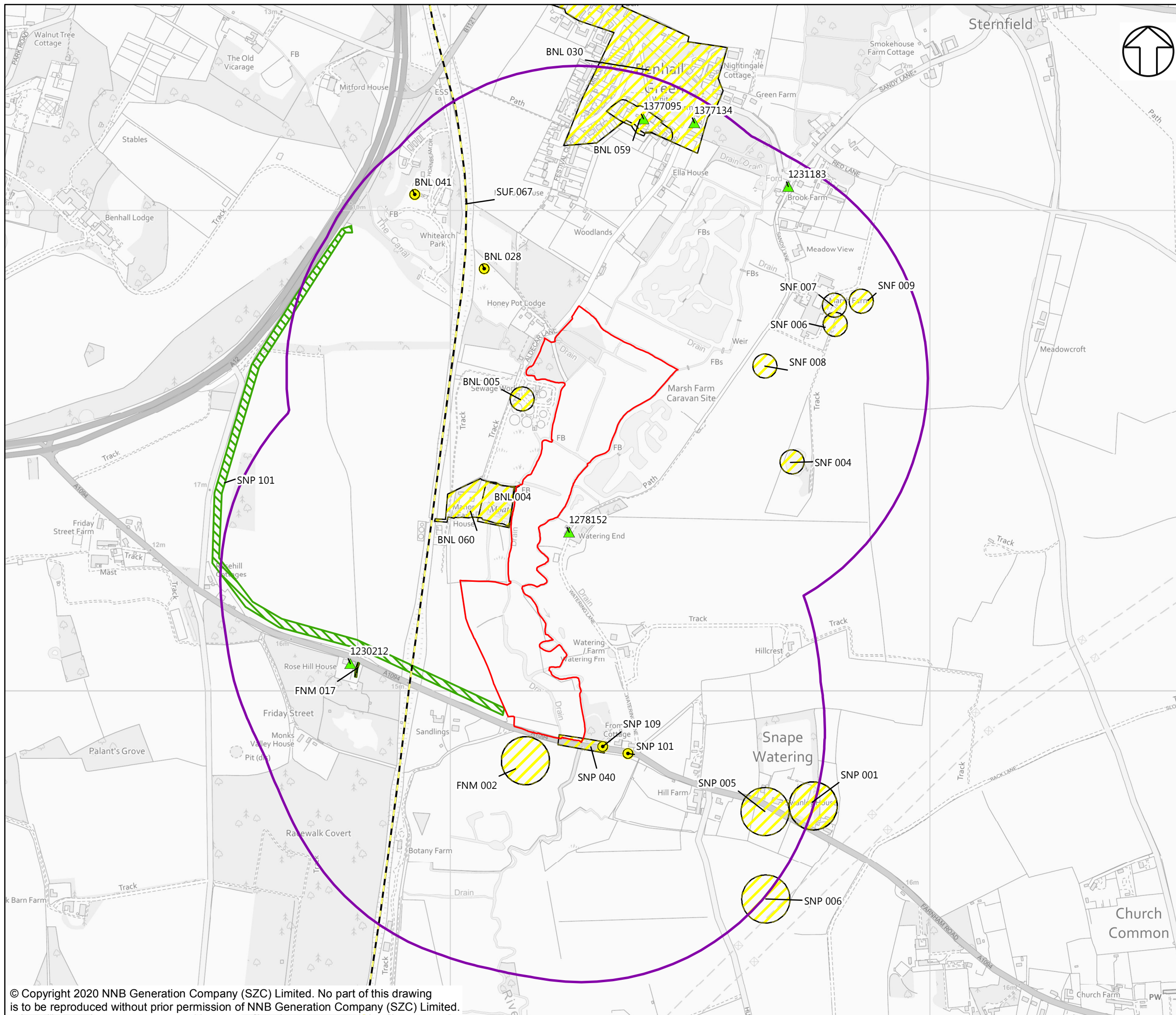
DOCUMENT:
SIZEWELL C
ENVIRONMENTAL STATEMENT
VOLUME 2
APPENDIX 16F
SIZEWELL C ES OFF-SITE DEVELOPMENTS
ASSESSMENT APPENDIX

DRAWING TITLE:
SPORTS FACILITIES AT LEISTON:
HERITAGE ASSETS

DRAWING NO:
FIGURE 16F.01

DATE: JAN 2020 **DRAWN:** V.P. **SCALE:** 1:5,000 @A3

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0 50 100 150 200 250
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- NOTES**
SEE GAZETTEER (ANNEX16F.1) FOR HERITAGE ASSET RECORD NUMBERS AND DESCRIPTIONS
- KEY**
- FEN MEADOW HABITAT DEVELOPMENT
 - SITE BOUNDARY
 - 500M STUDY AREA
 - ▲ GRADE II LISTED BUILDING
 - HER MONUMENT RECORD
 - HER MONUMENT RECORD
 - HER MONUMENT RECORD
 - HER EVENTS RECORD
 - HER EVENTS RECORD

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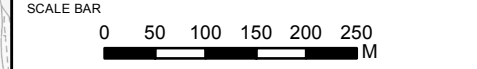


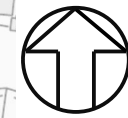
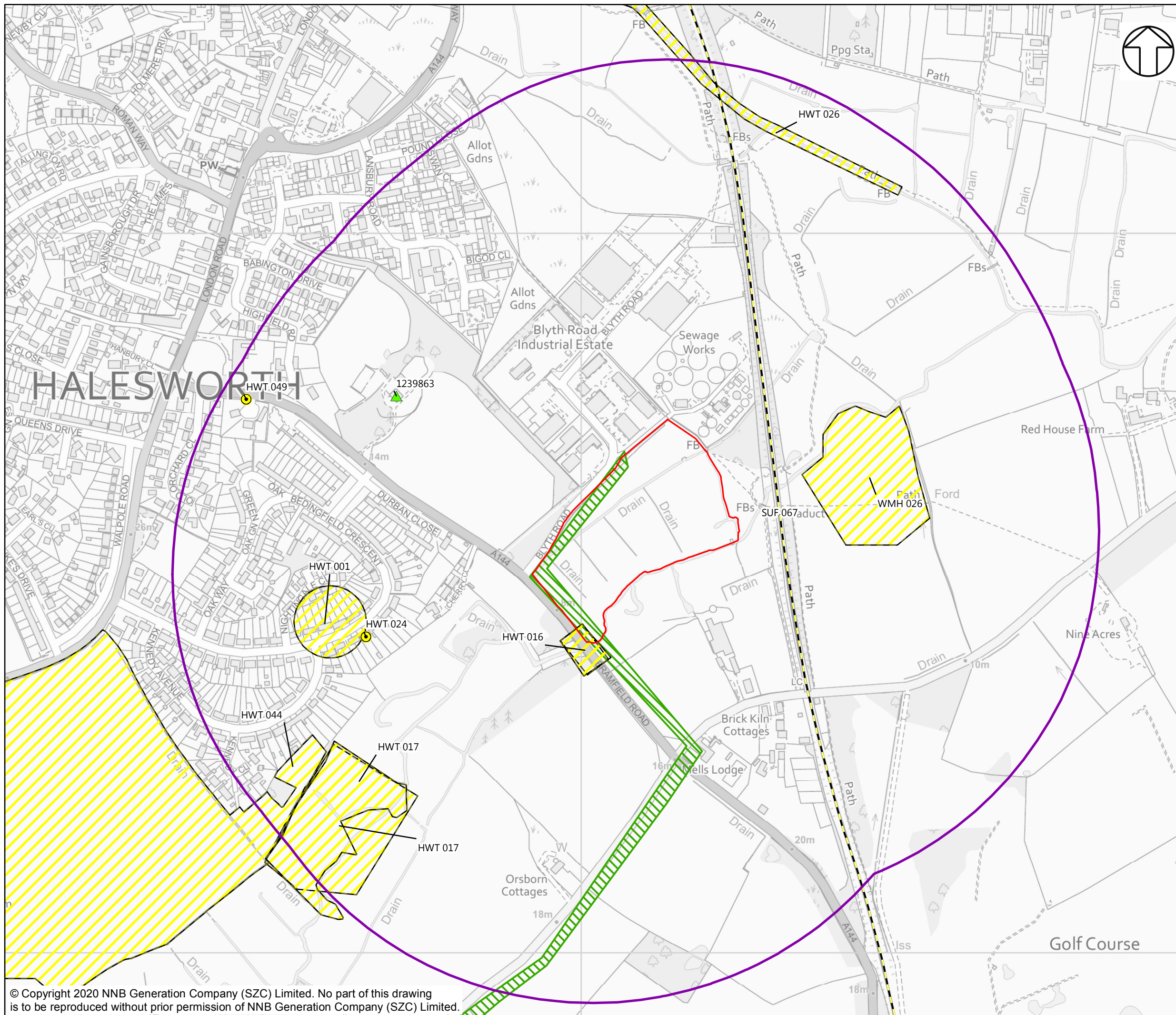
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APPENDIX 16F
SIZEWELL C ES OFF-SITE DEVELOPMENTS
ASSESSMENT APPENDIX

DRAWING TITLE:
FEN MEADOW COMPENSATION SITE SOUTH
OF BENHALL:
HERITAGE ASSETS

DRAWING NO:
FIGURE 16F.02

DATE: JAN 2020 **DRAWN:** V.P. **SCALE:** 1:7,500 @A3





NOTES

SEE GAZETTEER (ANNEX16F.1) FOR HERITAGE ASSET RECORD NUMBERS AND DESCRIPTIONS

KEY

- FEN MEADOW HABITAT DEVELOPMENT SITE BOUNDARY
- 500M STUDY AREA
- ▲ GRADE II LISTED BUILDING
- HER MONUMENT RECORD
- HER MONUMENT RECORD
- HER MONUMENT RECORD
- HER EVENTS RECORD
- HER EVENTS RECORD

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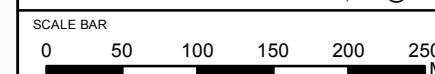


DOCUMENT:
 SIZEWELL C
 ENVIRONMENTAL STATEMENT
 VOLUME 2
 APPENDIX 16F
 SIZEWELL C ES OFF-SITE DEVELOPMENTS
 ASSESSMENT APPENDIX

DRAWING TITLE:
 FEN MEADOW COMPENSATION SITE EAST
 OF HALESWORTH:
 HERITAGE ASSETS

DRAWING NO:
 FIGURE 16F.03

DATE: JAN 2020 DRAWN: V.P. SCALE: 1:5,000 @A3





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Plates

None provided.

Figures

None provided.

1. Gazetteer of Heritage Assets

Table 1.1 Listed buildings within study area

Historic England List Entry	Name	Grade	Easting	Northing
1030689	Vale House	II	643123	268175
1030690	Village Hall	II	644046	269061
1030691	Crown Inn	II	644050	269004
1030692	The Grange	II	643741	269001
1198558	Lavender Cottage	II	644008	269050
1198585	Mulley's Cottage	II	644142	268863
1198596	The Old School House	II	644068	269070
1198621	Holly Tree Cottage	II	644156	269121
1198627	Moor House	II	644007	268918
1216614	Red House	II	644745	261973
1227755	Nos. 1-4, Church Road	II	643941	266238
1227756	Church of St Peter	I	643729	265918
1227758	The Old Rectory	II	643566	265973
1227759	Stable Block 10 metres to south of The Lion Public House	II	643764	265806
1227920	Lilycot	II	644005	266242
1227936	The Old Thatched Cottage	II	645225	266170
1228180	Thatched House The Cottage	II	643773	265872
1228262	The Cottage	II	644676	265713
1228263	Flash Cottages	II	644646	265705
1228265	Woodview	II	644673	265856
1228266	Bob's Cottage	II	644601	265220
1228267	Potter's Farmhouse	II	644981	265185
1228268	Theberton House Stables	II	644550	265161

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Historic England List Entry	Name	Grade	Easting	Northing
1228269	Gateway 45 metres north of main entrance to Theberton House	II	644526	265146
1228270	Barn 30 metres south east of Old Manor House	II	643632	265883
1228378	Theberton House	II*	644524	265111
1228384	Old Manor House	II	643618	265920
1230212	Rose Hill House	II	637791	260058
1231183	Brook Farmhouse	II	638704	261051
1239863	South Lodge	II	638742	276774
1278152	Watering End	II	638247	260331
1283774	Chatburn Farmhouse	II	642912	268967
1283793	St Peter's Church	II*	643943	269036
1287235	Walls enclosing garden 60 metres to north of Theberton House and greenhouse at north end	II	644511	265184
1287237	Gate and gate piers 105 metres south east of main entrance to Theberton House	II	644567	265011
1287260	gate and gate piers 80 metres north west of main entrance to Theberton house	II	644432	265129
1287282	Flint House	II	643814	265810
1287303	Gate and gate piers at junction of Leiston Road and Onner's Lane	II	644023	265523
1287530	Sweet Briar Cottage	II	644928	266192
1287533	The Lion Public House	II	643764	265824
1377095	Whitehouse Farmhouse	II	638402	261192
1377134	28, Benhall Green	II	638508	261184

Historic England List Entry	Name	Grade	Easting	Northing
1377228	Vine Cottage	II	644134	269215
	Apple Tree Cottage			
1377229	South West Cottage	II	644167	269135
1391780	The Croft	II	644059	268797
1392677	Cottages to the NE of Westleton Grange	II	643794	269071

Table 1.2 HER monument records within study area

Parish Reference	Monument Number	Name	HER Summary Description	Period	Easting	Northing
BNL 028	MSF23041	'Near Saxmundham'	NOTE - confidential location. May 2006: Ewart Park phase Late Bronze Age hoard metal detected over circa 100m area. Finds consist of 60 small fragments: 2 sword; 4 spearhead; 10 socketed axe (3 decorated); 9 unknown bronze objects; 32 ingot & 3 other.	Late Bronze Age	638070	260880
BNL 041	MSF13082	Medieval pottery, White Arch Covert	Watching brief of area being excavated for fishing lakes in valley bottom, utilizing course of 'The Canal'. Formerly recorded as BNL MISC.	Medieval	637925	261035
DAR 043	MSF1945	Findspot of a Neolithic flint knife	Flint 'knife', Mes/Neo from TM 424 694 (S1). Formerly recorded as DAR MISC.	Neolithic	642450	269450
HWT 024	MSF22987	53 Bedingfield Crescent	Leaf shaped arrowhead found in 1989.	Neolithic	638700	276440
HWT 049	MSF35360	Milestone on the A144	Extant milestone on the A144	Post Medieval	638533	276770
LCS 272	MSF26866	Mill Hill (tithe)	Approximate location of former windmill suggested by 'Mill Hill' name in tithe (S1)(R1). Formerly recorded as LCS MISC.	Medieval to IPS: Post Medieval	644000	267800
LCS 275	MSF38060	OUTLINE RECORD: Area 3 Sizewell C (SGL) GEO	n/a	Unknown	645721	265622

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Parish Reference	Monument Number	Name	HER Summary Description	Period	Easting	Northing
LCS 276	MSF38061	OUTLINE RECORD: Area 4 Sizewell C (SGL) GEO	n/a	Unknown	645755	265305
SNP 101	MSF30553	OUTLINE RECORD: BENHALL TO SNAPE MAINS - MON (NPS)	n/a	Unknown	638370	259870
SNP 109	MSF35357	Milestone on the A1094	Milestone on the A1094 at Snape Watering.	Post Medieval	638317	259884
THB 010	MSF30765	Milestone on the B1122	Milestone on the B1122	Post Medieval	643649	265963
THB 012	MSF30766	OUTLINE RECORD: FIELD SYSTEM	n/a	Unknown	643900	265800
THB 013	MSF21751	Forged bronze spearhead with single peg hole found some years ago in a garden (S1).	Forged bronze spearhead with single peg hole found some years ago in a garden (S1).	Unknown	644334	266154
THB 025	MSF30771	Medieval pottery shard	Medieval pottery sherd found during an archaeological evaluation.	Unknown	643751	265787
THB 026	MSF31262	Medieval pottery found at Chiquita, Church Road, Theberton	Medieval pottery shards found in the subsoil during an archaeological monitoring.	Unknown	643867	265981
THB 040	MSF36477	OUTLINE RECORD: Roman copper alloy openwork mount (PAS)	Included in the Proceedings of the Suffolk Institute of Archaeology and History annual round up of individual finds and discoveries for 2016.	Unknown	644191	265568
THB 044	MSF38031	OUTLINE RECORD: The Old Manor,		Unknown	643617	265918

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Parish Reference	Monument Number	Name	HER Summary Description	Period	Easting	Northing
		Pretty Road (LA) HAA				
THB 047	MSF38721	OUTLINE RECORD: Sizewell C Theberton Area 5 (SGL) GEO		Unknown	643981	265382
WLN 048	MSF30988	OUTLINE RECORD: WOODLANDS, DUNWICH RD - EVAL (LE)		Unknown	644300	269200
WLN 053	MSF27418	Fenstreet DMV	Deserted Medieval Village at Fenstreet, Westleton.	Medieval	643500	268000
WLN 109	MSF10869	Rebuilding of brick wall of old Smithy revealed wall construction was of clay lump (circa 9"x9"x18" blocks) on brick plinth	Rebuilding of brick wall of old Smithy revealed wall construction was of clay lump (circa 9"x9"x18" blocks) on brick plinth. Formerly recorded as WLN MISC.	Post Medieval	644025	268955
WLN 116	MSF11836	Medieval pottery sherds, The Street	Three body sherds Med coarseware (C13/C14) and 1 body shard glazed Med jug, ? C14/C15, found during watching brief on small building site in centre of village (S1). Formerly recorded as WLN MISC.	Medieval	644035	268935
WLN 117	MSF38513	OUTLINE RECORD: The Vicarage, Darsham Road (CAS) EVL		Unknown	643940	269117

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Parish Reference	Monument Number	Name	HER Summary Description	Period	Easting	Northing
SUF 067	MSF34987	East Suffolk railway line	East Suffolk railway line between Ipswich and Lowestoft.	19th century to IPS: Modern	634558	268468
LCS 019	MSF14092	Agricultural pit of negligible archaeological significance	A pit, probably relating to post medieval or modern agricultural activity and of negligible archaeological significance, is visible as an earthwork and soilmark on aerial photographs. It had been recorded previously as a possible enclosure.	Post Medieval to IPS: Modern	645130	261670
LCS 141	MSF26876	Sizewell Crossing	Sizewell Crossing and crossing keeper's cottage, built 1859 or 1860. Line closed by 1994 (S2). Cottage extant.	19th century to 20th century	645568	262494
LCS 143	MSF22245	Medieval town of Leiston.	Leiston Medieval Town.	Medieval to IPS: Post Medieval	644486	262486
LCS 172	MSF27177	Cremation in pot	Cremation in pot found by builders during groundworks (2012) , reburied, see details.	Bronze Age	644996	262363
LCS 175	MSF29487	Early Neolithic cluster pits, Bronze Age ring ditch, pits and ditches	Early Neolithic activity/cluster pits and Late Bronze Age ring ditch, pits and ditches, possible remnants of a contemporary field system. Roman rectilinear field system also identified.	Early Neolithic to IPS: Post Medieval	644757	261820
LCS 206	MSF33438	Site of Leiston Very High Frequency (VHF) Fixer Station	A World War Two direction finding (D/F) station (or a similar type of communications/navigation	Second World War to Cold War	645830	261771

NOT PROTECTIVELY MARKED

Parish Reference	Monument Number	Name	HER Summary Description	Period	Easting	Northing
			site), which remained in use into the Cold War period under the Rotor programme, is visible as a group of structures, connected by pathways, on aerial photographs.			
LCS 209	MSF33434	Site of fragmentary cropmarks of unknown date and significance	Fragmentary cropmarks, of uncertain date and archaeological significance, are visible on aerial photographs. They could represent former field boundaries.	Unknown	645765	262325
LCS 218	MSF33815	Bronze Age/Early Iron Age settlement activity at Land south of Red House Lane, Leiston (Excavation pending)	Middle-late Bronze Age to early Iron Age settlement activity identified by field boundaries, possible roundhouses, pits in a ditched enclosure and urned cremation.	Middle Bronze Age to IPS: Post Medieval	644987	261760
LCS 019	MSF14092	Agricultural pit of negligible archaeological significance	A pit, probably relating to post medieval or modern agricultural activity and of negligible archaeological significance, is visible as an earthwork and soilmark on aerial photographs. It had been recorded previously as a possible enclosure.	Post Medieval to IPS: Modern	645130	261670
LCS 141	MSF26876	Sizewell Crossing	Sizewell Crossing and crossing keeper's cottage, built	19th century to 20th century	645568	262494

NOT PROTECTIVELY MARKED

Parish Reference	Monument Number	Name	HER Summary Description	Period	Easting	Northing
			1859 or 1860. Line closed by 1994 (S2). Cottage extant.			
LCS 143	MSF22245	Medieval town of Leiston.	Leiston Medieval Town.	Medieval to IPS: Post Medieval	644486	262486
LCS 172	MSF27177	Cremation in pot	Cremation in pot found by builders during groundworks (2012) , reburied, see details.	Bronze Age	644996	262363
LCS 175	MSF29487	Early Neolithic cluster pits, Bronze Age ring ditch, pits and ditches	Early Neolithic activity/cluster pits and Late Bronze Age ring ditch, pits and ditches, possible remnants of a contemporary field system. Roman rectilinear field system also identified.	Early Neolithic to IPS: Post Medieval	644757	261820
LCS 206	MSF33438	Site of Leiston Very High Frequency (VHF) Fixer Station	A World War Two direction finding (D/F) station (or a similar type of communications/navigation site), which remained in use into the Cold War period under the Rotor programme, is visible as a group of structures, connected by pathways, on aerial photographs.	Second World War to Cold War	645830	261771
LCS 209	MSF33434	Site of fragmentary cropmarks of unknown date and significance	Fragmentary cropmarks, of uncertain date and archaeological significance, are visible on aerial photographs. They could represent former field boundaries.	Unknown	645765	262325

NOT PROTECTIVELY MARKED

Parish Reference	Monument Number	Name	HER Summary Description	Period	Easting	Northing
LCS 218	MSF33815	Bronze Age/Early Iron Age settlement activity at Land south of Red House Lane, Leiston (Excavation pending)	Middle-late Bronze Age to early Iron Age settlement activity identified by field boundaries, possible roundhouses, pits in a ditched enclosure and urned cremation.	Middle Bronze Age to IPS: Post Medieval	644987	261760
LCS 273	MSF26867	Mill Piece (tithe)	Approximate location of former windmill suggested by 'Mill Piece' name in tithe (S1)(R1). Formerly recorded as LCS MISC	Medieval to IPS: Post Medieval	645200	261600
LCS 285	MSF38798	OUTLINE RECORD: Sizewell C Leiston (SGL) GEO	n/a	Unknown	645232	262055
ADB 226	MSF35003	Aldeburgh branch railway line	Aldeburgh to Saxmundham branch line	19th century to IPS: Modern	642577	260504
LCS 019	MSF14092	Agricultural pit of negligible archaeological significance	A pit, probably relating to post medieval or modern agricultural activity and of negligible archaeological significance, is visible as an earthwork and soilmark on aerial photographs. It had been recorded previously as a possible enclosure.	Post Medieval to IPS: Modern	645130	261670
LCS 143	MSF22245	Medieval town of Leiston.	Leiston Medieval Town.	Medieval to IPS: Post Medieval	644486	262486
LCS 141	MSF26876	Sizewell Crossing	Sizewell Crossing and crossing keeper's cottage, built 1859 or 1860. Line closed by 1994 (S2). Cottage extant.	19th century to 20th century	645568	262494

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Parish Reference	Monument Number	Name	HER Summary Description	Period	Easting	Northing
LCS 172	MSF27177	Cremation in pot	Cremation in pot found by builders during groundworks (2012) , reburied, see details.	Bronze Age	644996	262363
LCS 175	MSF29487	Early Neolithic cluster pits, Bronze Age ring ditch, pits and ditches	Early Neolithic activity/cluster pits and Late Bronze Age ring ditch, pits and ditches, possible remnants of a contemporary field system. Roman rectilinear field system also identified.	Early Neolithic to IPS: Post Medieval	644757	261820
LCS 209	MSF33434	Site of fragmentary cropmarks of unknown date and significance	Fragmentary cropmarks, of uncertain date and archaeological significance, are visible on aerial photographs. They could represent former field boundaries.	Unknown	645765	262325
LCS 206	MSF33438	Site of Leiston Very High Frequency (VHF) Fixer Station	A World War Two direction finding (D/F) station (or a similar type of communications/navigation site), which remained in use into the Cold War period under the Rotor programme, is visible as a group of structures, connected by pathways, on aerial photographs	Second World War to Cold War	645830	261771
LCS 218	MSF33815	Bronze Age/Early Iron Age settlement activity at Land south of Red House Lane,	Middle-late Bronze Age to early Iron Age settlement activity identified by field boundaries, possible	Middle Bronze Age to IPS: Post Medieval	644987	261760

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Parish Reference	Monument Number	Name	HER Summary Description	Period	Easting	Northing
		Leiston (Excavation pending)	roundhouses, pits in a ditched enclosure and urned cremation.			

(Details taken from Suffolk County Council Archaeological Service (SCCAS) HER entry; Key: Neo - Neolithic; Rom – Romano British, Sax – Saxon, Med – Medieva PMed – PostMedieval; IPS – Ipswich; AP – Aerial Photography; C – century, ?/unc - uncertainty)

Table 1.3 HER event records within study area

Parish Reference	Event ID	Name	HER Summary Description	Easting	Northing
Multiple	ESF26558	Geophysical Survey - Sizewell C, Darsham and Leiston		643893	266596
WLN 117	ESF26704	Evaluation - The Vicarage, Westleton	n/a	643940	269117
	ESF26746	Geophysical Survey - Sizewell C, Various Sites	n/a	641404	266331
	ESF26790	Evaluation - Link Road, Sizewell C	n/a	641400	266432
	ESF23091	Monitoring - Huntingfield and Cratfield Sewage Scheme	Pipeline route walked after pipe had gone in - spoil examined (pipeline noticed in passing).	631142	275259
FNM 017	ESF19878	Monitoring at Rosehill House	Monitoring of the groundworks revealed no archaeological features or finds (S1).	637804	260043
FNM 017	ESF20391	Building Recording, Outbuildings at Rosehill House, Farnham	A written and photographic record at English Heritage (2006) Level 2 of a group of brick outbuildings at Rosehill House and is intended to fulfil a condition of planning permission for conversion to holiday accommodation.	637805	260044
LCS 154	ESF20234	Land near Upper Abbey Farm, Eastbridge Road	An evaluation was carried out in advance of the construction of eight wildlife ponds and associated works. Eight trenches (total area 75.80m ²) were excavated, representing approximately 7% of the area affected by the proposed development.	645152	264770
LCS 224	ESF26106	Detailed Documentary Study - Sizewell C: Historic Environment	Detailed documentary research was conducted for Sizewell C site using all	647329	263830

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Parish Reference	Event ID	Name	HER Summary Description	Easting	Northing
			known and accessible primary sources relating to Sizewell from the late 13th century until the 1850s have been examined for this study (S1).		
SNP 101	ESF22017	Monitoring, Along the Route of the Benhall to Snape Mains Scheme	PROJECT DETAILS An archaeological watching brief was conducted for Essex and Suffolk Water ahead of the installation of a water main between the parishes of Benhall and Snape in Suffolk.	637529	260460
THB 025	ESF22179	Evaluation - Land To Rear Of The Lion PH, Leiston Road, Theberton, Suffolk	Evaluation trenching for a small residential development of two dwellings within the village and some 40m back from the road frontage did not reveal any archaeological features or any finds of pre 1900 date save one small shard of medieval pottery.	643755	265782
THB 026	ESF24335	Monitoring - Chiquita, Church Road	Archaeological monitoring of ground works for a new house did not reveal any archaeological features. Stray finds of 11th-12th century pottery shards were found in the stripped subsoil.	643869	265983
THB 037	ESF23061	Evaluation, Adjacent The Old Manor, Pretty Rd, Theberton	Evaluation trenching for a single dwelling development. No archaeological features or finds were recorded. The historic land surface of the site has been truncated.	643664	265892
WLN 005	ESF20046	Evaluation, St Peter's Church, Westleton	An examination of two test pits within the church did not reveal any earlier floor surfaces, just a single fragment of possible medieval floor tile was recovered.	643927	269037

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Parish Reference	Event ID	Name	HER Summary Description	Easting	Northing
WLN 049	ESF20977	Crown Inn, Westleton	An archaeological monitoring was carried out during ground reduction for the construction of new accommodation blocks and some underground gas tanks.	644056	268989
WLN 049	ESF20977	Crown Inn, Westleton	An archaeological monitoring was carried out during ground reduction for the construction of new accommodation blocks and some underground gas tanks. It revealed a natural stratum of laminated sands overlaid by a buried soil horizon interpreted as a typ	644056	268989
WLN 103	ESF24501	Evaluation - Land off Mill Street, Westleton	Two trenches were excavated as part of an evaluation in advance of a new dwelling to be positioned on land off Mill Street, Westleton. No archaeological features, deposits or finds were identified.	644128	268809
WLN 104	ESF25837	Evaluation - Greenways, Mill Street, Westleton	Evaluation trenching was carried out for a single dwelling development. One trench was excavated to a depth of 0.7m-0.9m with the local glaciofluvial deposit at the site being pale grey sand with areas of dark brown iron panning. Below the 0.4m of topsoil	644119	268845
WLN 105	ESF26753	Historic Asset Assessment - Holly Tree Cottage, Westleton	Brief assessment focused on the first floor ceilings of the cottage and is intended to inform and accompany an application for listed building consent to Suffolk Coastal District Council. The site was inspected on June 8th 2015.	644154	269121
WLN 107	ESF26667	Westleton School/Village Hall	Heritage Statement	644057	269067

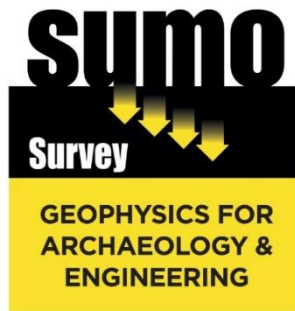
NOT PROTECTIVELY MARKED

Parish Reference	Event ID	Name	HER Summary Description	Easting	Northing
LCS 175	ESF25556	Geophysical Survey - Land off Aldeburgh Road, Leiston	Geophysical survey prior to a residential development. Readings were taken at 0.25m intervals along 1m traverses. Anomalies were detected that could be of archaeological origin. They principally comprise a number of possible ditches and pits.	644757	261820
LCS 175	ESF25304	Evaluation - Land Opposite 18-30A Aldeburgh Road, Leiston	Archaeological evaluation in advance of a proposed residential development. 32 trenches were excavated across 5ha. The trenches were between 25m and 37m long and 2m wide. Trenches 1 and 26 were excavated to 4m wide.	644757	261820
LCS 175	ESF25654	Archaeological Excavation at Land opposite 18-30A Aldeburgh Road	Excavation of an 1.45ha area was undertaken in advance of residential development. Preceding geophysical survey and trial trenching had demonstrated the presence of significant archaeological remains.	644757	261852
LCS 218	ESF23221	Evaluation - Land at Red House Lane, Leiston	Trial trench evaluation excavated 27 trenches in advance of the construction of residential development on the c.8.5ha site. A programme of magnetometry geophysical survey was carried out in advance of the evaluation.	644987	261760
LCS 218	ESF23212	Geophysical Survey - Land south of Red House Lane, Leiston	A detailed gradiometry survey was conducted over approximately 8.2ha of agricultural land. The survey has identified a former enclosure of unknown date. All of	644987	261760

NOT PROTECTIVELY MARKED

Parish Reference	Event ID	Name	HER Summary Description	Easting	Northing
			the other anomalies detected are modern in origin.		
LCS 218	ESF25659	Excavation - Land south of Red House Lane, Leiston	Between the 22nd January and 16th February 2018 Oxford Archaeology East (OA East) carried out excavations at Land South of Red House Lane, Leiston, Suffolk.	645012	261903

(Details taken from SCCAS HER entry)



GEOPHYSICAL SURVEY REPORT

**Leiston Leisure Centre Sport Pitches,
Sizewell, Suffolk**

Client

Cotswold Archaeology

For

EDF Energy

Survey Report

14282J

Date

June 2019



Survey Report 14282J: Leiston Leisure Centre Sport Pitches, Sizewell, Suffolk

Survey dates	28 - 29 May 2019
Field co-ordinator	Matthew Jackson BA MSc
Field Team	Amy Dunn BA
Report Date	27 June 2019
CAD Illustrations	Joe Perry BA
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2. SURVEY TECHNIQUE

Detailed magnetic survey (magnetometry) was chosen as the most efficient and effective method of locating the type of archaeological anomalies which might be expected at this site.

Bartington Grad 601-2 Traverse Interval 1.0m Sample Interval 0.25m

3 SUMMARY OF RESULTS

- 3.1 The geophysical survey at Leiston Leisure Centre Sport Pitches, Sizewell, Suffolk detected no anomalies of archaeological interest. Ferrous responses and an area of disturbance were recorded. Natural magnetic variations in the local geology have been noted.

4 INTRODUCTION

- 4.1 **SUMO Geophysics Ltd** were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by **Cotswold Archaeology** on behalf of **EDF Energy**.

4.2 Site details

NGR / Postcode	TM 452 620 / IP16 4LS
Location	The site is located 2km south-west of Sizewell power station and 7km south-east of Saxmundham. The survey area is bounded by Grimsey's Lane to the south, Leiston Leisure Centre to the west, Alde Valley Academy to the north and residential housing to the east.
HER	Suffolk
HER Code	sumogeop1-339765
OASIS Ref.	LCS 285
District	East Suffolk
Parish	Leiston
Topography	Flat
Current Land Use	Leiston Leisure Centre Sport Pitches
Geology (BGS 2019)	Bedrock: Crag group - sand. Superficial: Lowestoft formation - diamicton.
Soils (CU 2019)	Soilscape 7: Freely draining slightly acid but base-rich soils
Archaeology	None known within the survey area.
Survey Methods	Magnetometer survey (fluxgate gradiometer)
Study Area	2.3 ha

4.3 Aims and Objectives

To locate and characterise any anomalies of possible archaeological interest within the study area.

5 RESULTS

5.1 ***Probable / Possible Archaeology***

5.1.1 No magnetic responses have been recorded that could be interpreted as being of archaeological interest.

5.2 ***Natural / Geological / Pedological***

5.2.1 Poorly defined anomalies which are sinuous and amorphous in shape are likely to be of natural origin, probably relating to pedological variations or possibly landscaping of the sports ground.

5.3 ***Ferrous / Magnetic Disturbance***

5.3.1 A small rectilinear area of magnetic disturbance recorded in the centre of the survey area is associated with a cricket pitch, presumably reflecting artificially made ground.

5.3.2 Large magnetically strong isolated anomalies in the survey area are due to goalposts for hockey, rugby and football.

5.3.3 Ferrous responses close to boundaries are due to adjacent fences and gates. Smaller scale ferrous anomalies ("iron spikes") are present throughout the data and are characteristic of small pieces of ferrous debris (or brick / tile) in the topsoil; they are commonly assigned a modern origin. Only the most prominent of these are highlighted on the interpretation diagram.

6 DATA APPRAISAL & CONFIDENCE ASSESSMENT

6.1 Historic England guidelines (EH 2008) Table 4 states that the typical magnetic response on the local soils / geology is poor. The results from this survey are dominated by ferrous responses. Elsewhere, there is no *a priori* reason why the technique would not have detected archaeological features.

7 CONCLUSION

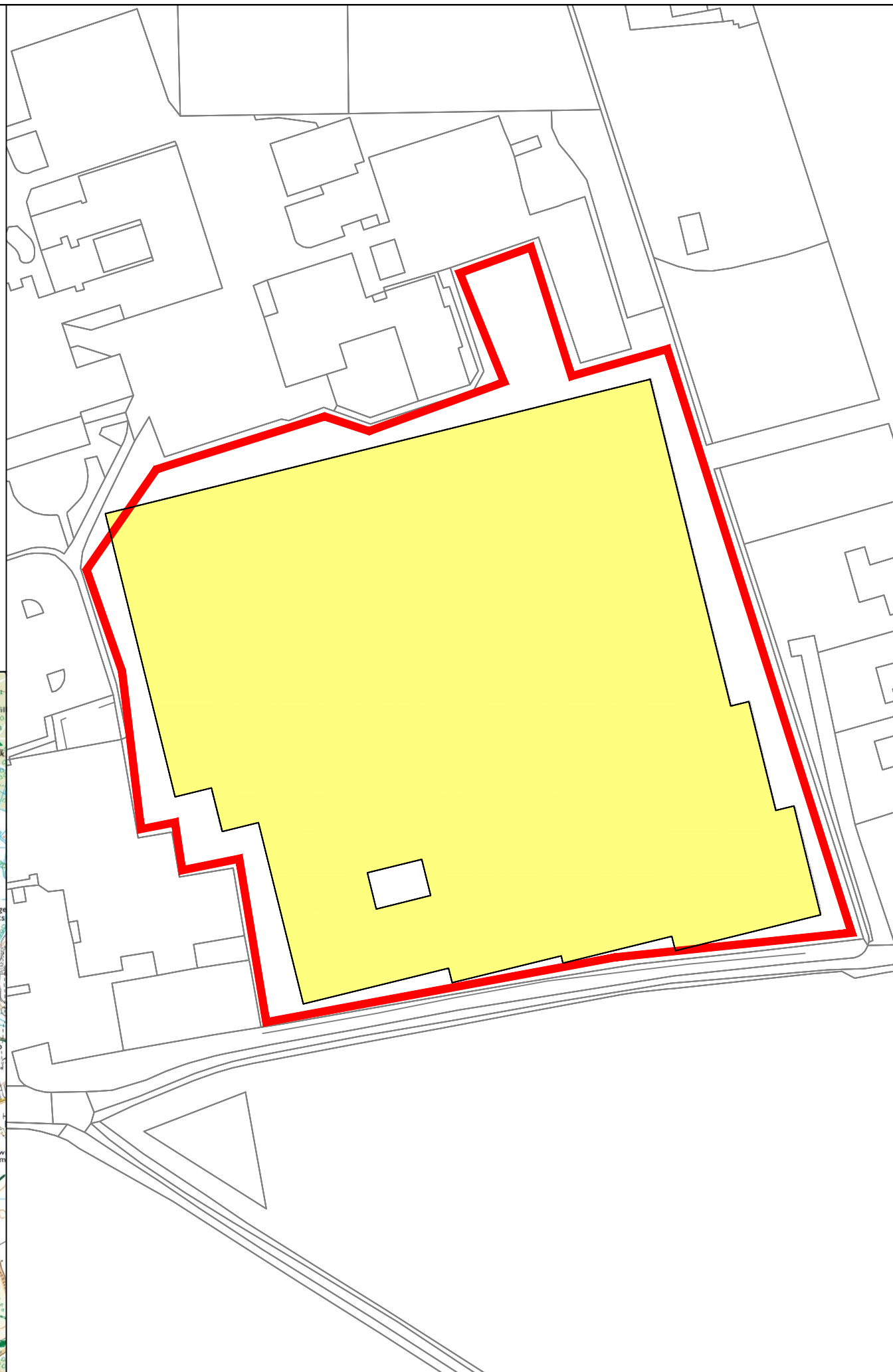
7.1 The survey has not identified any responses of archaeological interest. Ferrous responses and an area of magnetic disturbance are attributed to Leiston Leisure Centre. Localised pedological changes are recorded in the data.

8 REFERENCES



- BGS 2019 British Geological Survey, Geology of Britain viewer [accessed 27/06/2019] *website*: (<http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps>)
- ClfA 2014 *Standard and Guidance for Archaeological Geophysical Survey*. Amended 2016. ClfA Guidance note. Chartered Institute for Archaeologists, Reading
http://www.archaeologists.net/sites/default/files/ClfAS%26GGeophysics_2.pdf
- CU 2019 The Soils Guide. Available: www.landis.org.uk. Cranfield University, UK. [accessed 27/06/2019] *website*: <http://mapapps2.bgs.ac.uk/ukso/home.html>
- EAC 2016 *EAC Guidelines for the Use of Geophysics in Archaeology*, European Archaeological Council, Guidelines 2.
- EH 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage, Swindon
<https://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf/>



Survey Area

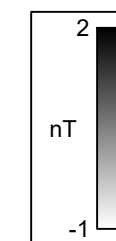
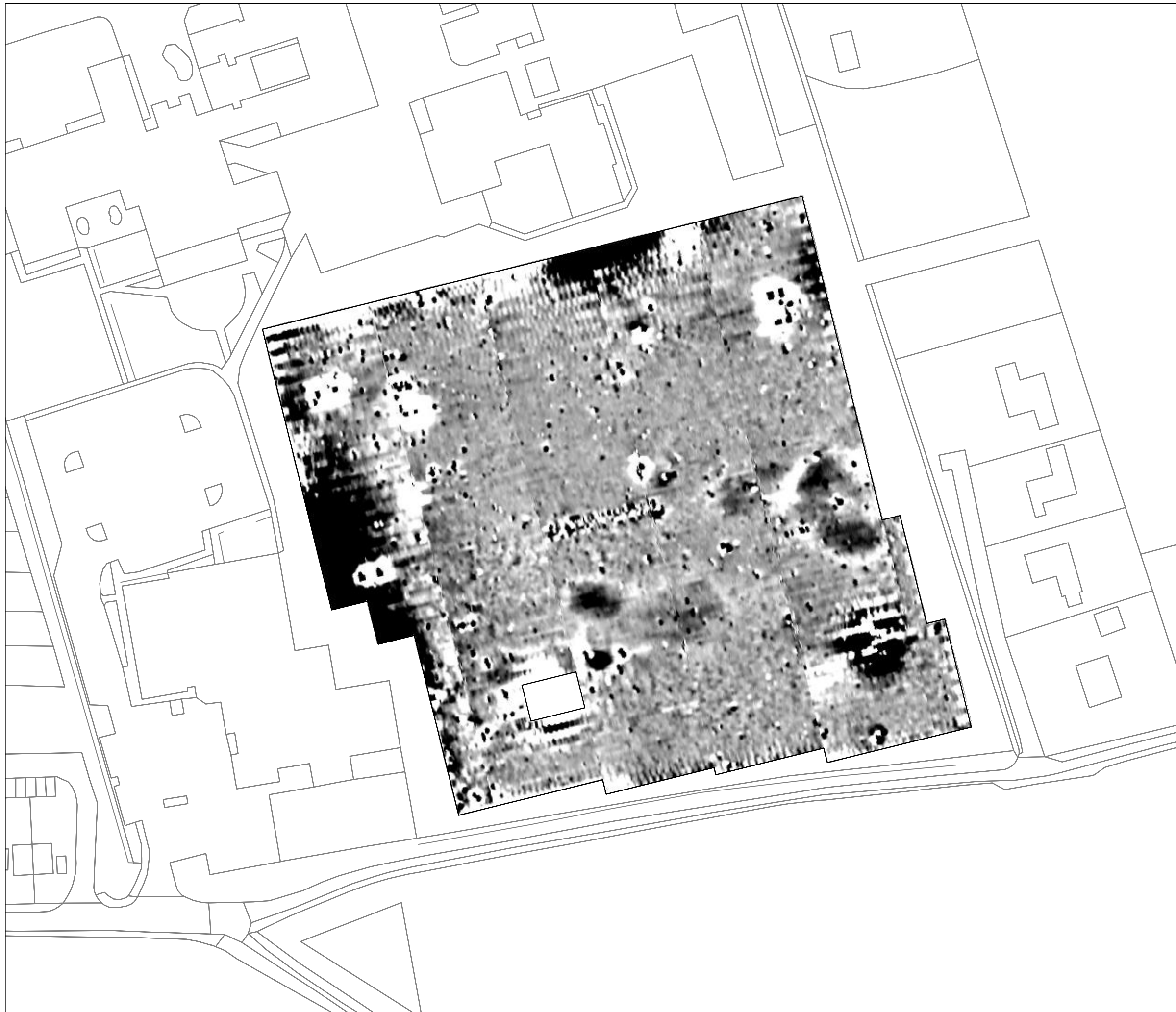


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	Site Location
	Magnetometer Survey



Title:	Site Location	
Client:	Cotswold Archaeology	
Project:	14282J Leiston Leisure Centre Sport Pitches, Sizewell, Suffolk	
	not to scale	Fig No: 01



Title: Magnetometer Survey
Greyscale Plot

Client: Cotswold Archaeology

Project: 14282J Leiston Leisure Centre Sport Pitches,
Sizewell, Suffolk

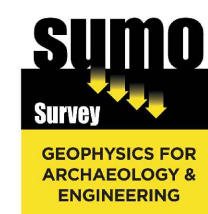
Scale: 0 metres 50
1:1000 @ A3

Fig No:
02



KEY

	Goal Posts
	Cricket Strip
	Natural
	Ferrous



Title: Magnetometer Survey Interpretation

Client: Cotswold Archaeology

Project: 14282J Leiston Leisure Centre Sport Pitches, Sizewell, Suffolk

Scale: 0 metres 50
1:1000 @ A3

Fig No: 03



Title: Magnetometer Survey [Minimally Processed Data] - Greyscale Plot

Client: Cotswold Archaeology

Project: 14282J Leiston Leisure Centre Sport Pitches, Sizewell, Suffolk

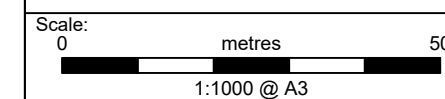


Fig No: 04

Standards & Guidance

This report and all fieldwork have been conducted in accordance with the latest guidance documents issued by Historic England (EH 2008) (then English Heritage), the Chartered Institute for Archaeologists (CIfA 2014) and the European Archaeological Council (EAC 2016).

Grid Positioning

For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

Instrumentation: **Bartington Grad 601-2**

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each site survey, data is transferred to the office for processing and presentation.

Data Processing

Zero Mean	This process sets the background mean of each traverse within each grid to zero.
Traverse	The operation removes striping effects and edge discontinuities over the whole of the data set.
Step Correction (De-stagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

Display

Greyscale/ Colourscale Plot	This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly, all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.
--------------------------------	---

Presentation of results and interpretation

The presentation of the results includes a 'minimally processed data' and a 'processed data' greyscale plot. Magnetic anomalies are identified, interpreted and plotted onto the 'Interpretation' drawings.

When interpreting the results, several factors are taken into consideration, including the nature of archaeological features being investigated and the local conditions at the site (geology, pedology, topography etc.). Anomalies are categorised by their potential origin. Where responses can be related to other existing evidence, the anomalies will be given specific categories, such as: Abbey Wall or Roman Road. Where the interpretation is based largely on the geophysical data, levels of confidence are implied, for example: Probable, or Possible Archaeology. The former is used for a confident interpretation, based on anomaly definition and/or other corroborative data such as cropmarks. Poor anomaly definition, a lack of clear patterns to the responses and an absence of other supporting data reduces confidence, hence the classification Possible.

Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk-based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall, etc.*) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

<i>Archaeology / Probable Archaeology</i>	This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
<i>Possible Archaeology</i>	These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
<i>Industrial / Burnt-Fired</i>	Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
<i>Former Field Boundary (probable & possible)</i>	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.
<i>Ridge & Furrow</i>	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases, the response may be the result of more recent agricultural activity.
<i>Agriculture (ploughing)</i>	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
<i>Land Drain</i>	Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.
<i>Natural</i>	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
<i>Magnetic Disturbance</i>	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present.
<i>Service</i>	Magnetically strong anomalies, usually forming linear features are indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.
<i>Ferrous</i>	This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.
<i>Uncertain Origin</i>	Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of <i>Possible Archaeology / Natural</i> or (in the case of linear responses) <i>Possible Archaeology / Agriculture</i> ; occasionally they are simply of an unusual form.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

Appendix B - Technical Information: Magnetic Theory

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns; material such as brick and tile may be magnetised through the same process.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried feature. The difference between the two sensors will relate to the strength of a magnetic field created by this feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services.

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OASIS ID: sumogeop1-339765

Project details

Project name	Sizewell C
Short description of the project	Geophysical (magnetometer) survey
Project dates	Start: 14-01-2019 End: 15-02-2019
Previous/future work	Not known / Not known
Any associated project reference codes	14282 - Contracting Unit No.
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 3 - Operations to a depth more than 0.25m
Monument type	NONE None
Monument type	NONE None
Significant Finds	NONE None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology	CAMBRIAN
Solid geology (other)	Crag Group sand, Chillesford Church Sand Member
Drift geology (other)	Lowestoft Formation sand and gravel; peat; Diamicton
Techniques	Magnetometry

Project location

Country	England
Site location	SUFFOLK SUFFOLK COASTAL LEISTON Sizewell C
Postcode	IP164RH
Study area	72.9 Hectares
Site coordinates	TM 47 65 52.227096080424 1.617227187207 52 13 37 N 001 37 02 E Point
Site coordinates	TM 45 63 52.210048758979 1.586552405854 52 12 36 N 001 35 11 E Point
Site coordinates	TM 39 68 52.257574264664 1.502432494564 52 15 27 N 001 30 08 E Point

Site coordinates	TM 46 63 52.209600059274 1.601160164043 52 12 34 N 001 36 04 E Point
Site coordinates	TM 45 62 52.201075150762 1.585829018313 52 12 03 N 001 35 08 E Point
Site coordinates	TM 40 60 52.185341524777 1.51138288496 52 11 07 N 001 30 40 E Point
Site coordinates	TM 42 62 52.202409742143 1.542012269371 52 12 08 N 001 32 31 E Point
Site coordinates	TM 46 62 52.200626597374 1.60043384569 52 12 02 N 001 36 01 E Point
Site coordinates	TM 44 63 52.210495613125 1.571944268582 52 12 37 N 001 34 19 E Point
Site coordinates	TM 45 65 52.227995912477 1.588000319552 52 13 40 N 001 35 16 E Point

Project creators

Name of Organisation	Sumo Geophysics
Project brief originator	Cotswold Archaeology
Project design originator	Sumo Geophysics
Project director/manager	Sumo Geophysics
Project supervisor	Sumo Geophysics
Type of sponsor/funding body	Developer
Name of sponsor/funding body	Not known

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Suffolk HER
Digital Contents	"Survey"
Digital Media available	"Geophysics"
Paper Archive recipient	Suffolk HER
Paper Contents	"Survey"
Paper Media available	"Drawing", "Report", "Survey "

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Entered on	12 July 2019

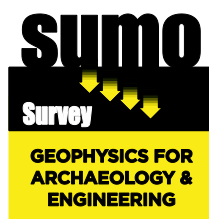
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VOLUME 2, CHAPTER 16, APPENDIX 16G: PEAT
STRATEGY

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Sizewell C Main Platform Peat Strategy

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XXXXXXX
Issue 03 - Rev

DOCUMENT ISSUE RECORD

Document Title:	SZC Main Platform Peat Strategy
Project Reference:	34882C001

Purpose of Issue: Revised Issue to EDF for comments

Security Class: EDF access

Issue	Description of Amendment	Originator/ Author	Checker	Approver	Date
01	Preliminary Issue to EDF (PREL)	MJ Grant [REDACTED]	S Steadman [REDACTED]	G Bishop [REDACTED]	22/09/15
02	Revised Issued to EDF (PREL)	MJ Grant [REDACTED]	S Steadman	G Bishop	01/07/16
03	Revised Issued to EDF (PREL)	MJ Grant [REDACTED]	J Mabbitt		05/11/19

Total number of pages:	Intro: <input style="width:40px;" type="text" value="1"/>	Text: <input style="width:40px;" type="text" value="28"/>	Tables: <input style="width:40px;" type="text" value="2"/>	Figures: <input style="width:40px;" type="text" value="23 + 2"/>	Appendices: <input style="width:40px;" type="text" value="1"/>
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Sizewell C Main Platform Peat Strategy

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Sizewell C Main Platform Peat Strategy

Figure 23: Proposed areas for archaeological investigation

Figure A1: Total depth of cores used within the deposit model

Figure A2: Stratigraphic Model, including borehole locations, for the Sizewell C study area, looking southeast.

EXECUTIVE SUMMARY

Sizewell C will require the construction of a platform upon which the main power station buildings will be sited. The construction of the platform will require the excavation of the underlying Holocene wetland deposits that contain thick sequences of peat and which have been identified as having archaeological potential. As the peat is situated several metres below ground level, covered with a significant depth of overburden, pre-application geophysical survey and trial trenching are not feasible.

This document sets out a strategy for undertaking geoarchaeological investigations of the peat deposits and mitigating the loss of any archaeological remains if present.

A three phased approach has been undertaken, consisting of:

- 1) Review of existent datasets and deposit modelling;*
- 2) Construction of a predictive model to identify areas of highest archaeological potential; and*
- 3) Creation of a proposed excavation strategy to target key locations identified through the predictive modelling stage.*

Phase 1 has identified a stratified series of palaeochannel sequences beneath the main platform area. The lowest palaeochannel is incised into underlying Norwich Crag Formation. It crosses the site in a west-east direction and measures up to 150m in width. A review of aerial photographs and historic maps has identified 19th and 20th century quarrying along the southern edge of the main platform area resulting in a loss of archaeological potential from this part of the site.

Phase 2 has produced a predictive model identifying areas of highest archaeological potential that will form the focus of the Phase 3 site investigations.

The proposed excavation strategy in Phase 3 will focus on the stratigraphic sequence in four locations in order to access the main Holocene sedimentary sequence and, most notably, the edges of the main palaeochannel areas where human activity upon the wetland is likely to be greatest. These investigations will also provide the best opportunities for geoarchaeological sampling of these sedimentary sequences. Three additional areas would also be investigated towards the base of the Holocene sequence, situated upon the Norwich Crag surface, where evidence of prehistoric dryland activity may be preserved. The timing of these excavations will coincide with on-site excavations as the elevation of the main site, within the cut-off wall, is reduced.

1 INTRODUCTION

1.1 Project Background

- 1.1.1.1 The Sizewell C main development site is located on the Suffolk coast, in close proximity to the hamlet of Sizewell and approximately 1.5 kilometres (km) north-east of the town of Leiston. It is 36km north-east of Ipswich and 31km south of Lowestoft and is located within the civil parish of Leiston, Suffolk Coastal District and the County of Suffolk. The proposed development is hereafter referred to as Sizewell C and will be located on land to the north of the existing Sizewell power station complex.
- 1.1.1.2 Construction work for the Sizewell C main platform would commence with site clearance and preparation. The construction of the main site platform will require large scale earthworks including deep excavations requiring the use of cut-off walls, stockpiling, grading of materials prior to re-use and backfilling. Additional works associated with the Sizewell C Main Development Site would include construction of a permanent new access road into the site, establishment of temporary construction areas and permanent and temporary bridges linking these to the main platform on which the power station would be built and construction of a jetty.
- 1.1.1.3 Site investigations have identified that some of the material that will be excavated, in advance of the platform construction, will consist of peat and clay, along with large quantities of silty and sandy material. The peat, in particular, has high potential for the preservation of organic material which may be of archaeological interest (e.g. preservation of archaeological material) as well containing a palaeoenvironmental archive. As a result, a mitigation strategy for dealing with any potential archaeological remains within the peat is required.
- 1.1.1.4 This document outlines a review of the site investigations that have been completed to date; describes the sedimentary sequences beneath the Sizewell C main platform; sets out a predictive model of archaeological potential and proposes a mitigation strategy for investigating the archaeological significance of these deposits.

2 GEOLOGY AND HOLOCENE DEVELOPMENT

2.1 Pre-Quaternary and Pleistocene Deposits

- 2.1.1.1 The bedrock geology of the wider area, extending 10km beyond the Sizewell C main development site (hereafter referred to as the “wider area”), consists of the Cretaceous Chalk Group unconformably overlain by Palaeogene deposits, consisting of the Palaeocene Ormesby Clay Member (Lista Formation) and Lambeth Group overlain by Eocene Thames Group (including the Harwich and London Clay Formations) (Ellison et al., 1994). The Palaeocene bedrock is unconformably overlain by several metres of Pliocene to possibly early Pleistocene sands of the ‘Crag Group’. Locally these consist of the Coralline Crag Formation (c. 3.75 – 2.58 Mya: Late Pliocene), Red Crag Formation (2.58 – 2.14 Mya: Pre-Ludhamian - Thurnian) and Norwich Crag Formation (2 – 1.78 Mya: Antian – pre-Pastonian; Hamblin et al. 1997; Funnell 1995). All three Crag deposits are predominantly estuarine or marine shelly-sand in origin, deposited during periods of major sea-level fluctuation, isostatic deformation and tectonic subsidence (Mathers and Zalasiewicz et al. 1988; 1996; Funnell 1995; Busschers et al. 2007). The Coralline Crag Formation sediments indicate deposition primarily as offshore sandbanks in shallow shelf (< 50m) conditions (Hodgson and Funnell 1987). These sediments are somewhat cemented and more resistant to erosion (Pye and Blott 2006), with seabed exposure of the Coralline Crag Formation found to extend at least 5.5km north east from Thorpeness.
- 2.1.1.2 The main bedrock in the area is the Norwich Crag Formation. Previous investigations have shown that this deposit has eroded the earlier Coralline Crag, with downcutting into the underlying Eocene London Clay Formation (also see Carr 1967; Funnell 1972; Riches 2012; Mathers and Zalasiewicz 1988; AMEC 2014). Previous surveys have shown that the London Clay Formation upper surface inclines along a west-east gradient, from -47m ODN at Sizewell to -61m ODN below the Sizewell Bank. However, there is a rise in the surface of the London Clay Formation beneath the offshore Coralline Crag deposits, rising to c. -28m LAT (Lowest Astronomical Tide; approximately level with Chart Datum).
- 2.1.1.3 The presence of Red Crag Formation, beneath the Norwich Crag Formation, has been suggested along the coast, consisting of the Sizewell Member (typically below -30m ODN at Sizewell) overlying the Thorpeness Member (typically with an upper surface between -4 to -12m ODN at Sizewell) (Zalasiewicz et al. 1988), though recent studies (Rose 2009; Riches 2012) have suggested these members may be younger than the Red Crag Formation and contain reworked earlier Crag Group material.
- 2.1.1.4 Late Pliocene to Early Pleistocene Crag Formation deposits within the wider area, beyond the Sizewell C main development site, are unconformably overlain by the riverine sediment aggradations of the Dunwich Group, which includes the Kesgrave and Bytham Sand and Gravels and the fluvial and estuarine, fine grained, floodplain deposits of the Cromer Forest Bed Formation (see Rose 2009).

These deposits were laid down in East Anglia by the ancestral Ancaster, Bytham and pre-diversionary Thames river systems which drained eastwards into the North Sea basin throughout the Early to Middle Pleistocene (prior to the Anglian glaciation southern diversion (see Rose et al. 2001; Rose 2009). It is these riverine sediment deposits that contain the earliest archaeological evidence of the hominin occupation of the north-west European peninsula (Parfitt et al. 2010), including the recently discovered earliest record of hominin footprints outside of Africa (Ashton et al. 2014). No such deposits are known to be present within the local area.

- 2.1.1.5 These climatically controlled riverine environments, of the Early-Middle Pleistocene, were eventually replaced by a strong cycle of lowland glaciations and shorter lived interglacials, with the area being dominated by three major glaciations during this period: the Anglian (Elsterian: MIS 12), the Wolstonian (Saalian: MIS 6) and the Devensian (Weichselian: MIS 2), which capped these deposits with glacially derived tills (see Preece et al. 2009), such as the Lowestoft Formations found along much of the coastline within the local area.
- 2.1.1.6 These glacially derived deposits are unconformably overlain by Holocene sediments, primarily deposited in response to the post-Last Glacial Maximum (Devensian) marine transgression.

2.2 Holocene Sea Level Change

- 2.2.1.1 The Holocene environmental history of the Suffolk coastal zone has been dominated by rising sea levels and successive periods of marine transgression and regression. Previous reconstructions of relative sea level on the East Anglia coast suggest that sea levels were approximately 20m lower at c. 8,400 BP (Shennan and Horton, 2002), although Early- to Mid-Holocene Sea Level Index Points (SLIPs) are few in number. SLIPs derived from the Blyth Estuary, Southwold (Brew et al. 1992), and Broadland (Coles and Funnell 1981) in Suffolk, as well as Horsey (Horton et al. 2004) on the north-east Norfolk coast, indicate a rapid rate of relative sea level rise across East Anglia in the Early Holocene, significantly reducing by the Mid to Late Holocene.
- 2.2.1.2 Within the local study area, the Blyth data can be supplemented with SLIPs from Minsmere and Sizewell Belts (Lloyd et al. 2008) and tentatively with the data from Aldeburgh and Orford Ness in the south (Carr and Baker 1968). The majority of the generated SLIPs (see Lloyd et al. 2008 for methodology employed) show a close agreement with the relative sea level (RSL) curve proposed in Shennan and Horton (2002). The two deep dated sequences from Aldeburgh are notable outliers and have been previously questioned by Carr and Baker (1968), who observed that the associated palynological assemblage appeared younger in age than the obtained radiocarbon dates, and should therefore be considered as problematic. The data acquired by Lloyd et al. (2008), directly relating to the Minsmere-Sizewell coast, indicates a slowly rising sea level of $0.75 \pm 0.12 \text{ mm a}^{-1}$ from c. 3,500 cal. BP. This rate is similar to estimates by Horton et al. (2004), from the north-east Norfolk coast, suggesting a Late Holocene rate of RSL change of $0.67 \pm 0.06 \text{ mm a}^{-1}$. Both these rates are markedly lower than the average rate

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calculated for the past 50 years from the Lowestoft tide gauge of 1.81mm a⁻¹ (Woodworth et al. 1999).

2.3 Holocene Sediments – Wider Area

- 2.3.1.1 Within the Minsmere area, directly to the north of the proposed development, the Holocene stratigraphic sequence is dominated by a series of relatively fine clastic (predominantly silt) and peat units, which increase up to 7m thick and become more dominant to the west, moving away from the coastline (Lloyd et al. 2008), relating to Holocene sea level change. The stratigraphic sequence suggests peat accumulation within a relatively sheltered quiet water environment containing abundant reedbeds, with the first marine incursion dated 3,830-3,470 cal. BP (3,390±60 BP; Beta-242549). The alternation between peat and clastic (silt) units probably reflects continuous gradual sea-level rise (Lloyd et al. 2008). The coastline in the Minsmere–Sizewell area at this time would have been open to tidal inundation, though it may have been protected by a partial barrier similar to that proposed for the Blyth estuary further north (Pye and Blott 2006). A notable period of marine influence has been dated to c. 2,600-1,700 cal. BP, with a protracted period of open access to the sea recorded between 1,690-400 cal. BP in borehole SM30/2.5, though this suggests that the area was protected by a barrier, with marine influence attributed to an opening associated with the Minsmere Old River.
- 2.3.1.2 Within the Coney Hill area, sedimentation dominated by marine clastic units is dated between c. 600 cal. BP and the present day. This coincides with the lowest point of the barrier system along the Minsmere-Sizewell coastline where overtopping events are known to have occurred. Successive phases of land claim have also had a significant impact on the shoreline in this area. Land claim within the Minsmere estuary between the 12th and 18th centuries, for example, transformed what was a small inlet and ebb tide system to a continuous barrier beach and dune ridge. By the end of the 18th century tidal flow was so restricted that the inlet became blocked, leading to freshwater flooding (Halcrow 2008).
- 2.3.1.3 To the south of the existing Sizewell power station complex, relatively shallow palaeochannels (<2m deep) with basal peat deposits were identified during the construction of the 132kV underground electricity cable and substation for Greater Gabbard Offshore Wind Farm (Atfield 2007; 2008). The palaeochannel passing through Sandy Lane was associated with both Roman and Medieval settlements along its southern bank (Atfield 2008; Martin et al. 2009).
- 2.3.1.4 Offshore studies, within the wider area (notably Lees 1980; 1982; Brew 1990), have identified a series of distinct Holocene estuarine and terrestrial deposits, containing over 70 km² of channel infill deposits not readily identifiable from the seabed bathymetry alone, that predominantly form a continuation of some of the main onshore drainage catchments.

2.4 Sizewell C Main Platform Area Holocene Deposits

- 2.4.1.1 The Sizewell C main platform area has been subject to extensive site investigations, including geotechnical boreholes, a resistivity tomography survey (Bates 2008; Bates et al. 2009; 2012), watching briefs on a powered auger survey

(Batchelor 2012) and excavation of peat extraction trenches (Stirk 2009). These studies demonstrated extensive Holocene deposits (including thick peat deposits) to the north and west of the Sizewell B power station where the local underlying Norwich Crag Formation topography reduces in altitude. Across the centre of the main platform area there is a clearly demarcated palaeochannel, running west to east towards the coastline. Holocene deposits overlying this palaeochannel range in thickness between 4-8m. A watching brief undertaken in 2009, during excavation of the peats overlying this palaeochannel for Heathland Creation Trials, did not yield any significant information (Stirk 2009).

- 2.4.1.2 Palaeoenvironmental assessment was undertaken on three boreholes (ABH2, ABH3 and ABH4) spanning the width of the main channel (Bates et al. 2009), a single borehole (GBH1), located further to the west within the main palaeochannel and a single borehole (GBH2) located outside the main channel (Bates et al. 2012).
- 2.4.1.3 The humin fraction from the base of core ABH4 (c. -8.66 to -8.68m ODN) yielded a radiocarbon date of 11,710-11,240 cal. BP (9,980±60 BP; Beta-261937). The basal peat in ABH4 is overlain by a sharp transition to a silt deposit. This is likely to indicate an erosive boundary/hiatus which is reflected in an apparent change in the pollen assemblage. The peat overlying this silt (at c. -7.44 to -7.46m ODN) yielded a radiocarbon date of 6,180-5,900 cal. BP (5,220±40 BP; Beta-261935), which indicates a sizable time gap between deposition of the basal peat and the middle peat horizon. A radiocarbon date on unidentified plant material from the base of GBH1 (c. -8.18m ODN) yielded a date of 9,540-9,310 cal. BP (8,440±50 BP; Beta-322037).
- 2.4.1.4 It is likely that some of the discrepancies between dates for the base of the peat and the chronological discontinuity up-core relate to changing channel activity and position of the main channel flow. Geomorphological features, such as oxbows and cut-off channels, are likely to have been present, accumulating with peat under reduced flow conditions and vegetation colonisation, with subsequent later truncation as the channel meandered across the floodplain. The expansion of peat away from the main channel area, onto the periphery of the floodplain, would have been driven by elevation of the water table and a subsequent reduction in the drainage flow gradient, largely driven by sea level rise throughout the Early Holocene.
- 2.4.1.5 A radiocarbon date derived from core GBH2, situated away from the main channel, at c. -6.01m ODN, provided a date of 7,580-7,430 cal. BP (6,610±40 BP; Beta-322038). This indicates that wetland expansion, covering a large area of the Norwich Crag Formation land surface, had occurred by the Late Mesolithic.
- 2.4.1.6 The change from peat formation (interpreted as being fen carr with some brackish influence) to estuarine clay-silt deposition, recorded in ABH4 (at c. -5.21m ODN), post-dates 3,350-3,070 cal. BP (3,020±40 BP; Beta-261933; c. -5.82m ODN). This indicates that marine incursion into the area of the main palaeochannel occurred from the Middle Bronze Age onwards. An upper peat, below the Made Ground,

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provided an Early-medieval (Early to Middle Anglo-Saxon) radiocarbon date, on the humin fraction, of 1,380-1,260 cal. BC (1,390±40 BP; Beta-261931).

2.5 Trial Excavations on Sizewell C Main Platform Area

2.5.1.1 Initial trial excavations of the peats underlying the main platform area were undertaken in 2009 for the Heathland Creation Trials. However, these failed to establish a suitable work methodology that could be adopted during the site preparation works for Sizewell C. The approach taken, and challenges encountered, is summarised by Stirk (2009):

2.5.1.2 *“The archaeological work was conducted in accordance with a Brief and Specification written by ...Suffolk County Council’s Archaeological Conservation Team. The planned methodology for archaeological monitoring was hindered by the extreme depth of the peat deposits. The upper peat horizon was located beneath approximately 4 metres of alluvium and a further 4 metres of modern make-up. The modern make-up was removed over the whole extraction area, after which a series of north-south aligned machine trenches were dug through the alluvium to reach the peat. The bulk of the peat was located over 10.5m below the modern ground surface, and approximately 6.5m below the machined area. As a result, none of the peat was seen in-situ. Flooding was also a problem at such a depth and this severely limited access to the trenches. Archaeological recording was limited to general photographs of the operation, and documentation of the deposit sequence as related by the contractors. The peat stockpiles were examined for cultural material and worked timbers, but the majority of the alluvial deposits could not be examined...no cultural material was seen in the stockpiled peat; however, this is perhaps not sufficient evidence to demonstrate the absence of archaeological deposits. While the archaeological monitoring of the works has proven ineffective to determine the presence of archaeological deposits, it is difficult to imagine a work methodology that would have permitted this.”*

2.5.1.3 This series of trial excavations demonstrates the potential problems that may be encountered with both sequence thickness and water table depth (and flooding). For a meaningful archaeological mitigation strategy an alternative approach is therefore required.

3 PEAT STRATEGY

3.1 Challenges

3.1.1.1 The archaeological investigation in advance of the proposed development on the Sizewell C main platform area poses several challenges, in terms of producing a meaningful site investigation strategy while ensuring the safety of people working on the site. The key challenges are:

- *Extensive peat deposits, with unresolved potential for archaeological remains, located beneath most of the development area. Identification of areas of higher archaeological potential will be essential to enable targeted investigation and deliver a viable strategy for investigation.*
- *Increased risk of flooding of excavated areas due to the high groundwater table, relative to the depth of Holocene sediments. Developing an effective methodology to protect the excavated areas will be essential to enable investigation and recording of archaeological remains, in situ.*
- *Significant depth of overburden (Modern Made Ground) preventing access to Holocene sediments. Archaeological investigation and recording will only be possible during the site preparation works phase. Careful planning will be required to ensure the safety of archaeologists working on the site at the same time as the large mechanical plant that will be needed to undertake bulk excavation.*
- *Health and Safety will be a paramount consideration, which will take precedence over all archaeological requirements.*

3.2 Approach

3.2.1.1 A three-phased approach to formulating an archaeological strategy is outlined within this report. This consists of:

- *Phase 1: Desk-based assessment of all previous site investigations (archaeological and geotechnical) and deposit modelling.*
- *Phase 2: Predictive modelling of areas of higher archaeological potential within the Holocene sedimentary stack.*
- *Phase 3: Excavation strategy.*

4 PHASE 1: DESK-BASED ASSESSMENT AND DEPOSIT MODELLING.

4.1 Introduction

- 4.1.1.1 Existing deposit models demonstrate the presence of extensive Holocene sediments (including thick peat) to the north and west of Sizewell B power station overlying the surface of the Norwich Crag Formation (Bates 2008 and Bates et al. 2012).
- 4.1.1.2 Additional geotechnical site investigations, undertaken in 2010-11 and 2014, together with archive records from 1975 site investigations associated with Sizewell B have presented the opportunity to retest these earlier deposit models with a larger dataset (see Figure 1). In addition, the Sizewell B boreholes record the site stratigraphy across much of the north of the main platform area prior to the build-up of Made Ground associated with Sizewell B construction.
- 4.1.1.3 The production of an updated deposit model permits the identification of the main palaeolandscape zones with greater certainty, and in particular defining the edges of the palaeochannel. From these palaeogeographic reconstructions it is possible to start defining the position of wetland zones that would have been suitable for human activity, as well as the areas of elevated topography away from the river channels where human habitation may have occurred. Defining such landscape zones will enable tailored strategies for investigation to be developed for each zone and the formulation of a targeted strategy for archaeological excavation and recording within Phase 2 of this peat strategy.
- 4.1.1.4 The methodology for the generation of the deposit model, including definitions of the lithological and stratigraphic units, are provided in Appendix A.

4.2 Stratigraphic and Lithological Models

- 4.2.1.1 Principal features revealed within the stratigraphic and lithological models are summarised below.

4.2.2 Stratigraphy

- 4.2.2.1 The most notable feature visible within the stratigraphic model is the clearly defined palaeochannel, incised into the Norwich Crag Formation surface, that flows west – east across the centre of the site (Figure 2). The channel is up to 150m in width, with average basal altitude between -8 and -10m ODN. To the north of the palaeochannel the Norwich Crag surface rises to a plateau at c. -6m ODN, hereafter referred to as the ‘northern plateau area’. The Norwich Crag topography rises to the modern surface, outcropping at c. 8m ODN, c. 300m to the south of the main channel. This topographic pattern is largely replicated within the resistivity tomography survey conducted across a smaller area within the centre of the site (Bates et al. 2012). Holocene peats and clays are thickest in the centre of the channel, reaching up to 8m in thickness (Figure 3). Upon the northern plateau area these deposits vary in thickness between 2-6m.

4.2.2.2 Made Ground is shown to be thickest along the east and north of the study area where it coincides with the Bent Hills and North Mound, which the deposit model conservatively maps as up to 12m in thickness (Figure 3). Localised patches of thick Made Ground, up to 8m in thickness, are dotted across the centre of the site, which suggests deep disturbance within these areas, coinciding with localised thinning of the underlying Holocene deposits.

4.2.3 *Lithology*

4.2.3.1 The site lithology may be divided into two principle components: organic and non-organic lithologies. The organic lithologies (Figure 4) are dominated by peat deposits with an increase in organic clays and silts in the eastern part of the site, as well as along the southern margins of the palaeochannel. These deposits are often represented by thin intercalated peats which would be positioned in locations most sensitive to changes within the local hydrological and sedimentological processes, such as tidal channel, creek networks and the coastal / riverine margin of the main marsh. Organic sands are associated with channel fills. Organic deposits are thickest along the alignment of the main palaeochannel, up to 7m in thickness, though thin to 1-2m outside of the main channel and less than 1m beyond this.

4.2.3.2 Non-organic lithologies (Figure 5) are dominated by clays with some localised patches dominated by silts. There are localised thicknesses of up to 6m within parts of the main palaeochannel, and in general these are thickest within the east of the study area closest to the coastline. In the northeast the Holocene sequence is dominated by clays, probably of estuarine origin, which thin out along the north-western boundary of the site where peats dominate the Holocene stratigraphy.

4.2.3.3 Figure 6 shows fence diagrams, evenly spaced across the study area, of the Holocene lithology overlying the Early Holocene palaeochannel incised into the Norwich Crag. This clearly demonstrates the relationship between the deeper organic and shallower minerogenic deposits, with increased thickness of the latter in the east of the site. This relationship is the result of marine incursion of the site which has been dated locally to the Middle Bronze Age (Bates et al. 2009; Lloyd et al. 2008).

4.2.3.4 The relationship between the peats and clays within the upper levels of the Holocene stratigraphy suggest the presence of local marine incursions in the form of channels or creeks (Figure 7). The main channel largely coincides with the Early Holocene palaeochannel alignment although it is narrower in its extent and splits into two sections, one aligned northwest and the other southwest, west of easting 647200.

4.2.3.5 Within the north of the site, coincidentally following the alignment of the North Mound, another channel / creek area can be mapped progressing inland across the northern plateau area, implying this is a later channel network than the deeper main palaeochannel to the south. This channel appears to terminate within the centre of the study area where the Holocene lithology is dominated by peat deposits. The age of this channel system is unknown but it could be Late Bronze Age to Early Medieval in date. There is the possibility that such channel

developments could be contemporary with channel-edge activity recorded to the south of the Sizewell complex at Sandy Lane (Atfield 2008; Martin et al. 2009) where both Roman and Medieval settlements were found along the southern bank of the channel.

4.2.3.6 The palaeochannels identified within the Main Platform Area are likely to have been foci for human activity along the channel's edge, with the resultant potential to produce evidence of

- *prehistoric dryland occupation and/or activity;*
- *boats;*
- *prehistoric trackways;*
- *fish weirs; and*
- *possible medieval remains.*

4.2.4 SZC Main Development Site before the Made Ground

4.2.4.1 Historic maps dated pre-1970 show the area covered by a series of drainage channels (the Sizewell Belts), with the marshes being drained using a wind pump located at the south-eastern edge of Goose Hill. This drainage pattern (shown on Figure 8) remained intact until the early 1970s, (it is recorded on the 1971 Ordnance Survey (OS) map, but by the mid-1970s the marshes had undergone a dramatic transformation with much of the marsh hidden below Made Ground.

4.2.4.2 A small surface outcrop of marsh is shown in the north of the study area on the 1976 OS. This coincides with marsh (peat) deposits recorded at the surface of six boreholes taken from this area in 1975 (Figure 8). The ground surface elevation associated with these six boreholes is recorded as 0.31 ± 0.07 m ODN. Oblique aerial photographs, taken during the construction of Sizewell B, demonstrate that the final disappearance of this marsh surface took place between April 1988 (Figure 9a) and July 1989 (Figure 9b).

4.2.4.3 There is also evidence for historic quarrying within the study area. On the 1st edition OS dated 1884, two isolated pits are indicated beyond the southern edge of the marsh. The number of pits is shown to have increased by 1905, with sand pits along much of the southern edge of the marsh (Figure 8), targeted on the Crag sands. At this time a rifle range was present to the east, perpendicular to the shoreline. By 1912 the rifle range had been moved and its new position, shown on the 1927 Ordnance Survey map, coincides with the position of the sand pits, aligned perpendicular to the marsh edge. The sand pits were mapped consistently until as late as 1958, but they are not shown on the 1971 OS. The rifle range (albeit disused) was mapped until 1971, but none of its associated earthworks are recorded on the 1976 OS.

4.2.4.4 Within seven of the 1975 boreholes the original land surface was identified below the Made Ground along the southern edge of the marsh and adjacent Crag

surface (Figure 10). In some cases, (e.g. TM46SE117) the topsoil still retained a layer of *in situ* grass directly below the Made Ground.

- 4.2.4.5 Five of the boreholes lying in the SE corner, within the boundary of the marsh, provided an elevation of the surface of the buried topsoil as -1.47 ± 1.1 m ODN. This shows a statistically significant altitudinal difference ($p=0.009$; 1-tailed T-Test) from the recorded marsh (peat) surface within the boreholes from the north of the marsh (shown in Figure 8) where no Made Ground was present. Assuming there were no significant differences in the surface elevation across the marsh prior to the deposition of Made Ground, (and given that surface stripping of the topsoil can be ruled out), this may indicate local compaction of the ground surface, by 1975, of c. 1-2m.

4.2.5 Changes during the past 40 years and their impact on sediment preservation

- 4.2.5.1 The compaction of the Holocene marsh deposits by Made Ground associated with the Sizewell B construction, as stated above, can be further investigated by comparing the 1975 borehole records with those obtained more recently (between 2008-2014) in association with the proposed Sizewell C development. Figure 10 shows an area where borehole coverage from the two geotechnical site investigation campaigns is sufficient to allow a direct comparison to be made. Separate deposit models have been constructed from the two datasets in order to map the altitude of the base of the Made Ground, as well as its thickness, as recorded in both 1975 and 2008-2014. These results have been combined within ArcGIS to calculate changes in the altitude of the base of the Made Ground (Figure 11a) and the thickness of Made Ground (Figure 11b). The former represents both the top of the Holocene deposits and, in the south of the study area, the Norwich Crag surface where intervening Holocene deposits are absent.
- 4.2.5.2 Figure 11a shows the calculated reduction in the Holocene marsh surface, represented by the base of the Made Ground. This shows reductions of up to 5.0m across the north of the site. Through the centre of the study area the reduction is generally 0.5-2.6m, while in the south changes in Made Ground are closer to 0m where the Made Ground directly abuts exposures of Norwich Crag.
- 4.2.5.3 Bates et al. (2012) noted that, in the southern part of the Site, there were major difficulties in resolving the difference between Made Ground and Norwich Crag Formation that could lead to inconsistencies in recording the base of the Made Ground where it overlies Norwich Crag. This is clearly demonstrated in Figure 9 where it can be seen that large amounts of marine sand and excavated Norwich Crag Formation has been spread across the site during the construction of Sizewell B. The large reduction in the Holocene surface in the north of the study area is attributable to marsh deposits still present at the surface here in 1975 but then deeply buried by Made Ground after the construction of Sizewell B (see TM46SE151 vs BH 5 and TM46SE147 vs BH 6; Figure 12).
- 4.2.5.4 The reduction of the Holocene surface in this area, of up to 4.2m, is likely to relate to a combination of stripping of the original marsh surface and compaction of the underlying peats by several metres of Made Ground.

4.2.5.5 Figure 11b shows the change in thickness of Made Ground across the study area. Thickness increases of up to 9.3m are recorded in the north coinciding with the western edge of the North Mound which contains considerably thicker Made Ground deposits. The change in thickness of Made Ground is least across the centre of the site where 0-2.0m is recorded. The modelled thickness of the Made Ground only reflects the difference between the surfaces of 1975 and 2008-2014. This therefore does not include any additional Made Ground present upon the site during the construction of Sizewell B that was subsequently removed during the landscaping of this area in the 1990s.

4.2.6 Comparison of Borehole records from 1975 and 2008-2012

4.2.6.1 A direct comparison of the borehole records collected from these two periods is shown in Figure 12. Eight pairs of boreholes were found to be within 20m of each other (using the mean position of the 1975 boreholes whose spatial accuracy is $\pm 10\text{m}$). In all eight instances Made Ground is recorded as thicker, and descends to a lower altitude, in the latest phase of Site Investigations. In most instances (six out of eight) the ground surface is also higher now than it was in 1975.

4.2.6.2 To assess the direct impact of any compaction on the Holocene deposits, it is first necessary to demonstrate that there is consistency in the altitude of the underlying non-compressible sedimentary units (surface of the Norwich Crag Formation). In addition to the borehole survey, Bates et al. (2012) undertook a resistivity tomography survey of the area and, based upon this data, estimated the altitude of the Crag surface (also shown on Figure 12). Assigning a $\pm 1\text{m}$ vertical error to the results of the resistivity survey, it is shown that the modelled Crag surface coincided with that recorded in the boreholes in four out of seven instances. In three out of eight instances the 1975 boreholes showed the Crag surface at a lower altitude than that recorded in 2008-2012. These discrepancies can be attributed to the positioning of the sample locations in relation to the dipping Norwich Crag Formation surface orientated on the large palaeochannel which has incised this surface.

4.2.6.3 The main exception to this lies with the paired boreholes TM46SE130 and BH27, located in the south east of the study area. TM46SE130 recorded the presence of the old land surface (topsoil), beneath the Made Ground, at 1.6m ODN. However, BH27 records the Norwich Crag surface at -1.0m ODN, indicating a difference of 2.6m. Comparison of the location of these boreholes to the pre-1975 Ordnance Survey maps show that they coincide with the alignment of the sand pits and rifle range.

4.2.6.4 It is also possible to compare the lithology of the Holocene deposits between these boreholes (where recorded). The 1975 borehole logs provide detailed descriptions for the Holocene sequences. There is a trend, however, for thin intercalated peat layers to be grouped within a larger unit containing clays, silts and organics. In comparison, the 2008-2012 investigations, undertaken by a geoarchaeologist, have separated out some of the thinner peat layers as individual contexts. However, this methodological difference does not affect the representation of the main lithological units – notably the main peat bodies. Figure

12 shows the presence of thick peat deposits in the north of the site. There is an increase in the minerogenic sediments (clays and silts) towards the centre of the site, coinciding with the locations of the main palaeochannel.

- 4.2.6.5 Two closely aligned transects, based on the 1975 and 2008-2012 datasets recorded along the southern edge of the palaeochannel (Figure 13) show a distinct tripartite pattern with a thick basal peat, central clay dominated layer, and overlying thin intercalated peat. A direct comparison of the altitudes of these layers within the two datasets, assuming that these surfaces are consistent across the palaeochannel, provides an estimation of the compaction of these Holocene deposits. Calculating differences in the surface of the intercalated peat is not possible due to some cores having Made Ground directly overlying the peat, which suggests that the surface of the intercalated peat has been truncated.
- 4.2.6.6 However, comparison of the altitude of the base of the intercalated peat shows a change from -2.80 ± 0.58 in 1975 to -3.78 ± 0.58 mODN in 2008-2012, representing a mean altitudinal reduction of 1m. The upper surface of the basal peat changed from -4.4 ± 0.32 in 1975 to -6.2 ± 0.35 mODN in 2008-2012, representing a mean altitudinal reduction of 1.78m. The mean altitudinal difference of the Crag surface between the two datasets was 0.5m.
- 4.2.6.7 The basal peat surface therefore appears to have reduced altitudinally by an average of 1.28m between 1975 and 2008-2012. The fact that the Holocene fills are intact, overlying the basal peat bed, indicates that this altitudinal change must be related to sediment compression.

4.2.7 *Holocene wetland deposit compaction – wider context*

- 4.2.7.1 Sediment compaction of coastal deposits is a widely recognised phenomenon (e.g. Bennema et al. 1954; Skempton 1970; Paul and Barras 1998; Allen 1999; 2000; Baeteman et al. 2011; Horton and Shennan 2009) with highly compressible peat and fine-grained minerogenic deposits being more susceptible to compaction than sands (van Asselen et al. 2009).
- 4.2.7.2 A range of factors control compaction, including the mechanical and chemical properties of the sediment, the loading history, changes in water content, and the spatial and vertical characteristics of the sediment body (Brain, 2006). The significance of sediment compaction was recognized from early studies of North American (Kaye and Barghoorn, 1964) and European (Jelgersma, 1961) wetlands.
- 4.2.7.3 A number of studies have sought to quantify the impact of sediment compaction. Edwards (2006) and Törnqvist et al. (2008) used basal peat deposits to estimate the magnitude of sediment compaction. Basal peats overly uncompressible substrates, compared to peats intercalated between thick Holocene clastic sediments. As a result, a basal peat date will experience much smaller reductions in altitude (Jelgersma 1961; Kaye and Barghoorn 1964). Using this approach Edwards (2006) found a strong correlation with elevation residuals and overburden thickness, concluding that the influence of compaction during the past 4000 years was $0.7-1 \text{ mm yr}^{-1}$. Törnqvist et al., (2008) analysed overburden thickness to illustrate millennial scale compaction rates of 5 mm yr^{-1} with local

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and/or decadal to centennial rates in excess of 10 mm yr⁻¹. Horton and Shennan (2009) found, from a database of 363 sea-level index points from the east coast of England, statistically significant correlations between elevation residuals and the thickness of overburden, with average compaction rates of 0.4±0.3 mm yr⁻¹ and higher values for large estuaries. However, these compaction rates should be considered minimums because they have often been averaged over long timescales and it is unlikely that they are constant over such a long time span (Allen 2000; Törnqvist et al. 2008).

- 4.2.7.4 Most compaction of peats is predicted to have occurred within a few centuries after the start of overburden deposition and subsequently continued over time at a subdued rate (Van Asselen et al. 2011). This certainly seems to be the case at SZC.
- 4.2.7.5 Other studies have sought to calculate the magnitude of compaction by comparing the elevations of compacted (and hence lowered) intercalated peat strata with isochronous basal peats from the same stratigraphic sequences. Haslett et al. (1998) documented the variable elevation of a peat-clay contact within the Somerset levels, southwest England, and found a maximum compaction of 2.2 m. At Romney Marsh, southeast England, Long et al. (2006) suggested that an originally largely planar peat surface was locally lowered by a minimum of 4.2 m, which equates to a 50% reduction in peat thickness. Horton and Shennan (2009) showed numerous comparable examples of within-site variation on the order of 2–6 m difference from the east coast of England averaged over long (millennial) timescales.
- 4.2.7.6 The estimates of compaction of the basal peat surface within the main palaeochannel, of a minimum of ≥1.28m over decadal timescales, is comparable in scale to the above findings but clearly indicates that there was a much more rapid rate of initial compaction.
- 4.2.7.7 It is possible to estimate sediment compaction at Sizewell C, averaged over longer timescales, by comparing the radiocarbon dated sequence from GH08-04 collected from Goose Hill (Lloyd et al. 2008) and Borehole ABH4 collected from the proposed Sizewell C main platform area (Bates et al. 2009) (Figure 14).
- 4.2.7.8 An upper peat within ABH4, at c. 4.53m below ground level (c. -2.78m ODN) at the base of the Made Ground, provided a radiocarbon date of 1600-1400 cal. BP (1610±40 BP; Beta 261930). In comparison, a peat from Goose Hill, recorded 650m northwest of ABH4 at 1.48m below ground level (c. -0.8m ODN), provided a statistically comparable (χ^2 -Test: df=1 T=0.7(5% 3.8)) radiocarbon date of 1880-1380 cal. BP (1710±110 BP; Beta-242542). Crudely, this suggests an altitudinal offset of c. 2m between these two peat deposits within the same wetland basin. Even if the errors on the two radiocarbon dates are taken into account, the Goose Hill date is closely correlated altitudinally with other peat surfaces of similar date within the wider Minsmere area (Lloyd et al. 2008).
- 4.2.7.9 The main difference therefore between the ABH4 core and those dated within the wider region relates to the thickness of Made Ground overlying the Holocene

deposits. It seems reasonable to assume therefore that the altitudinal differences are the result of increased sediment compaction at the proposed Sizewell C site.

4.2.8 Summary of Sizewell C Site Compaction

- 4.2.8.1 The review of the available cartographic, geotechnical and palaeoenvironmental datasets from the proposed Sizewell C main platform area has identified significant changes to the Holocene stratigraphy over the past 40 years. This includes the thick deposits of Made Ground derived from the construction of Sizewell B. There is anecdotal evidence that during Sizewell C construction *‘that the area was raised to approximately 6m ODN with material from the Sizewell B excavations (sands) and gravels (probably marine sourced)’* (Bates 2008). This clearly appears to be the case in the aerial photographs of the site shown in Figure 9.
- 4.2.8.2 The reduced thickness of the underlying Holocene [peat] deposits has been as a result of the additional weight of the Made Ground, as well as compaction from heavy machinery used during both construction and post-construction landscaping, marsh drainage and compaction from naturally occurring estuarine minerogenic deposits.
- 4.2.8.3 It is also likely that during site preparation works for the construction Sizewell B the original marsh surface was affected through activities, such as excavation / stripping, further reducing the thickness (and upper altitude) of the Holocene deposits. At its most fundamental basis, compaction of the Holocene peats can be estimated by comparison to dated sequences in the nearby area. These deposits will have been equally affected by eustatic sea-level rise, glacio-hydro-isostasy, tectonic subsidence and marsh drainage strategies, so it is reasonable to assume that the main cause of increased sediment compaction at Sizewell C may be attributed to differences in the amount of ground surface loading from Made Ground build-up. The estimates of sediment compaction at Sizewell C, of a minimum of c. 1.3m, are comparable to findings from similar studies in coastal wetlands. As a consequence, any investigations of the Sizewell C site, which require the use of attitudinally-accurate age-estimations, would need to rely upon a strategy based upon the dating of basal peat which directly overlay the Norwich Crag Formation surface.
- 4.2.8.4 The existent palaeoenvironmental and geoarchaeological assessments of the Sizewell C site have provided important insights into the nature, and age, of the Holocene deposits present. These deposits have identified a classic alternation between freshwater, brackish and marine conditions related to the changes in relative sea level during the Holocene. As a result, the Sizewell C sequences have the potential to shed light on the timing and nature of changes in both coastal conditions and local archaeological activity. However, as these intercalated deposits can no longer be tied to their original altitude then it is not possible to generate reliable age-depth models to inform predictions of the rate of flooding. The southern edge of the site is known to have been fully excavated for both quarrying and the rifle range construction and can therefore be considered as

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having no prehistoric archaeological potential. With the exception of the rifle range structures, this area can largely be discounted from the site excavation strategy.

4.2.8.5

5 PHASE 2: PREDICTIVE MODELLING

5.1 Introduction

5.1.1.1 Archaeological evaluation of deeply stratified sedimentary sequences from lowland river valleys and estuaries can be problematic due to:

- *the often excessive depth of deposits encountered;*
- *high water table levels; and*
- *ground instability.*

5.1.1.2 Consequently, alternative strategies are required for understanding the nature of the buried landscape and determining the likely location of both archaeology and the subsequent placement of any archaeological excavations.

5.1.1.3 Geotechnical site investigations and geophysical surveys provide the ability to visually inspect the stratigraphic sequence. Although these have often been constrained by their spatial extent and / or sampling density it is now becoming increasingly possible to model larger geographical areas. The creation of 3D geological models (e.g. Mathers et al. 2014; Gow et al. 2014) has been paralleled by the use of deposit modelling for understanding Pleistocene and Holocene sedimentary sequences, submerged landscapes, and associated archaeological sites, notably within river valleys and coastal deposits (e.g. Corcoran et al. 2011; Stevens et al. 2014; Harding et al. 2012; 2014; Grant in prep.; Sturt et al. 2016).

5.1.1.4 Modelling Early Holocene drainage basins, imprinted into the pre-Holocene surface topography permits palaeogeographic reconstruction, which is crucial in the development of predictive models that highlight where, within the landscape, human activity might have been most prominent.

5.2 Construction of a predictive model

5.2.1.1 The predictive model was generated from collated datasets and modelling results from the Phase 1 study. All predictive modelling was undertaken within ArcGIS 10.2.2. The model is based upon the assimilation of five principal data levels:

- *Stratigraphic Surfaces and Unit Thicknesses*
- *Lithology Type, Distribution and Thickness*
- *Hydrological Modelling of the study area and wider region*
- *Topographic Modelling of the study area*
- *Likely distribution of prehistoric archaeology, inferred from previous studies (e.g. Grant in prep.; Sturt et al. 2016.).*

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- 5.2.1.2 The topography of the pre-Holocene (Norwich Crag Formation) surface (Figure 2) was used as the main template from which the predictive model was generated (output **PD1**).
- 5.2.1.3 This is based upon the assumptions that:
- 1) the Norwich Crag topography controlled the distribution of watercourse, areas of wetland, and elevated dryland zones during the Early Holocene; and
 - 2) the distribution of Late Upper Palaeolithic and Mesolithic activity upon the floodplain is, to an extent, determined by the position of different wetland-dryland ecotones.
- 5.2.1.4 The latter assumption can be supported by the radiocarbon dating program of Bates et al. (2009; 2012) which demonstrates that basal peat initiation over the northern plateau area occurred during the Late Mesolithic.
- 5.2.1.5 The pre-Holocene surface (output **PD1**) was processed to simulate changing paleogeography limits of marine transgression and estuarine development. This followed the method described by Sturt et al. (2013) using the Glacial Isostatic Adjustment (GIA) model of Bradley et al. (2011), sampled at 500 year intervals. This resulted in a series of elevation surfaces indicative of the difference between present day elevation at a given location, and the elevation of the earth's surface in relation to mean-sea-level for the given time slice. Using the raster maths tools within ArcGIS, these surfaces were then batch processed to adjust the elevations of the pre-Holocene land surface model. From each of these surfaces, the mean sea level for each 500 year time slice (ranging from the Late Mesolithic, c. 4500 BC, through to the Early Medieval period c. AD 500) has been extracted and is shown on Figure 15 as a series of polygons (output **PD2**). These broadly represent the age, and extent, of marine incursion upon the site (and hence marine flooding of the habitable dryland surface).
- 5.2.1.6 Thickness and altitude of the main stratigraphic units (Figure 3) was modelled to identify areas of Holocene sediment losses. This consisted of mapping the areas of former disturbance, including the 2009 Heathland Creation Trial Trenches and sand quarries. These areas were compiled into a single layer to display areas of likely sediment (and archaeological potential) loss (output **PD3**) (Figure 16).
- 5.2.1.7 To model the distribution of Early Holocene palaeochannels, upon the floodplain, the topographic model (**PD1**) was nested within the 2010 LiDAR survey data and broader OS Terrain 50 topographic datasets in order to model the drainage catchment area. ArcGIS was then used to model the hydrological catchment of the study area and identify the drainage pattern on the Norwich Crag surface (output **PD4**; Figure 17). While this is a crude approximation of the Early Holocene submerged hydrological catchment, it does permit the identification, and calculation, of the relative elevation above the floodplain (centre of the main palaeochannel) of the pre-Holocene surface (output **PD5**).
- 5.2.1.8 Lithological models from Rockworks were also imported into ArcGIS and the extent and thickness (both individual units and grouped deposits) of units was

calculated (output **PD6**) (Figure 18). The distribution of palaeochannels within the Holocene sediment stack, including the abandoned creek pattern visible within aerial photography prior to burial of the marsh by Made Ground, were mapped and incorporated into the model (output **PD7**) (Figure 19).

5.2.1.9 A similar modelling approach was taken during a recent Historic England project for the Middle Kennet Valley (NHPP 6633), which demonstrated, using the local HER database, that a number of spatial patterns (traits) could be identified to predict archaeological potential (Grant in prep.). The following traits were identified:

- **Proximity to water.** When tested against **PD4**, over 50% of archaeological sites were within 400m of the modelled palaeochannels, with 85% within 1km of these channels.
- **Floodplain elevation.** When tested against output **PD5**, 50% of archaeological sites were no greater than 3m elevated above the 'floodplain' (palaeochannel surface).
- **Topographic traits.** Calculating the slope and aspect of the **PD1** layer demonstrated that 45% of archaeological sites were located on slopes with a southern aspect, compared to 8% which faced northwards. Analysis of the slope gradients demonstrated that 56% of archaeological sites were located on slopes with a gradient of $\leq 1^\circ$, with 95% of sites on slopes with a gradient of $\leq 4^\circ$.

5.2.1.10 These same traits were re-run against the Sizewell C datasets and assigned a value (0 to 5) for each trait, with 5 indicating best match (e.g. shallow slope gradient) and 0 showing poorest match (e.g. very steep slope gradient). Each trait had equal weighting and all traits were summed to generate a map of archaeological potential (output **PD8**). The model output was then filtered to identify the areas of greatest archaeological potential (locations which embraced the four principal traits) and categorised as high potential (80% of trait criteria) and highest (90% of trait criteria). Output **PD3** was then applied to **PD8** to remove areas which were expected to have been impacted upon and where any archaeology previously present would have been lost.

5.2.1.11 Output **PD8** was compared against **PD2** in order to ascertain the likely date by which the pre-Holocene surface was inundated. Outputs from **PD8** and **PD6** were combined to provide a predictive model showing the likely lithological sequence and to identify areas of high archaeological potential coinciding with the presence of organic and / or calcareous deposits.

5.2.1.12 The palaeochannels in output **PD7** were compared against **PD3** and **PD6** in order to identify where channel deposits, most notably channel margins, coincided and where the sedimentary sequence was likely to be intact (output **PD9**).

5.2.1.13 Finally, all outputs from the predictive model were screened against the footprint of the proposed cut-off wall (shown on Figure 22). This included a 50m internal buffer

where excavation was prohibited due to mitigate accidental damage to the wall once installed.

5.3 Results

5.3.1.1 The predictive model has resulted in two distinctive predictive model layers:

5.3.2 *PD9 – Areas of highest archaeological potential within the Holocene sedimentary stack situated along palaeochannel margins*

5.3.2.1 Four locations have been identified where archaeological investigations should be conducted to investigate the main channel deposit fills and margins. The proposed areas have also been chosen to maximise the effectiveness of each archaeological trench so that multiple channel deposits will be encountered within the same trench section and the relationship between each fill can be established. These four locations are broadly aligned west-east across the centre of the proposed development and between the two reactor sites.

5.3.2.2 The location of these sites towards the margins of each channel should provide the best opportunity of locating archaeological material associated with waterside activities (boats, fish weirs, trackways, etc) as well as providing the opportunity to sample and date material from each channel fill.

5.3.3 *PD8 – Areas of highest archaeological potential on the pre-Holocene surface*

5.3.3.1 The predictive model suggests that the main areas of archaeological interest, within the extent of the proposed site development, lie to the north of the main early Holocene channel system. The highest concentration lie beneath the proposed main turbine hall of the northernmost reactor (Figure 20). The altitude of the Norwich Crag surface in this area ranges between -5.5 to -9.5m ODN and is located beneath c. 7-10m of Made Ground and Holocene sediments (Figure 21).

5.3.3.2 The palaeogeographic reconstructions (Figure 15) indicate that these areas would have been flooded during the Late Mesolithic to Early Neolithic. As such it is possible to suggest that any archaeological material associated with the dryland surface within this area would be of this date or earlier. The extensive flooding of the pre-Holocene dryland surface by the Bronze Age, coupled with the thick organic deposits overlaying many areas, would suggest that settlement sites situated within a dryland context would be absent within the area of the proposed development, and those that might have existed on the southern edge of the site, upon the rise in the Norwich Crag surface, would have been disturbed by the later quarrying. Other areas predicted to have high archaeological potential lie beyond the development footprint to the northeast and southwest.

6 PHASE 3: EXCAVATION STRATEGY

6.1 Areas of Defined Archaeological Potential

6.1.1.1 The predictive model has provided the opportunity to identify areas with the highest archaeological potential. Four archaeological objectives have been identified:

- *Evaluation of key areas where basal deposits overlie the Norwich Crag topography.*
- *Environmental sampling through the Holocene sequence.*
- *Inspection and recording of exposed sections of Holocene deposits.*
- *Evaluation of key areas where palaeochannel deposits and peat-clay contacts exist.*

6.1.1.2 Using these pre-chosen locations, it is then possible to design an excavation strategy, which will address the key constraints on the site excavations:

- *High groundwater table relative to depth of Holocene sediments.*
- *Significant thicknesses of overburden (Made Ground).*
- *Large plant required during site excavation.*
- *Health and Safety.*

6.1.2 High groundwater conditions

6.1.2.1 Test excavations (Stirk 2009) demonstrate that groundwater conditions on site present a major limiting factor to both the archaeologists and engineers. For the construction of the Sizewell C main platform, the Holocene sediments will be removed in order to build the site foundations and this will require dewatering of the site.

6.1.2.2 The issue of dewatering was previously encountered during the construction of Sizewell B where excavations for its foundations needed to reach nearly 18m below the water table. The local groundwater conditions are controlled by almost 50m of the Norwich Crag dense silts and sands overlying the London Clay formation producing a natural aquifer. Conventional dewatering techniques were rejected for a number of reasons including excessive draw down below adjacent bird reserves, settlement beneath the Sizewell A site, heavy encrustation on the pipework due to high iron content in the groundwater, preliminary calculations showing that even with 52 wells (rather than 6 used for the Sizewell A station) it would be only possible to lower the water by 16m, and have an excessive cost.

6.1.2.3 The alternative approach that was adopted for SZB was the construction of a diaphragm wall, extending down c. 50m into the London Clay Formation, linking

with a cofferdam to form a 1260m-long, all-encompassing, cut-off wall around the whole site. The diaphragm wall was, at the time, the largest ever constructed in the UK.

6.1.2.4 This approach had the notable advantage of only needing nine dewatering wells (rather than 52) and halving the construction period to six months. Performance was monitored via a network of observation wells and piezometers. After more than 4 million m³ of water had been pumped away, the excavation remained dry until the pumps were switched off in the spring of 1992, with the water table having been kept at least 2m below the deepest excavation (Parker 1994).

6.1.2.5 During the excavation of the Sizewell C main platform area a similar approach, utilising a cut-off wall, will be employed to localise the dewatering of the Main Development Site (Figure 22). The construction of the cut-off wall and dewatering of the site will therefore gradually reduce the groundwater table within the site boundary enabling deeper excavations as the pre-construction works progress. Therefore, phased investigations within the four main excavation areas, timed to coincide the pre-construction works, will provide the best opportunity to excavate and sample these channel sequences.

6.1.3 Significant thicknesses of overburden (Made Ground)

6.1.3.1 The thickness of Made Ground across the site means that to safely undertake stepped trenching to a depth of many metres below ground level, each trench would require a very large initial footprint on the ground surface. However, by timing the archaeological investigations to coincide with the initial ground works, it would be possible for the site construction team to clear the Made Ground, typically 4-5m thick over the four trench locations of interest, prior to commencing trenching itself.

6.1.4 Large plant required during site excavation and Archaeologists' Health and Safety

6.1.4.1 Each of the four main trench locations will be fully cordoned off to prevent archaeologists coming into direct contact with plant. Archaeologists will be driven / escorted to each of the four cordoned off trenches, as well as escorted to local welfare facilities if not located within these cordons. All plant movement will be directed away from these cordoned areas (with the exception of any plant used to facilitate the excavations).

6.2 Phased excavation strategy

6.2.1.1 The excavations at the site will therefore require a phased approach given the requirement to both reduce the ground and groundwater levels and to permit safe site access. This phased approach correlates with the two principle predictive model layers:

6.2.2 Phase 1: Excavation of trenches, with basal elevations of -5 to -6m ODN, in four key locations to sample main channels (and their edge environments).

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6.2.2.1 Phase 1 will commence after the installation of the cut-off wall and site dewatering has commenced. It will also be preceded by initial site excavations and reduction in the thickness of Made Ground to the top of the estuarine deposits. Four trench locations (referred to as D1-D4; shown in Figure 23) are proposed, focused on investigating the Holocene alluvial sequence from immediately below the modern made ground through to the Crag surface. The primary aim of these trenches is for the investigation of the palaeochannel sequences, permitting sampling and recording of these features in section, as well as locating any archaeological material that may be associated with channel edge activity. The depth to which trenching can be safely achieved will be determined by groundwater conditions and trench stability. The preference is for a staged approach of excavation to coincide with the gradually reducing site elevation as main site excavation proceeds. Trenches would be excavated in spits using a mechanical digger under archaeological supervision. Trenches would be to a maximum depth of 2m in each instance, with deeper excavation occurring in line with the main site elevation reduction. 20x10m trenches are proposed, with a contingency for some lateral extension should archaeological material (e.g. boat or trackway) be revealed. Where discrete archaeological features or cultural material is observed, hand excavation will be undertaken to allow controlled recovery of material and a full understanding of its context. Spoil excavated from the trenches will also be surveyed with a metal detector to locate small metallic finds, with samples from each context also collected to permit sieving (where appropriate) to identify if any non-metallic finds are present.

6.2.2.2 The proposed positions of these trenches, coupled with elevations and sequence thickness, as provided in Table 1.

Table 1: Proposed location for four trenches investigating the Holocene alluvial sequence

Trench	Easting (OSGB36 BNG)	Northing (OSGB36 BNG)	Estimated upper elevation (m OD) - base made ground	Estimated base elevation (m OD) – Crag surface	Estimated thickness (m)
Trench D1	647179	264183	-4	-9.1	5.1
Trench D2	647214	264060	-2.7	-8.1	5.4
Trench D3	647267	264130	-2.5	-8.6	6.1
Trench D4	647468	264086	-3	-10.3	7.3

6.2.3 Phase 2: Excavation of basal areas after site elevation reduction.

6.2.3.1 Phase 2 will focus upon the areas of highest archaeological potential on the pre-Holocene (Norwich Crag) surface. This activity will occur during the later stages of the main site excavation when much of the Holocene sequence has been removed from the site and groundwater levels have been reduced to below the current Norwich Crag surface. Three trenches (referred to as E1-E3; shown in Figure 23) have been identified, located in areas of highest archaeological potential identified in the predictive modelling. These trenches are proposed for investigating any archaeology that may be associated with the Crag surface, beneath the alluvium, in the northern half of the main excavation site. Ground

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levels would be reduced to within 2m of the Crag Surface by site plant, with archaeologists overseeing removal of final 2m and, if archaeology is encountered, any necessary excavation. An area of up to 30x30m is proposed for each of these trenches.

6.2.3.2 The proposed positions of these trenches, coupled with elevations and sequence thickness, as provided in Table 2.

Table 2: Proposed location for three excavation trenches of basal Holocene and Norwich Crag surface

Trench	Easting (OSGB36 BNG)	Northing (OSGB36 BNG)	Estimated upper elevation (m OD) – Holocene alluvium over Crag surface	Estimated base elevation (m OD) – Crag surface	Estimated thickness (m)
Trench E1	647380	264255	-5.7 (2m above Crag)	-7.7	2
Trench E2	647310	264242	-4.3 (2m above Crag)	-6.3	2
Trench E3	647390	264165	-5.7 (2m above Crag)	-7.7	2

6.2.4 Detailed WSI

A detailed Written Scheme of Investigation (WSI) will be produced by the appointed archaeological contractor in advance of the start of works on site for approval by SCCAS and the HE Regional Advisor for Archaeological Science (East of England). The following professional standards would apply:

- *ClfA 2014 Guidelines for the Collection, Documentation, Conservation and Research of Archaeological Materials;*
- *ClfA 2014 Code of Conduct;*
- *SCCAS Fieldwork Guidance Documents; and*
- *Standards for Field Archaeology in the East of England.*

6.2.4.1 The WSI will set out procedures for:

- *Machine-stripped and hand-excavated trenches*
- *Archaeological and geoarchaeological recording;*
- *Sampling policies, including selection of deposits to be sampled and sampling techniques (e.g. column and bulk samples for environmental samples), in line with relevant HE guidelines (e.g. Environmental Archaeology)*
- *Policy for the treatment, storage, processing and discard of recovered archaeological material and soil samples;*
- *Policy for environmental analysis techniques (e.g. pollen, plant macrofossils, diatoms, insects) and scientific dating (e.g. AMS radiocarbon dating) assessment and analysis;*
- *Provision for extension of excavation areas to investigate any areas comprising exceptional survival of archaeological remains;*
- *Details of the archaeological contractor's staff and any sub-contractors/specialists;*
- *Health, Safety and Environmental policy;*
- *Post-excavation assessment (PXA) strategy; and*
- *Arrangements for Site Archive and Finds deposition.*

6.2.5 Additional strategies

6.2.5.1 In addition to site recording undertaken by the archaeologists, toolbox training will be offered to site excavation operatives with reporting protocols put in place should any archaeological material be found.

CONCLUSIONS

- 6.2.5.2 This peat strategy has been designed around pre-construction site investigations, predictive modelling, and a phased excavation strategy.
- 6.2.5.3 Detailed deposit modelling has provided the opportunity to test the potential of the Holocene sequences to address a range of archaeological questions. It has been demonstrated that although the Holocene sequences retain a record of landscape change and marine transgression, the deposits themselves are unsuitable for certain research questions that rely upon altitudinal precision due to site compaction (e.g. reconstructions of past sea level).
- 6.2.5.4 Palaeogeographic reconstructions have shown that the dryland surface beneath the Sizewell C main platform area would have been inundated between the Late Mesolithic and Early Neolithic. This means that dryland structures associated with later prehistoric activity are unlikely to be present within the site boundaries. Wetland structures may be present for which targeted investigations of the full thickness of the Holocene sequence (four trenches) are proposed. The multi-phased palaeochannel record from the site will also be investigated and opportunities for geoarchaeological sampling (and palaeoenvironmental assessment) will be available from the proposed trench locations.
- 6.2.5.5 The predictive model has been used to propose an excavation strategy, in consultation with site engineers, to investigation to Holocene alluvial sequence and areas identified as having the highest archaeological potential. Using this approach an excavation strategy has been developed that considers the considerable challenges presented by this site (water table, depth of excavation, health and safety).

7 REFERENCES

- Allen, J.R.L. 1999. Geological impacts on coastal wetland landscapes: some general effects of sediment autocompaction in the Holocene of northwest Europe. *The Holocene* **9**: 1–12.
- Allen, J.R.L. 2000. Morphodynamics of Holocene salt marshes: a review sketch from the Atlantic and Southern North Sea coasts of Europe. *Quaternary Science Reviews* **19**: 1155–1231.
- Atfield, R. 2007. *Leiston Substation 132kV Cable Route: A report on the Archaeological Monitoring, 2007*. Ipswich, Suffolk C.C. Archaeological Service, SCCAS Report No. 2007/190
- Atfield, R. 2008. *Archaeological evaluation report: Great Gabbard Wind Farm Onshore Works, Sizewell Wents, Leiston, Suffolk*. Ipswich, Suffolk County Council Archaeological Service report.
- AMEC 2014. *Sizewell C: Offshore and Intertidal Historic Environment Desk-Based Assessment*. Document No. 15930TR00058
- Ashton, N., Lewis, S.G., De Groot, I., Duffy, S.M., Bates, M., Bates, R., Hoare, P., Lewis, M., Parfitt, S.A., Peglar, S., Williams, C. and Stringer, C. 2014. Hominin Footprints from Early Pleistocene Deposits at Happisburgh, UK. In *PLoS-ONE* **9** (2): e88329.
- Baeteman, C., Waller, M., and Kiden, P. 2011. Reconstructing middle to late Holocene sea-level change: A methodological review with particular reference to “A new Holocene sea-level curve for the southern North Sea” presented by K.-E. Behre. *Boreas* **40**: 557–572.
- Basak, N.N. 1994. *Surveying and Levelling*. Delhi, Tata McGraw-Hill.
- Batchelor, C.R. 2012. *Report on the Geoarchaeological Monitoring During Peat Trials 2012 - Sizewell C*. AMEC Report, Project Reference 29816C008A.
- Bates, M. 2008. *A Geoarchaeological Report on the Geotechnical Ground Investigation at the Sizewell Site, Suffolk*. Unpublished client report.
- Bates, M., Bates, R., Jones, S., Walker, M. and Whittaker, J. 2009. *Sizewell C, Heathland Creation Trials Engineering, Geoarchaeological Assessment, Assessment Report on Site Works*. Unpublished client report. AMEC, SZC-KR1008-U0-000_Rep_00000XX.
- Bates, M., Bates, R., Cole, J and Whittaker, J. 2012. *A Report on the Geoarchaeological Resistivity Tomography Geophysical Survey at Sizewell C*. Unpublished client report.
- Bennema, J., Geue, E.C.W.A., Smits, H. and Wiggers, A.J. 1954. Soil compaction in relation to Quaternary movements of sea level and subsidence of the land, especially in The Netherlands. *Geologie en Mijnbouw* **16**: 173–178.
- Bradley, S.L., Milne, G.A., Shennan, I. and Edwards, R. 2011. An improved glacial isostatic adjustment model for the British Isles. *Journal of Quaternary Science* **26** (5): 541-552.
- Brain, M.J. 2006. *Autocompaction of mineralogenic intertidal sediments*. Unpublished PhD Thesis, University of Durham.
- Brew, D.S. 1990. *Sedimentary Environments and Holocene Evolution of the Suffolk Estuaries*. Unpublished PhD Thesis, University of East Anglia.

Not protectively marked

Sizewell C Main Platform Peat Strategy

Brew, D.S., Funnell, B.M. and Kreiser, A. 1992. Sedimentary environments and Holocene evolution of the lower Blyth estuary, Suffolk (England), and a comparison with other East Anglian coastal sequences. *Proceedings of the Geologists' Association* **103** (1): 57-74.

Busschers, F.S., Kasse, C., van Balen, R.T., Vandenberghe, J., Cohen, K.M., Weerts, H.J.T., Wallinga, J., Johns, C., Cleveringa, P. and Bunnik, F.P.M. 2007. Late Pleistocene evolution of the Rhine-Meuse system in the southern North Sea basin: imprints of climate change, sea-level oscillation and glacio-isostasy. *Quaternary Science Reviews* **26** (25-28): 3216-3248.

Carr, A.P. 1967. The London Clay Surface in Part of Suffolk. *Geological Magazine* **104**: 574-584.

Carr, A.P. and Baker, R.E. 1968. Orford, Suffolk: Evidence for the Evolution of the Area during the Quaternary. *Transactions of the Institute of British Geographers* **45**: 107-123.

ClfA 2014. Standard and guidance for archaeological excavation. Chartered Institute for Archaeologists, Reading

https://www.archaeologists.net/sites/default/files/ClfAS&GExcavation_1.pdf

Coles, B.P.L. and Funnell, B.M. 1981. Holocene palaeoenvironments of Broadland, England. In Nio, S.-D., Shüttenhelm, R.T.E. and van Weering, Tj.C.E. (eds) *Holocene Marine Sedimentation in the North Sea Basin*. Oxford, Blackwell, 123-131.

Corcoran, J., Halsey, C., Spurr, G., Burton, E. and Jamieson, D. 2011. *Mapping Past Landscapes in the Lower Lea Valley: a geoarchaeological study of the Quaternary sequence*. London, Museum of London Archaeology Monograph 55.

Edwards, R.J. 2006. Mid to late Holocene sea-level change in southwest Britain and the influence of sediment compaction: *The Holocene* **16**: 575-587.

Ellison, R.A. Knox, R.W.O., Jolley, D.W. and King, C., 1994. A revision of the lithostratigraphical classification of the early Palaeogene strata of the London Basin and East Anglia. *Proceedings of the Geologists' Association* **105**, 187-197.

Funnell, B., 1995. Global sea-level and the (pen-) insularity of late Cenozoic Britain. In: R. C. Preece (Ed.) *Island Britain: A Quaternary Perspective*. London: Geological Society, 3-13.

Gow, H., Cripps, C., Thorpe, S., Horabin, C. and Lee, J.R. 2014. *Model metadata report for the Somerset Levels 3D geological model*. British Geological Survey Open Report OR/13/050.

Grant, M.J. in prep. Deposit Modelling. In Barnett, C., Milwain, R., Barclay, A., Bell, M., Grant, M.J., Godden, A. and Orr, S. (eds.) *Tracing their Steps: Predictive Mapping of Upper Palaeolithic and Mesolithic Archaeology – A Case Study of the Middle Kennet Valley*. Salisbury, Wessex Archaeology.

Halcrow Group Limited 2008. *Phase 1: coastal geohazard risk assessment task 2 – Sizewell site characterisation*. Technical report series 07/08: 008. BEEMS

Hamblin, R.J.O., Moorlock, B.S.P., Booth, S.J., Jeffrey, D.H. and Morigi, A.N., 1997, The Red Crag and Norwich Crag formations in eastern Suffolk. *Proceedings of the Geologists' Association* **108**: 11–23.

Harding, P., Bridgland, D.R., Allen, P., Bradley, P., Grant, M.J., Peat, D., Schwenninger, J.-L., Scott, R., Westaway, R. and White, T.S. 2012. Chronology of the Lower and Middle Palaeolithic in NW Europe: developer-funded investigations at

Not protectively marked

Sizewell C Main Platform Peat Strategy

Dunbridge, Hampshire, southern England. *Proceedings of the Geologists' Association* **123** (4): 584-607.

Harding, P., Ellis, C. and Grant, M.J. 2014. Late Upper Palaeolithic Farndon Fields. In Cooke, N. and Mudd, A. (eds) *A46 Nottinghamshire: The Archaeology of the Newark to Widmerpool Improvement Scheme, 2009*. Salisbury, Wessex Archaeology, 12-70.

Haslett, S.K., Davies, P., Curr, R.H.F., Davies, C.F.C., Kennington, K., King, C.P., and Margetts, A.J. 1998. Evaluating late-Holocene relative sealevel change in the Somerset Levels, southwest Britain. *The Holocene* **8**: 197–207.

Hodgson, G.E. and Funnell, B.M., 1987. Foraminiferal biofacies of the Early Pliocene Coralline Crag. In Hart, M.B. (ed) *Micropalaeontology of carbonate environments*. Chichester, Micropalaeontological Society Special Publication, 44–73.

Horton, B.P., Innes, J.B., Shennan, I., Lloyd, J.M. and McArthur, J.J. 2004. Holocene coastal change in East Norfolk, UK: paleoenvironmental data from Somerton and Winterton Holmes, near Horsey. *Proceedings of the Geologists' Association* **115**: 209–220.

Horton, B.P. and Shennan, I. 2009. Compaction of Holocene strata and the implications for relative sealevel change on the east coast of England. *Geology* **37**: 1083-1086.

Jelgersma, S. 1961. *Holocene sea level changes in the Netherlands*. Maastricht, Van Aelst.

Kaye, C.A., and Barghoorn, E.S. 1964. Quaternary sea-level change and crustal rise at Boston, Massachusetts, with notes on the autocompaction of peat. *Geological Society of America Bulletin* **75**: 63–80.

Lees, B.J. 1980. *Sizewell-Dunwich Banks field study topic report: 1. a) Introduction, b) Geological background*. Wormley, Institute of Oceanographic Sciences Report 88.

Lees, B.J. 1982. Quaternary sedimentation in the Sizewell-Dunwich banks area, Suffolk. *Bulletin of the Geological Society of Norfolk* **32**: 1-35.

Lloyd, J., Yongqianq, Z. and Woods, A. 2008. *Preliminary investigation of the relative sea-level and inundation history of the Sizewell and Minsmere coastline, Suffolk*. BEEMS: Technical report series 07/08.

Long, A.J., Waller, M.P., and Stupples, P. 2006. Driving mechanisms of coastal change: Peat compaction and the destruction of late Holocene coastal wetlands: *Marine Geology* **225**: 63–84.

Martin, E., Pendleton, C. and Plouviez, J. 2009. Archaeology in Suffolk 2008. In *Proceedings of the Suffolk Institute of Archaeology & History* **XLII** (1): 61-92.

Mathers, S.J. and Zalaseiwicz, J.A. 1988. The Red and Norwich Crag formations of southern East Anglia. *Proceedings of the Geologists Association* **99**: 261–278.

Mathers, S.J. and Zalaseiwicz, J.A. 1996. A gravel beach-rip channel system: the Westleton Beds (Pleistocene) of Suffolk, England. *Proceedings of the Geologists' Association* **107**: 57–67

Mathers, S.J., Burke, H.F., Terrington, R.L., Thorpe, S., Dearden, R.A., Williamson, J.P. and Ford, J.R. 2014. A geological model of London and the Thames Valley, southeast England, *Proceedings of the Geologists' Association* **125** (4): 373-382,

Not protectively marked

Sizewell C Main Platform Peat Strategy

McNeill, A. 2010. *Sizewell Offshore Investigations: Integrated report: UX1, UHR, Resistivity, Refraction and MSW-P Surveys*. Falmouth, Fugro Seacore Report Number: EC.10.Ga.Co.0472_c_Rev1.

Parfitt, S.A., Ashton, N.M., Lewis, S.G., Abel, R.L., Coope, G.R., Field, M.H., Gale, R., Hoare, P.G., Larkin, N.R., Lewis, M.D., Karloukovski, V., Maher, B.A., Peglar, S.M., Preece, R.C., Whittaker, J.E. and Stringer, C.B. 2010. Early Pleistocene human occupation at the edge of the boreal zone in north-west Europe. *Nature* **466**: 229-233.

Parker, D. 1994. Key Cut-off. *New Civil Engineer Sizewell Supplement October 1994*, 39-40.

Paul, M.A. and Barras, B.F. 1998. A geotechnical correction for post-depositional sediment compression: examples from the Forth Valley, Scotland. *Journal of Quaternary Science* **13**: 171–176.

Preece, R.C., Parfitt, S.A., Coope, G.R., Penkman, K.E., Ponel, P. and Whittaker, J.E. 2009. Biostratigraphic and aminostratigraphic constraints on the age of the Middle Pleistocene glacial succession in north Norfolk. UK. *Journal of Quaternary Science* **24** (6): 557-580.

Pye, K. and Blott, S.J. 2006. Coastal processes and morphological change in the Sizewell—Dunwich area, Suffolk, UK. *Journal of Coastal Research* **22**: 453–473.

Riches, P. 2012. *The palaeoenvironmental and neotectonic history of the Early Pleistocene Crag basin in East Anglia*. Unpublished PhD Thesis, Royal Holloway, University of London.

Rose, J. 2009. Early and Middle Pleistocene landscapes of eastern England. *Proceedings of the Geologists' Association* **120**: 3-33.

Rose, J., Moorlock, B.S.P. and Hamblin, R.J.O. 2001. Pre-Anglian fluvial and coastal deposits in Eastern England: Lithostratigraphy and Palaeoenvironments. *Quaternary International* **79**: 5-22.

Scadgell, F. and Essaye, S. 2012. *Sizewell C: Historic Environment – LiDAR Analysis and Reporting*. AMEC Unpublished Report UKEPR 15930/TR/00064.

Skempton, A.W. 1970. The consolidation of clays by gravitational compaction. *Quarterly Journal of the Geological Society London* **125**: 373–411.

Stirk, D. 2009. *Heath creation trials at Sizewell B, Sizewell, Leiston, Suffolk: archaeological monitoring report*. SCCAS Report No. 2009/261.

Sturt, F., Garrow, D., Bardley, S. 2013. New models of North West European Holocene palaeogeography and inundation. *Journal of Archaeological Science* **40** (11): 3963-3976.

Sturt, F., Standen, T., Grant, M. and Dix, J. 2016. *Determining potential: onshore/offshore prehistory*. Southampton, GB, University of Southampton.

Törnqvist, T.E., Wallace, D.J., Storms, J.E.A., Wallinga, J., Dam, R.L., Blaauw, M., Derksen, M.S., Klerks, C.J.W., Meijneken, C., and Snijders, E.M.A. 2008. Mississippi Delta subsidence primarily caused by compaction of Holocene strata. *Nature Geoscience* **1**: 173–176.

van Asselen, S., Stouthamer, E. and van Asch, T.W.J. 2009. Effects of peat compaction on delta evolution: a review on processes, responses, measuring and modelling. *Earth Science Reviews* **92**: 35–51.

Not protectively marked

Sizewell C Main Platform Peat Strategy

van Asselen, S., Karssenberg, D. and Stouthamer, E. 2011. Contribution of peat compaction to relative sea-level rise within Holocene deltas. *Geophysical Research Letters* **38** (24): L24401.

Woodworth, P.L., Tsimplis, M.N., Flather, R.A. and Shennan, I. 1999. A review of the trends observed in British Isles mean sea-level data measured by tide gauges. In *Geophysical Journal International* **36**: 651-670.

Zalasiewicz, J.A., Mathers, S.J., Hughes, M.J., Gibbard, P.L., Peglar, S.M., Harland, R., Nicholson, R.A., Boulton, G.S., Cambridge, P. and Wealthall, G.P. 1988. Stratigraphy and Palaeoenvironments of the Red Crag and Norwich Crag Formations between Aldeburgh and Sizewell, Suffolk, England. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences* **322**: 221–272.

8 APPENDIX A: DEPOSIT MODEL METHODOLOGY

8.1.1.1 For the purposes of the deposit model, a study area measuring 0.62 km² was defined with its western boundary marked by the SW-NE aligned drainage ditch along the edge of the main development site. From this area the available geotechnical and geoarchaeological site investigation data was assimilated (shown on Figure 1). This consisted of:

1975 Foundation Engineering Ltd Site Investigations, derived from the BGS Onshore GeolIndex

- *62 x Cable Percussion*
- *5 x Cone Penetration Test*

2008 Geoarchaeological Site Investigations

- *37 x Cable Percussion*

2009 Geoarchaeological Site Investigations

- *5 x Cable Percussion*

2010-11 Phase 1 Sizewell C Onshore Site Investigations

- *1 x Cable Percussion and Rotary Core*
- *33 x Cable Percussion*
- *32 x Cone Penetration Test*
- *2 x Rotary Open and Rotary Core*
- *16 x Rotary Core*
- *42 x Rotary Open*

2014 Sizewell C Construction Area and Associated Development Ground Investigation

- *1 x Cable Percussion*

8.1.1.2 This represents a total of 246 data points. The 29 sites sampled during the powered auger survey (Batchelor 2012) have not been utilised within the deposit model as no stratigraphic information was available.

8.1.1.3 The total depth of each individual core is shown in Figure A1. This shows that most are between 5-20m in length, therefore penetrating the full thickness of the Holocene deposits modelled by Bates (2008), with a notable peak in the number of cores reaching 45-75m which penetrate the full thickness of the Norwich Crag

Formation and terminate within the centre of the Palaeogene deposits. The deepest cores, 100-125m, reach the basal Cretaceous Chalk.

8.1.2 Dataset handling and model constraints

- 8.1.2.1 The data was stored within an Access (MDB) database. All elevation data is related to Ordnance Datum (mOD) with locations stated using a British National Grid numeric 12-digit reference.
- 8.1.2.2 Positioning for the 2010-11 and 2014 site investigations is quoted as being derived using specialist Global Positioning System (GPS) equipment with coordinates of each exploratory hole measured relative to British National Grid, and the level relative to Ordnance Datum. These levels correlate with the 2010 LiDAR survey (Scadgell and Essaye 2012), commissioned by AMEC on behalf of EDF to determine the character, nature, extent and possible survival of archaeological remains within the footprint of the Sizewell C Indicative Development Site Boundary (IDSB).
- 8.1.2.3 The 2008 boreholes (Bates 2008) have coordinates quoted to the nearest metre and altitudes given to the nearest centimetre. The survey technique for obtaining these positions is not stated but a cross-reference of these reported ground levels with the 2010 LiDAR survey demonstrated an altitudinal difference of $0.04 \pm 0.06\text{m}$ ($n=37$), indicating that vertical errors are minimal. The boreholes from 2009 and 2012 (Bates et al. 2009; 2012) have no positional or altitudinal data available and were therefore transcribed from the location maps and ground surface levels derived from the reported illustrations and / or 2010 LiDAR survey.
- 8.1.2.4 For all historic boreholes the quoted well head elevations cannot be cross-referenced to modern topography (using the 2010 LiDAR data) to identify any outliers as the site has, in many places, undergone significant changes due to Made Ground and landscaping since the construction of Sizewell B. The Site Investigations from 1975 have coordinates quoted to the nearest 10m and altitudes given to the nearest centimetre. The accuracy of the borehole levels cannot be quantified from available data, nor can the method be identified by which these values were derived. Assuming that the levels were obtained by an experienced survey team, with reference to local / site benchmarks, for this type of surveying the permissible error is unlikely to have been greater than $\pm 0.025\text{m}$ (Basak 1994).
- 8.1.2.5 Deposit modelling was run within RockWorks 15, using the interpolation method of Inverse Distance Weighting, and a node spacing of 10m. The surface of the model was constrained using the 2010 LiDAR survey data. As explained in Section 4.2.5, the 1975 and 2008-2014 datasets were treated separated for the purposes of this study due to changes in the main platform area associated with the construction of Sizewell B. The 1975 dataset is utilised for the stratigraphic modelling solely for the geological deposits (Norwich Crag Formation and deeper) and excluded from the lithological modelling.

8.1.3 Stratigraphy

8.1.3.1 The first phase of the modelling was to define the stratigraphic sequence of the study area. Stratigraphy represents interpreted formations which are distinctly layered in nature, are consistent between cores in their order from the surface downward, and can only occur once within a core. As a result, these stratigraphic units present a simplified representation of the site deposits and will often contain groups of lithologies within each stratigraphic unit. Seven stratigraphic units were defined for the study area based upon a synthesis of the available boreholes (shown in Figure A2):

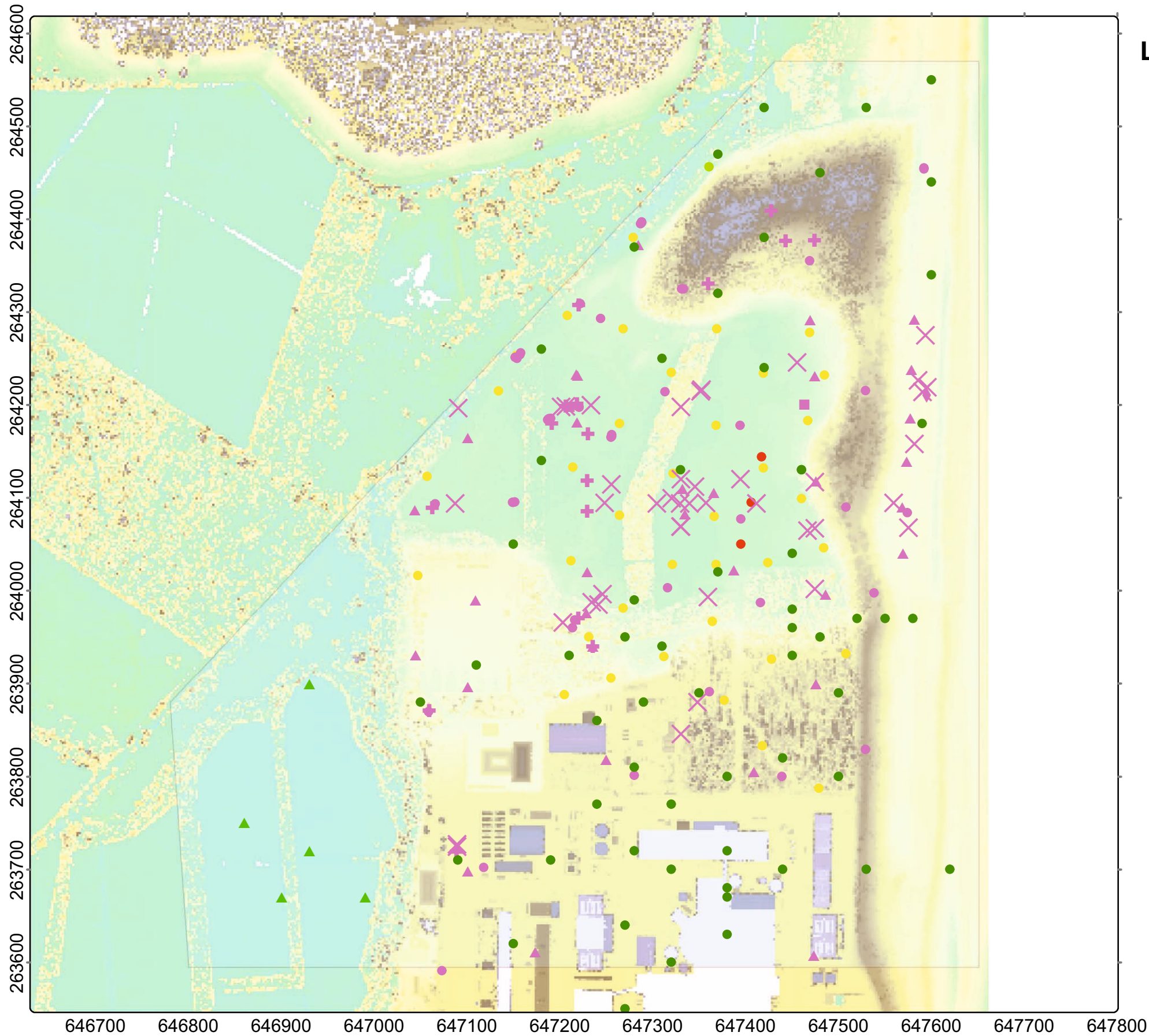
- **Made Ground** - typically consists of loose to medium dense sand and gravel deposits which can be indistinguishable, where they abut, from the Crag deposits. Much of the Made Ground is likely to originate from Crag deposits excavated during the construction of Sizewell B.
- **Buried topsoil (1970 surface)** - within a number of the 1975 boreholes a buried landsurface was present directly below the Made Ground, including intact grass turf. This represents the marsh surface prior to the Sizewell B construction works. Ordnance Survey maps of the area show that this landsurface was buried c. 1970 – see Section 4.2.5
- **Holocene peats and clays** - typically this sequence is dominated by peats at the base of the sequence, with clays and silts, along with intercalated peat surfaces, increasingly dominant towards the top of the sequence. Palaeoenvironmental and chronological assessments of these deposits have been undertaken by Bates et al. (2009; 2012).
- **Reworked Norwich Crag Formation / Pleistocene Deposits** (not shown in Figure A2) – within the base of the Holocene sequence there are a series of organic sands and gravels (the latter classed as Pleistocene deposits) present, as well as some reworked Crag sands. These were initially identified by Bates (2008) in a few locations across the site and may relate to Late Pleistocene channel activity.
- **Norwich Crag Formation** – consists of medium to fine sands with occasional lenses of clay, with shell material also often present. The Norwich Crag Formation may also contain earlier Red Crag Formation deposits at its base. Deposit modelling has shown that these deposits are up to 50m thick under Sizewell B power station and notably thinner 28-34m, beneath the Sizewell C main platform area, coinciding with a west-east aligned palaeochannel incised into the surface of the Norwich Crag Formation.
- **Palaeogene deposits** – the surface of the London Clay Formation dips south-eastwards, reducing from -41m ODN in the west to c. -50m ODN east of Sizewell B near the shoreline. This surface level correlates with the surface of the London Clay Formation defined by the 2010 Fugro offshore geophysical and geotechnical surveys (McNeill 2010).

- **Cretaceous Chalk** – the surface of the Cretaceous Chalk dips eastwards from -78 to -82m ODN. This surface level correlates with the surface of the Cretaceous Chalk defined by the 2010 Fugro offshore survey (McNeill 2010).

8.1.4 Lithology

8.1.4.1 Lithology data represents downhole material types that are not necessarily layered in a specific order and can therefore occur more than once down-sequence. For the purposes of this study, lithology has been defined for the Holocene deposits within the stratigraphic unit 'Holocene peats and clays'. This allows the lithological model to be directly nested within the main stratigraphic model so that the spatial variation of the Holocene lithology can be explored in more detail than the broader stratigraphic analyses such as unit thickness and surface topography. Given the broad range of different site investigations, often for different purposes and using different sampling / recording techniques, the Holocene lithology was categorised into eight broad units that could, with some certainty, be derived from all of the available core log records (shown in Figures 6 and 7):

- *Clay*
- *Silt*
- *Sand*
- *Gravel*
- *Peat*
- *Organic-Clay*
- *Organic-Silt*
- *Organic-Sand*



Legend

1975 Foundation Engineering Ltd Site Investigation

- Cable Percussion
- ▲ Cone Penetration Test

2008-9 Geoarchaeological Site Investigations

- Cable Percussion: 2008
- Cable Percussion: 2009

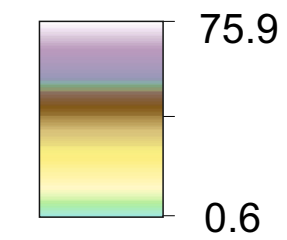
2010-11 Phase 1 Sizewell C Onshore Site Investigations

- ◆ Cable Percussion and Rotary Core
- Cable Percussion
- ▲ Cone Penetration Test
- Rotary Open and Rotary Core
- ⊕ Rotary Core
- ✕ Rotary Open

2014 Sizewell C Construction Area and Associated Development Ground Investigation

- Cable Percussion

Topography (2010 LiDAR Survey; m ODN)

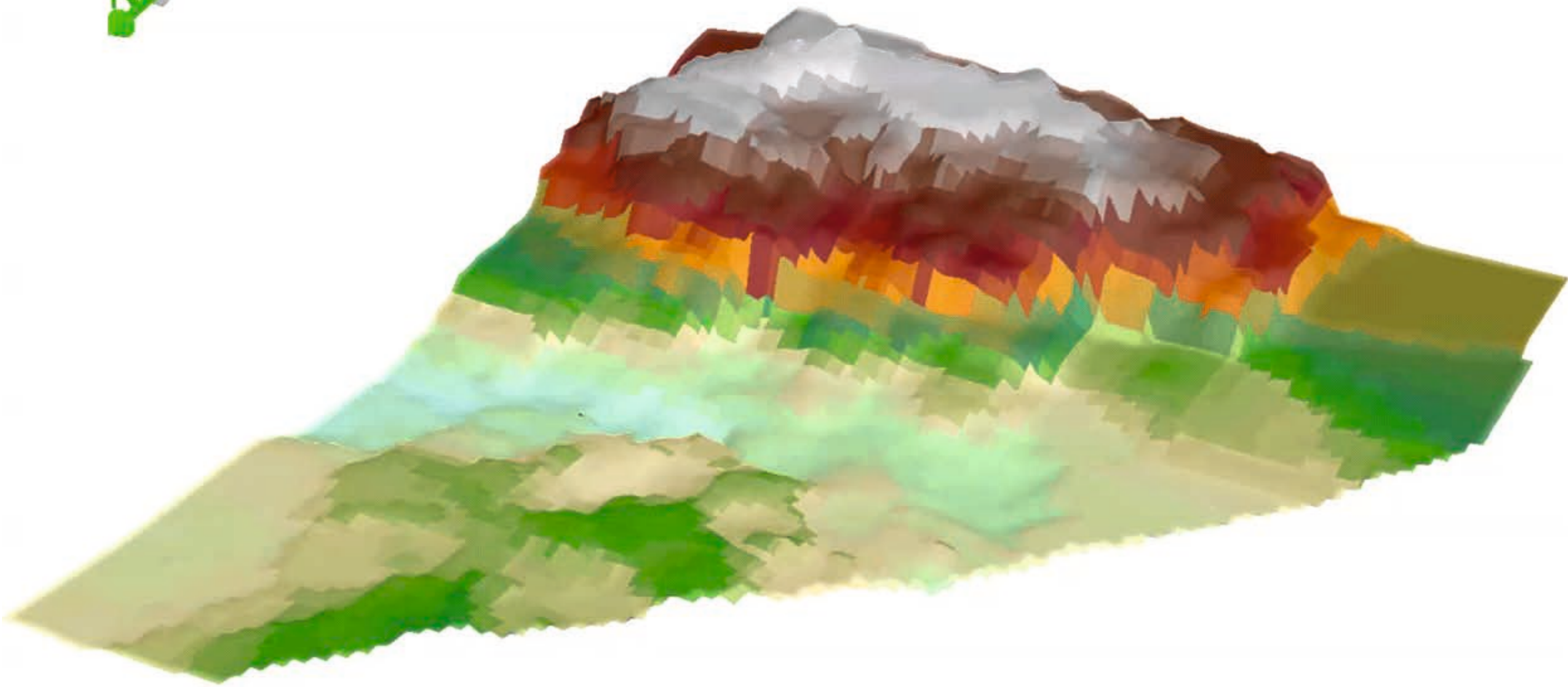


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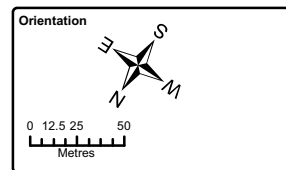
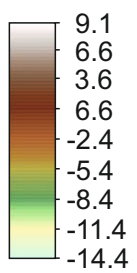
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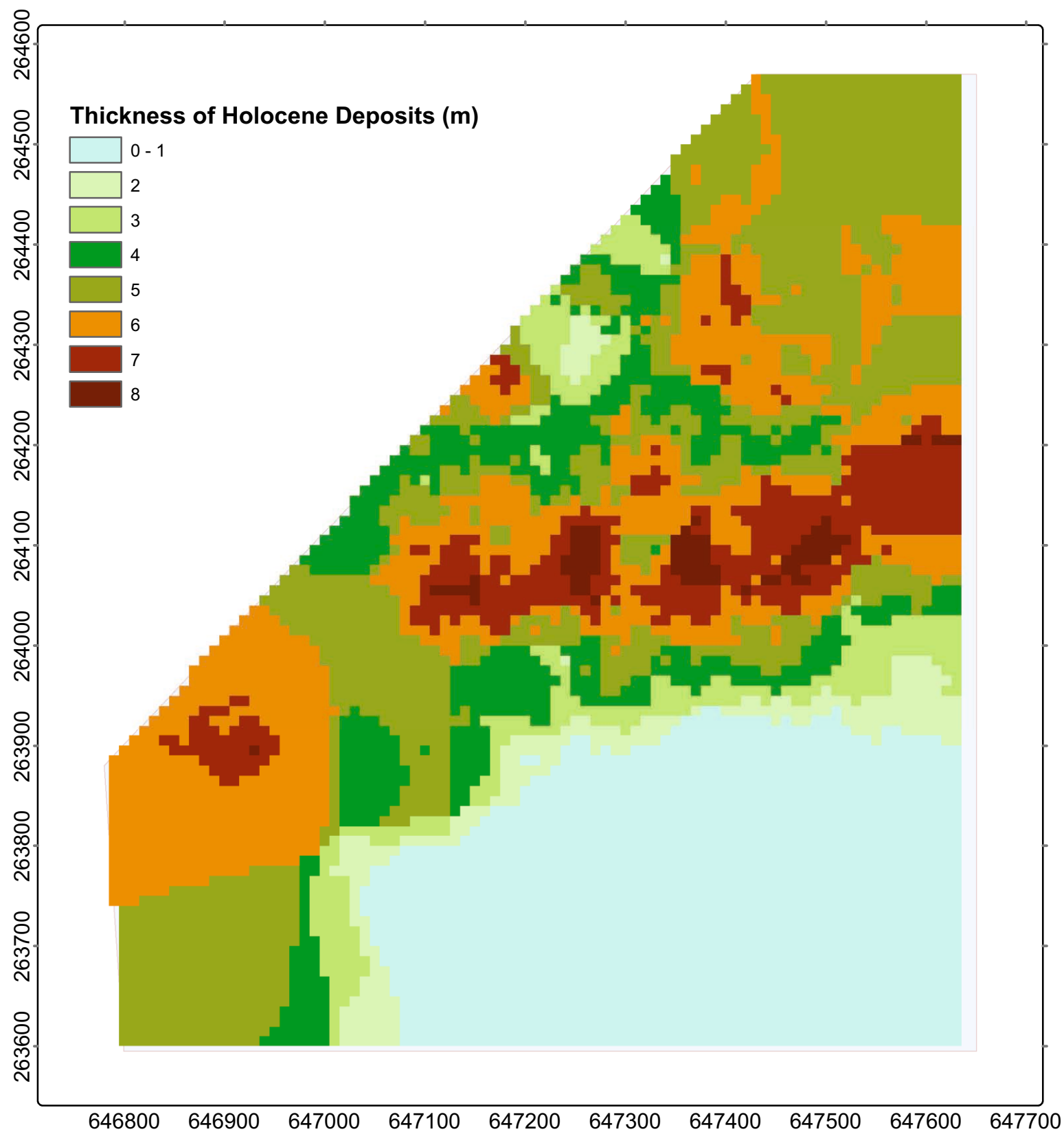
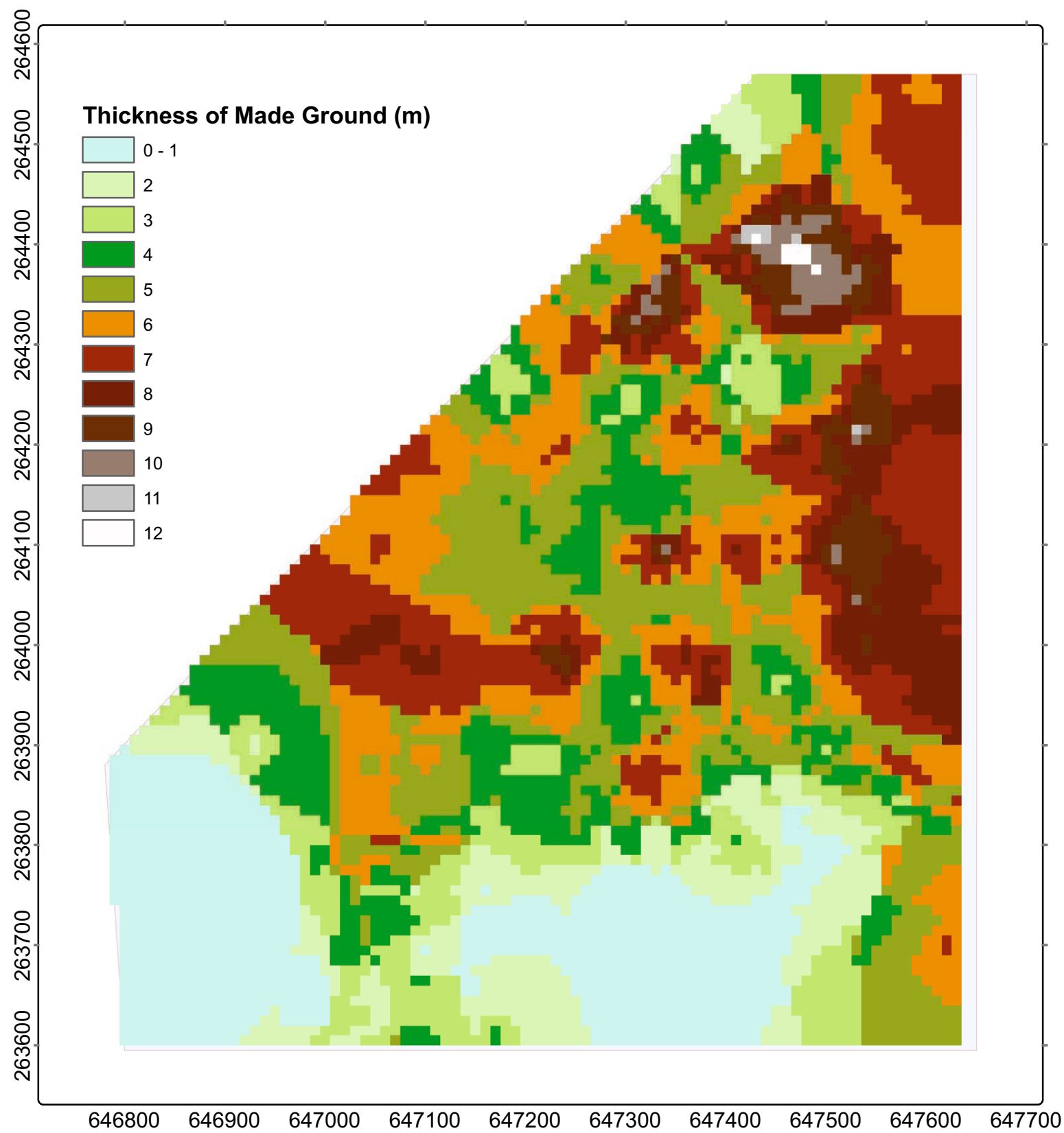
Crag Surface (m ODN)



Project	SZC Main Platform Peat Strategy		
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Client Name	EDF Development Ltd.
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Coordinate System: British National Grid. Contains OS data © Crown Copyright and database right 2016.

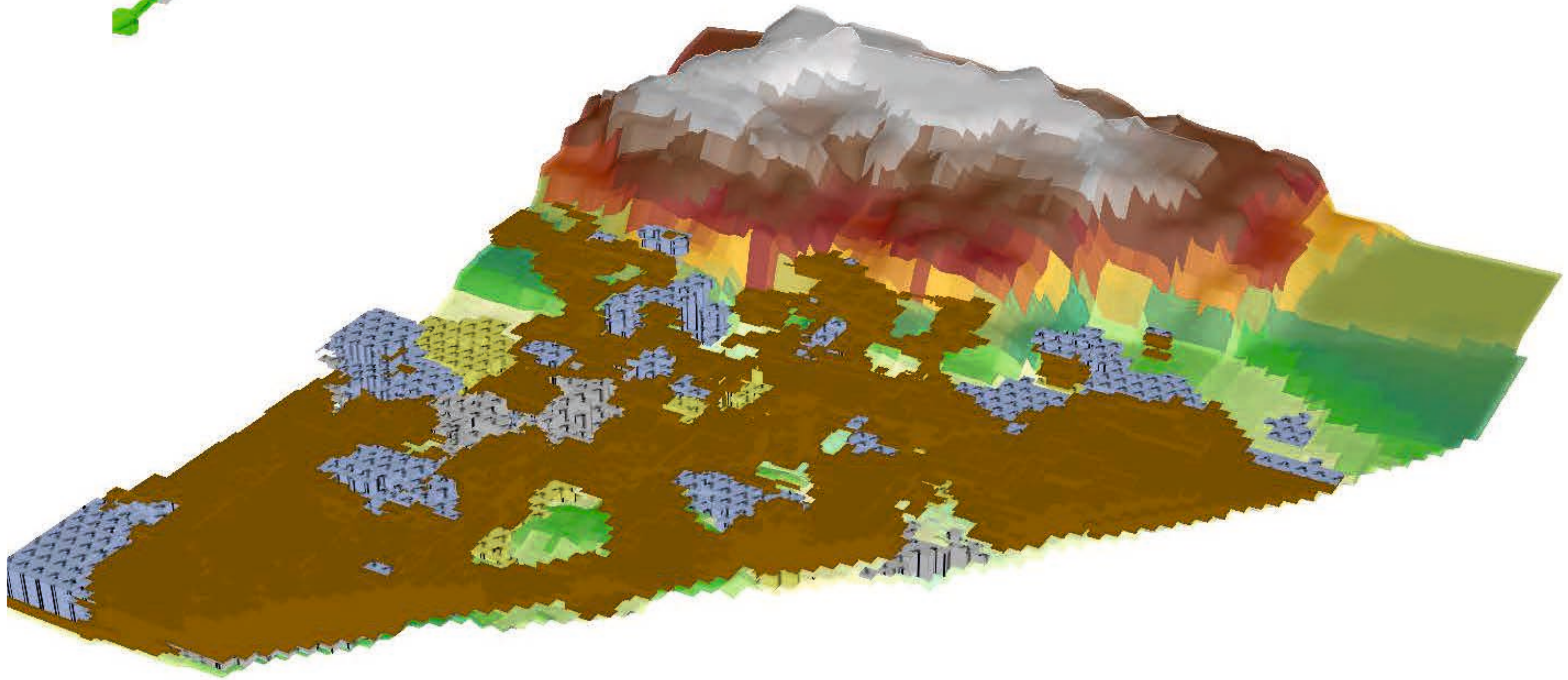
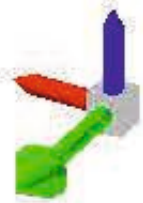


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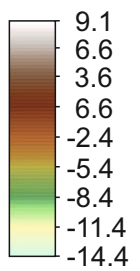
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Client Name
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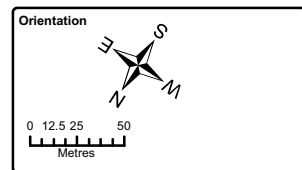


Crag Surface (m ODN)



Organic Lithologies

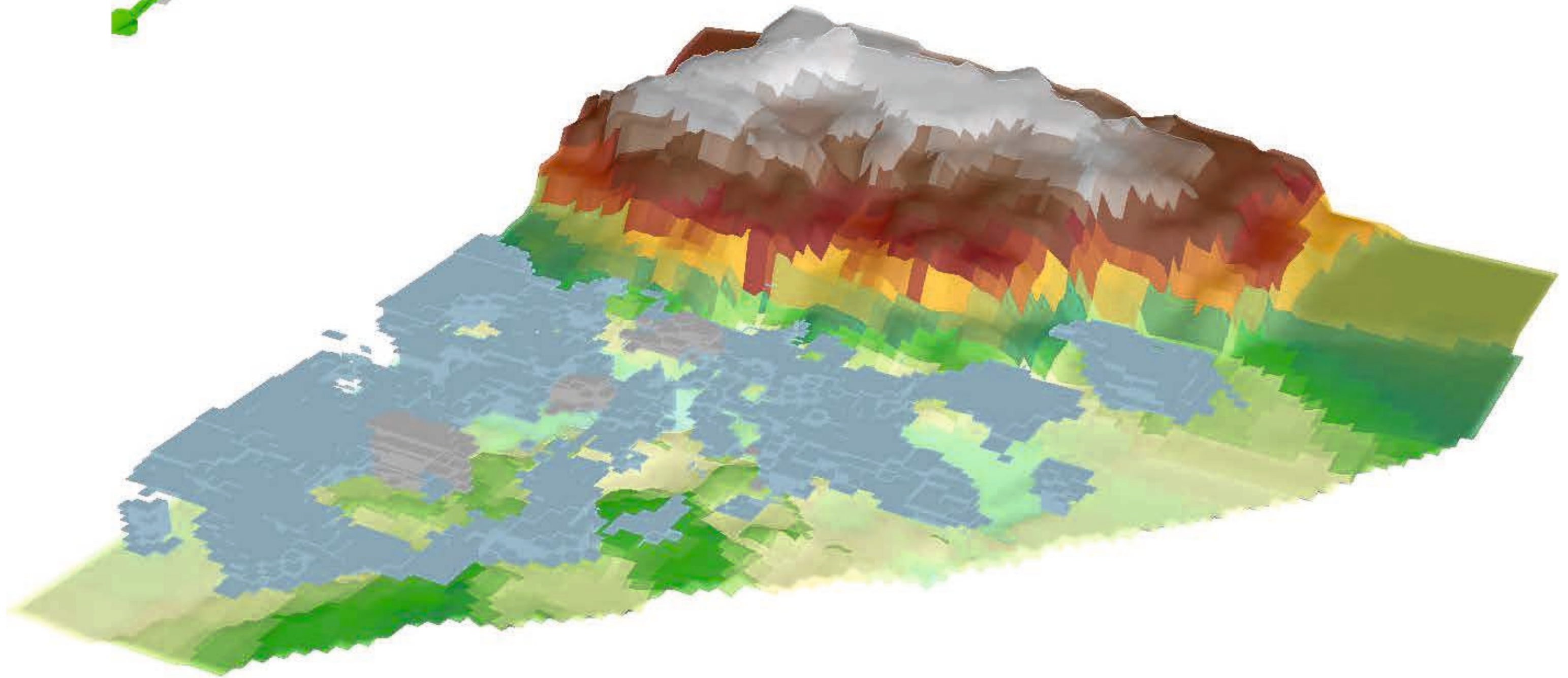
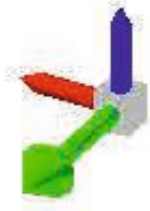
- Peat
- Organic Clay
- Organic Silt
- Organic Sand



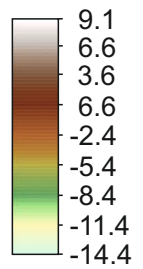
Client Name	EDF Development Ltd.
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Project	SZC Main Platform Peat Strategy	
Title	Distribution of Holocene organic lithologies	

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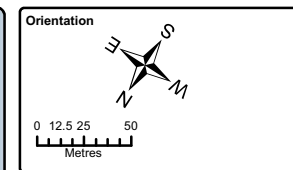


Crag Surface (m ODN)



Lithologies

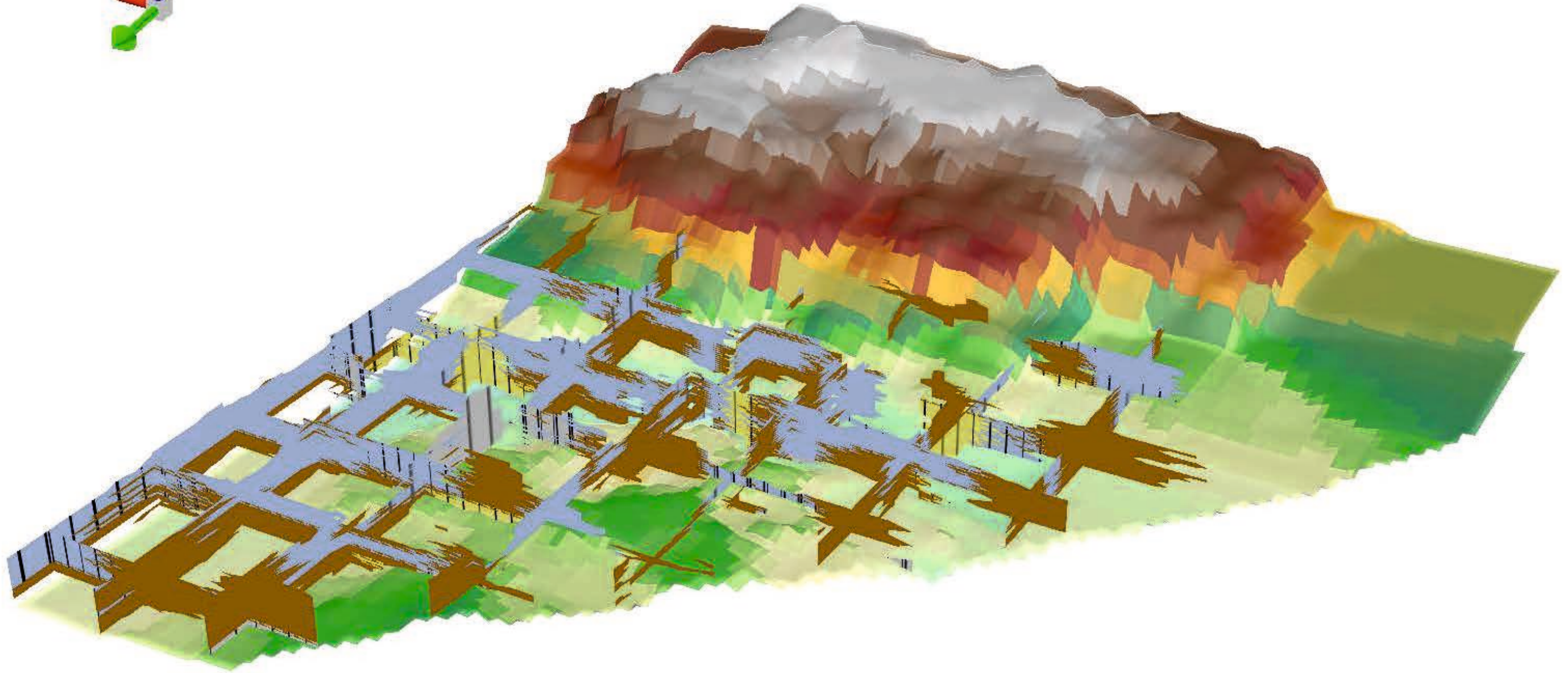
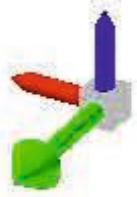
- Clay
- Silt
- Sand



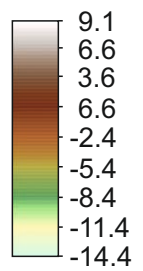
Client Name	EDF Development Ltd.
-------------	----------------------

Project	SZC Main Platform Peat Strategy	
Title	Distribution of Holocene non-organic lithologies. View looking southeast.	

Drawn	MJG	Checked	FS	Approved	SS
Date	01/07/2016			Sheet Size	A3
Drawing Number	Figure 5	Rev		Scale	1:4500

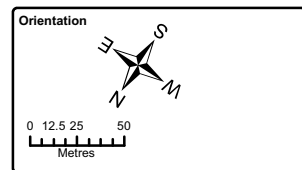


Crag Surface (m ODN)



Lithologies

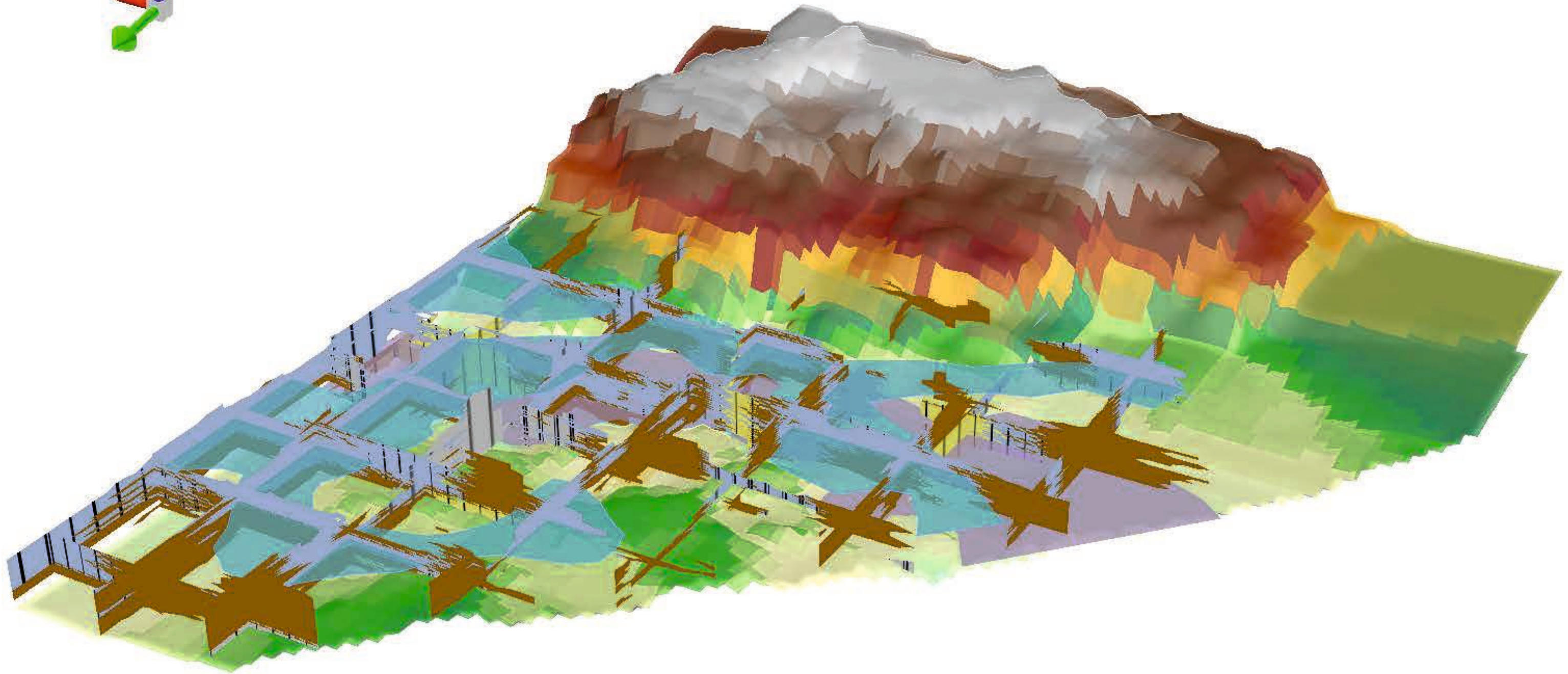
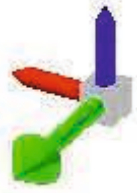
- Peat
- Organic Clay
- Clay
- Organic Silt
- Silt
- Organic Sand
- Sand



Client Name	EDF Development Ltd.
-------------	----------------------

Project	SZC Main Platform Peat Strategy	
Title	Fence diagram showing the distribution and relationship of Holocene lithologies. View looking southeast.	

Drawn	MJG	Checked	FS	Approved	SS
Date	01/07/2016			Sheet Size	A3
Drawing Number	Figure 6	Rev		Scale	1:4500



Crag Surface (m ODN) 	Lithologies		Interpreted Palaeochannels	
	Peat	Clay	Early Holocene Channel	Late Prehistoric / Early Historic Channel
	Organic Clay	Silt		
	Organic Silt	Sand		
	Organic Sand			

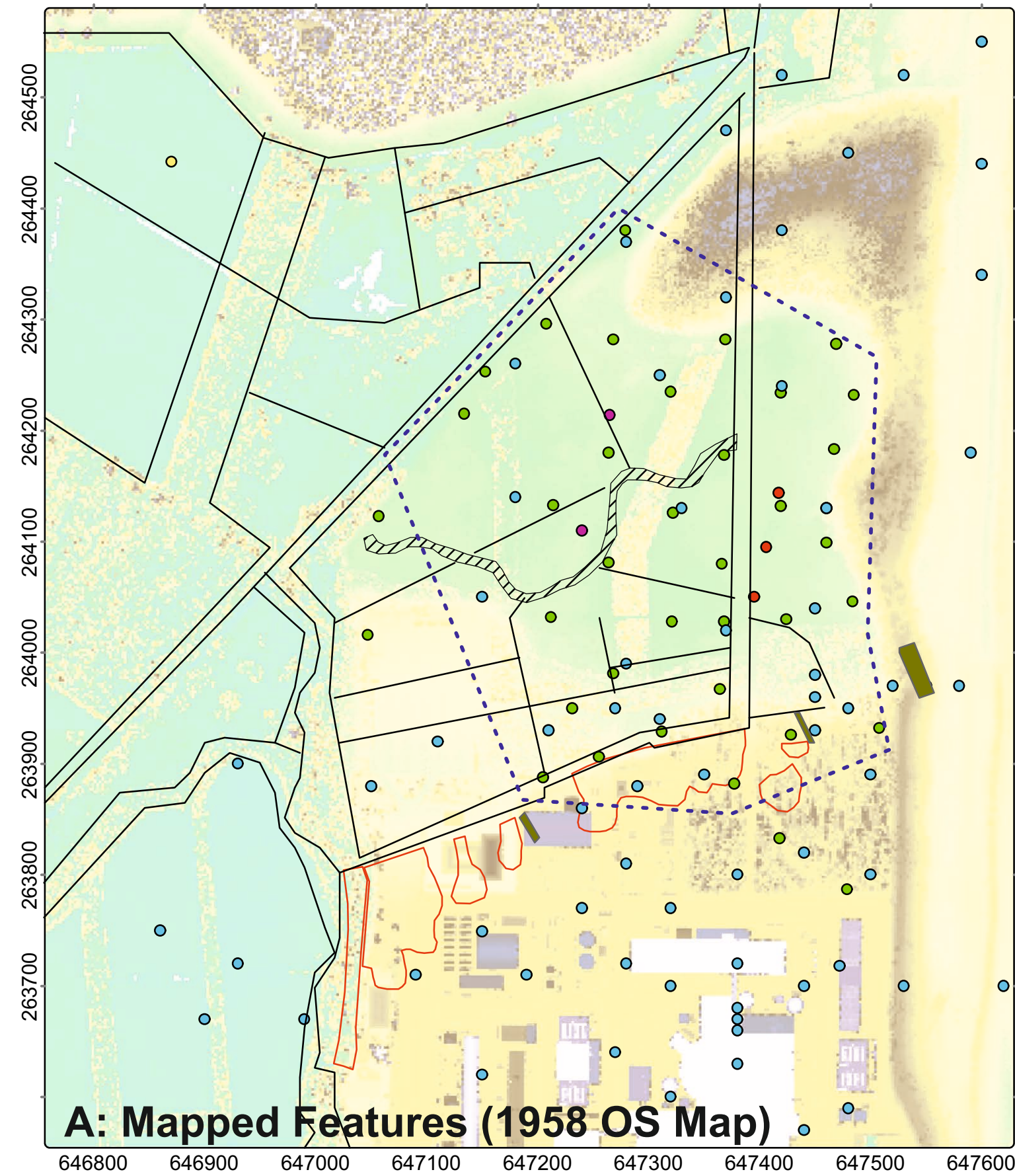


Orientation

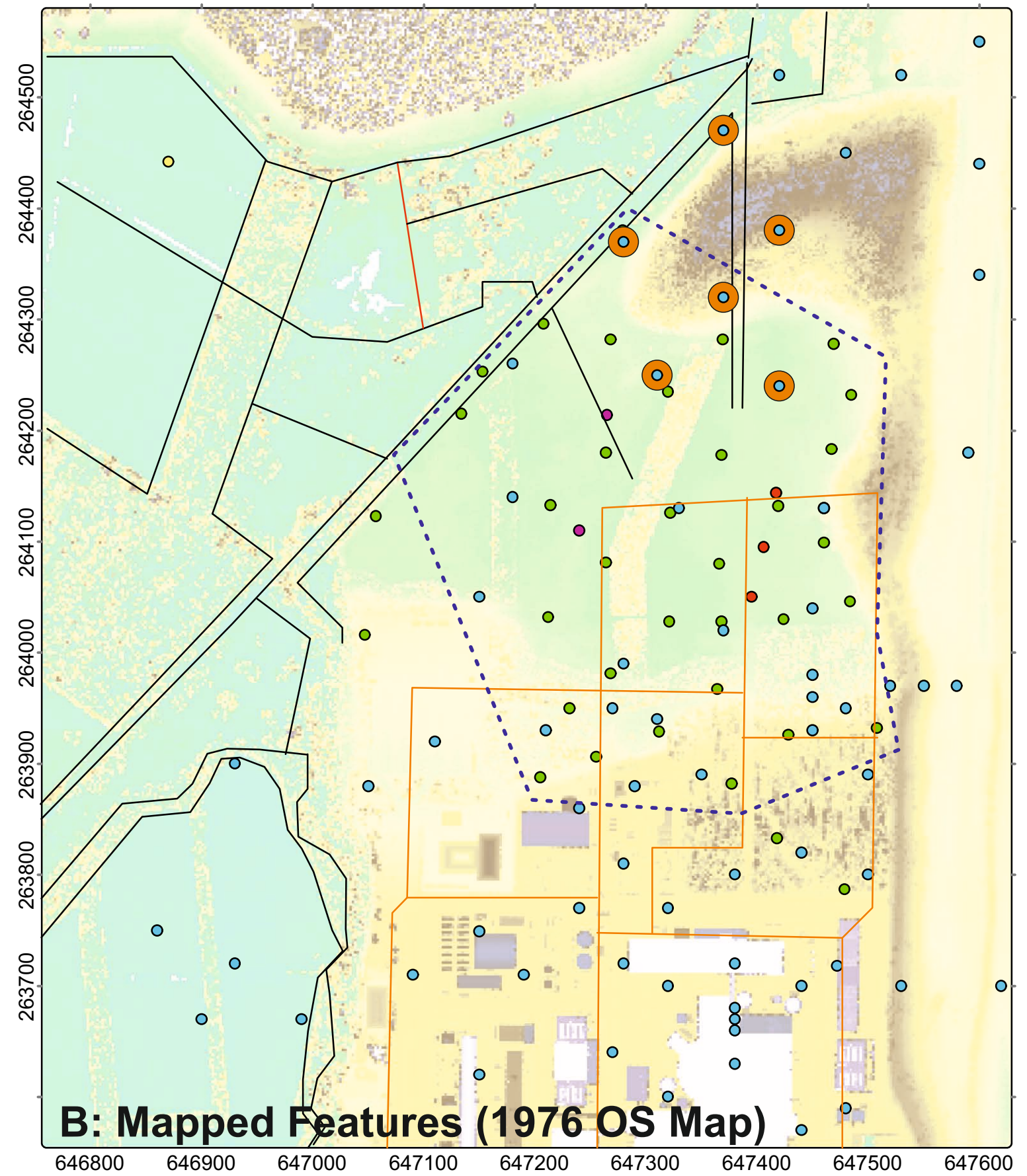
0 12.5 25 50
Metres

Client Name
EDF Development Ltd.

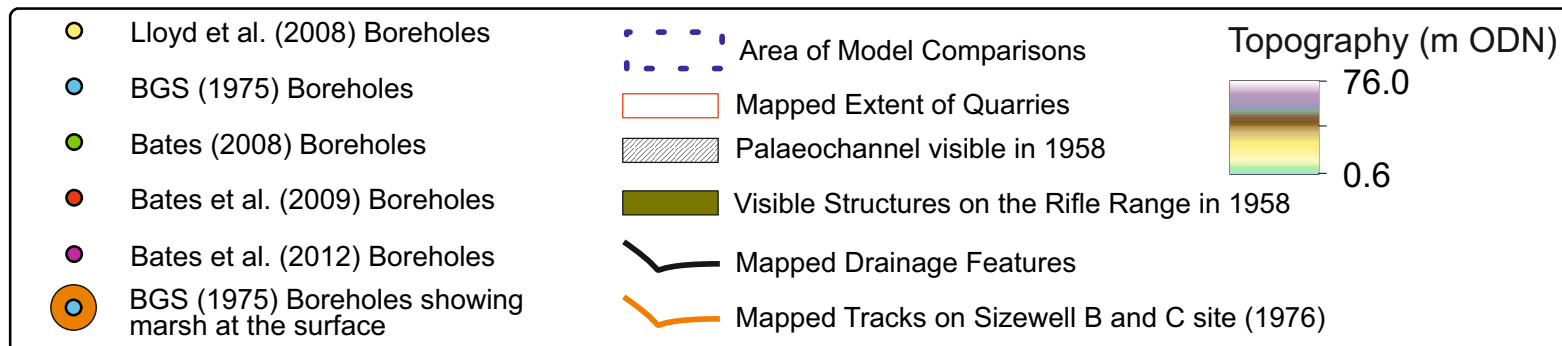
Project SZC Main Platform Peat Strategy		
Title Fence diagram showing the distribution and relationship of Holocene lithologies and interpreted palaeochannels. View looking southeast		
Drawn MJG	Checked FS	Approved SS
Date 01/07/2016		Sheet Size A3
Drawing Number Figure 7	Rev	Scale 1:4500



A: Mapped Features (1958 OS Map)



B: Mapped Features (1976 OS Map)



Orientation

0 12.5 25 50
Metres

Client Name
EDF Development Ltd.

Project SZC Main Platform Peat Strategy		
Title Transcribed features visible on the a) 1958 and b) 1976 Ordnance Survey maps mentioned in the text. The distribution of 1975 boreholes where no Made Ground is recorded are highlighted on Figure 8b.		
Drawn MJG	Checked FS	Approved SS
Date 01/07/2016		Sheet Size A3
Drawing Number Figure 8	Rev	Scale 1:4,500

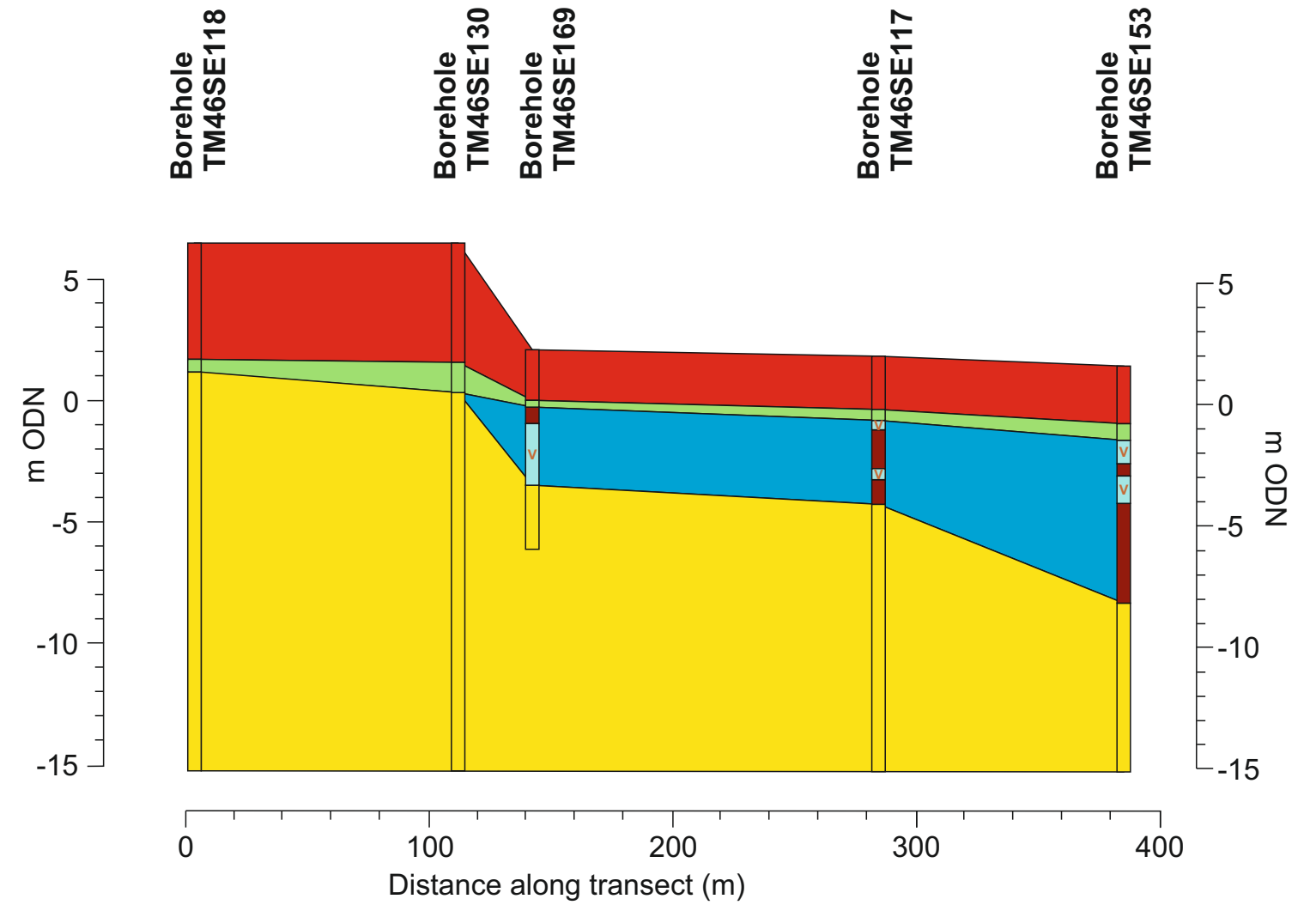
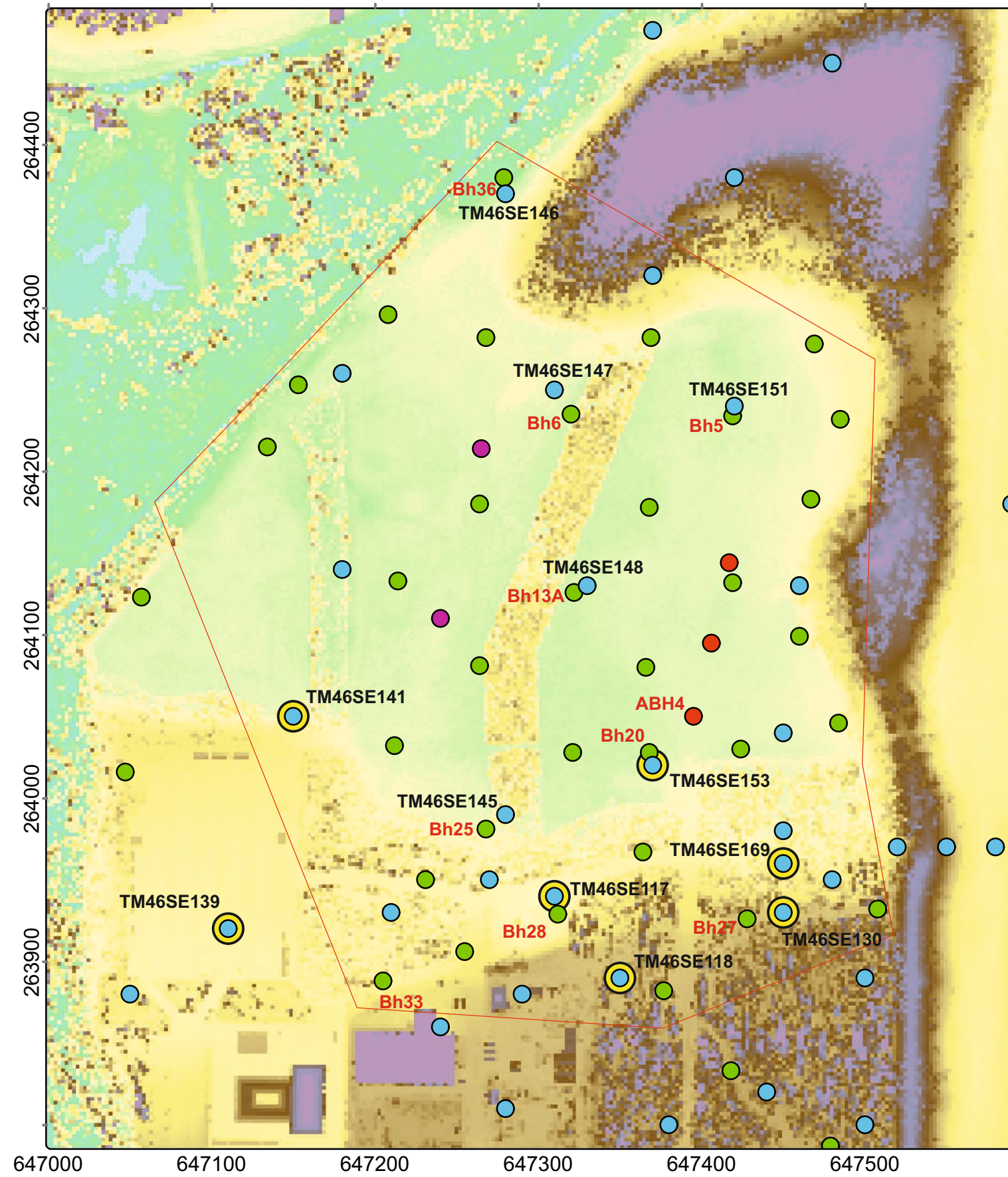


Coordinate System: British National Grid. Contains OS data © Crown Copyright and database right 2016.



Client Name	EDF Development Ltd.	
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Project			SZC Main Platform Peat Strategy		
Title			Oblique aerial photographs taken during Sizewell B Construction. a) April 1988, looking North; b) July 1989 looking south towards the Sizewell B main site.		
Drawn	MJG	Checked	FS	Approved	SS
Date	01/07/2016			Sheet Size	A3
Drawing Number	Figure 9	Rev	Scale		



Clay
 Silt
 Sand
 v Organics
 Peat
 No data available

<ul style="list-style-type: none"> ● BGS (1975) Boreholes ● Bates (2008) Boreholes ● Bates et al. (2009) Boreholes ● Bates et al. (2012) Boreholes ● BGS (1975) Boreholes with old land surface preserved 	<p>Topography (m ODN)</p> <div style="text-align: center;"> 25.6 1.8 </div> <p>Borehole Taken 1975 Borehole Taken 2008-2011</p>	<ul style="list-style-type: none"> Made Ground Buried topsoil (1970 surface) Holocene peats and clays Reworked Norwich Crag / Pleistocene Deposits Norwich Crag Formation Area of Model Comparisons
---	---	--

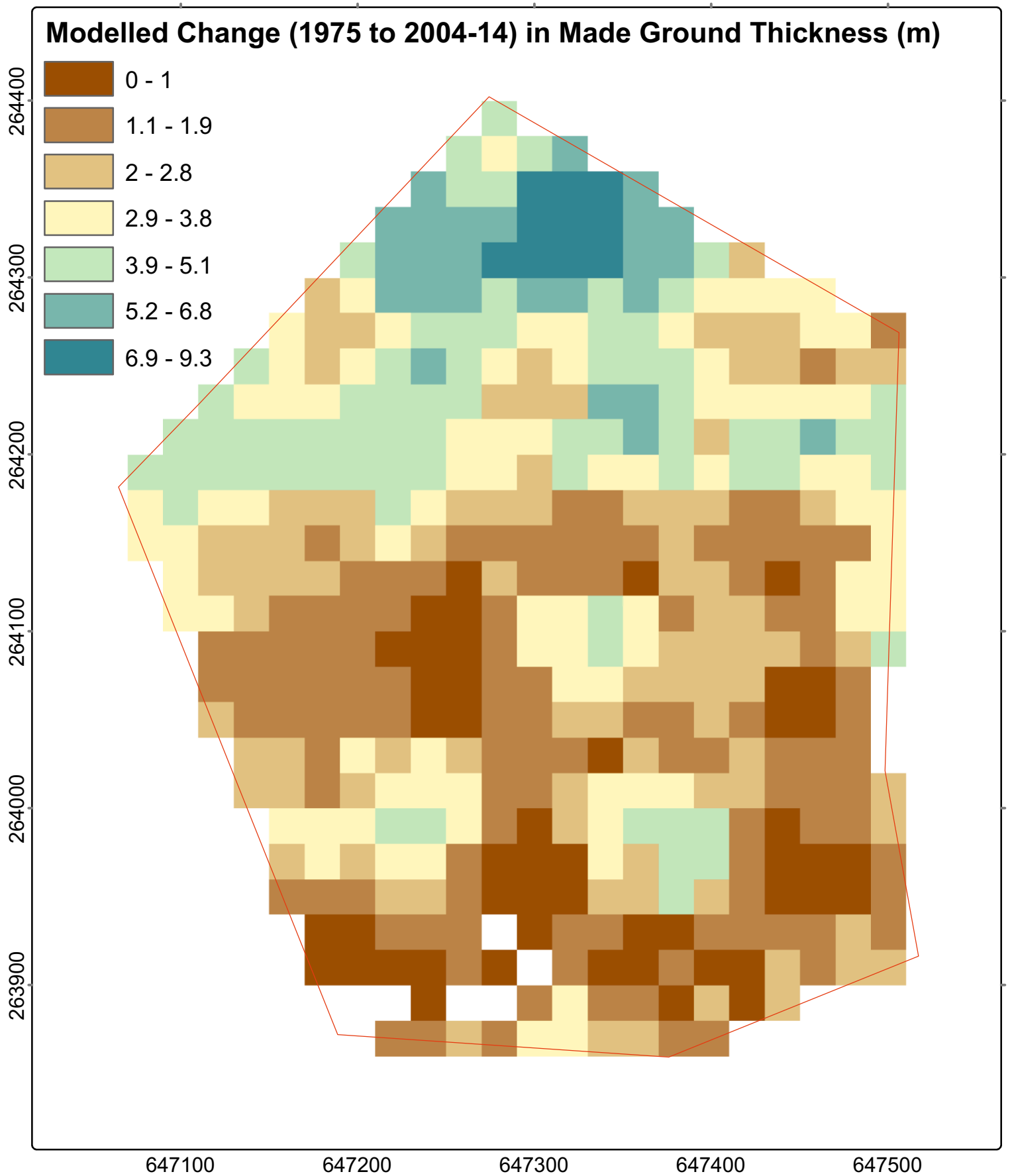
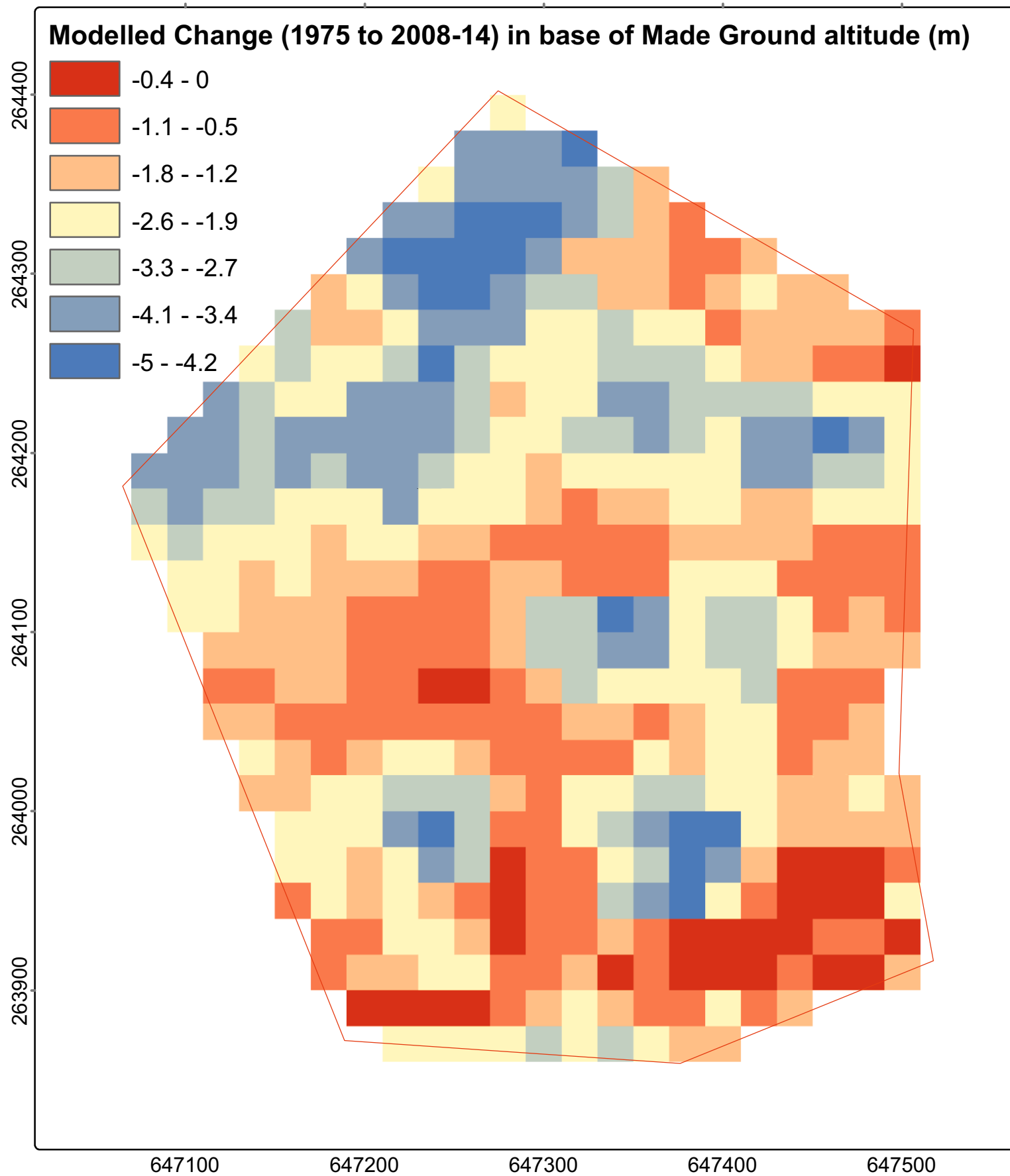


Orientation

0 12.5 25 50
Metres

Client Name
EDF Development Ltd.

Project SZC Main Platform Peat Strategy		
Title Distribution of 1975 and 2008/9 boreholes for Made Ground study. Transect on right shows existence of the pre-Made Ground marsh surface visible in 1975 boreholes		
Drawn MJG	Checked FS	Approved SS
Date 01/07/2016		Sheet Size A3
Drawing Number Figure 10	Rev	Scale 1:3000



Coordinate System: British National Grid. Contains OS data © Crown Copyright and database right 2016.

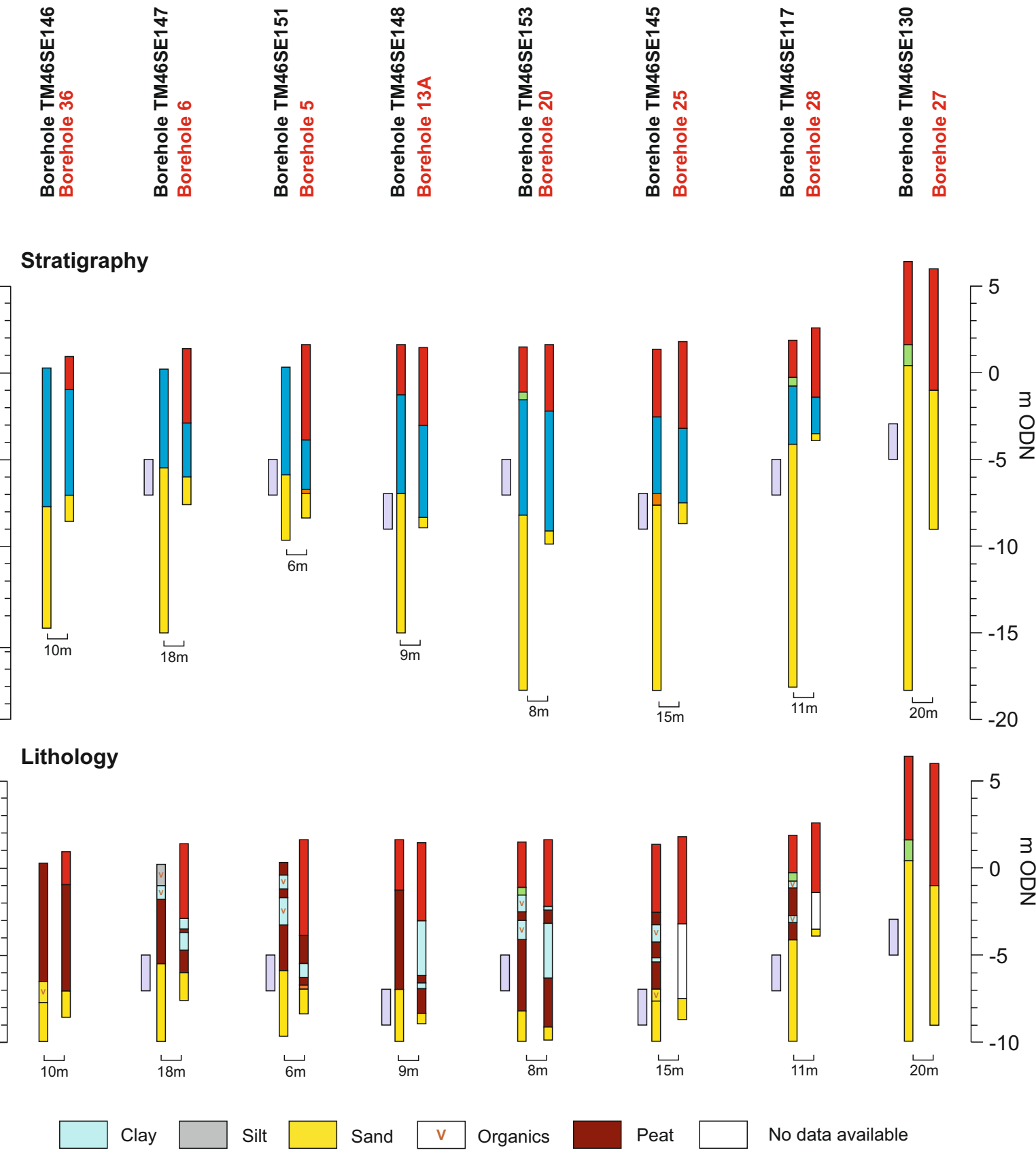
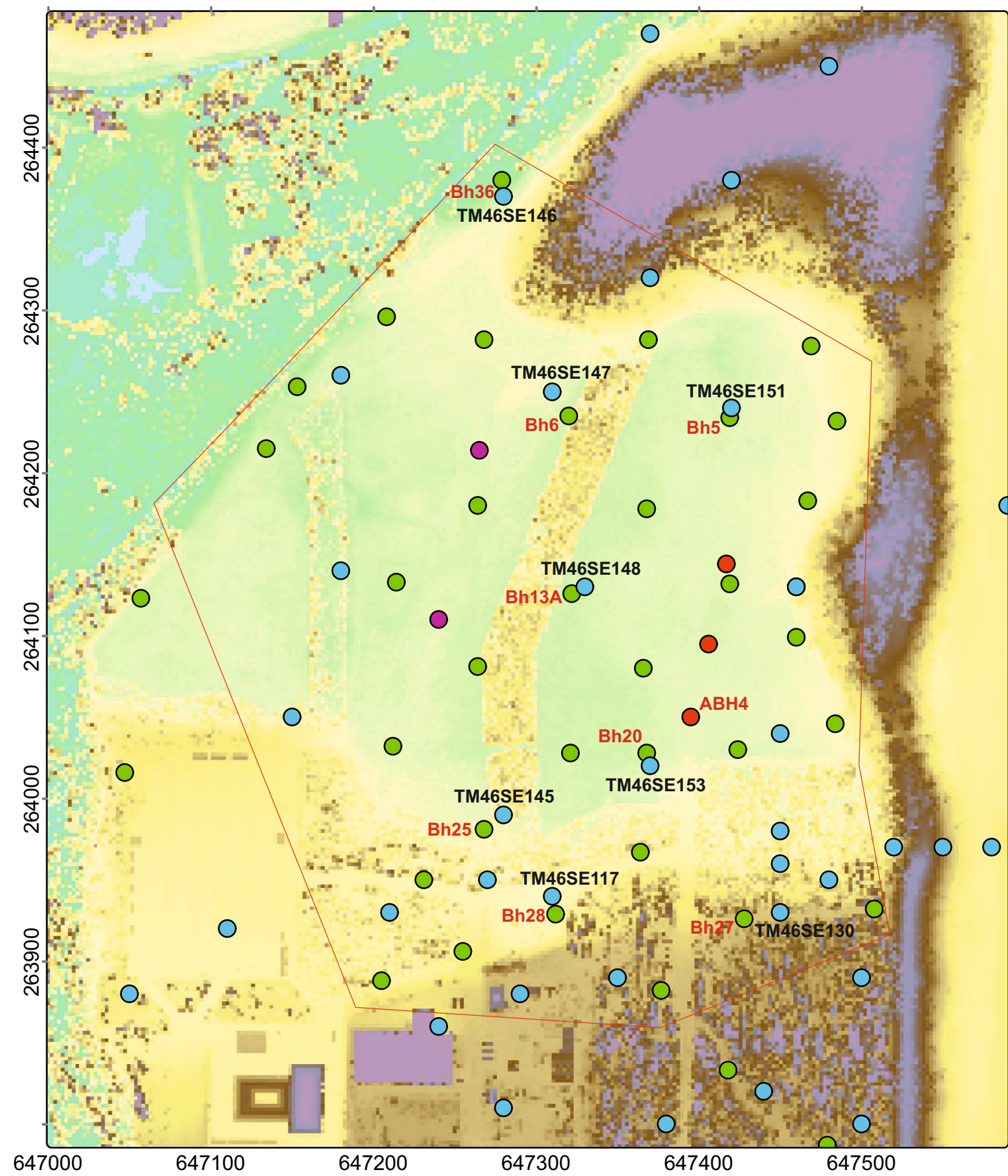


Orientation

0 12.5 25 50 Metres

Client Name
EDF Development Ltd.

Project SZC Main Platform Peat Strategy		
Title Modelled change (between 1975 and 2008-14) in the Made Ground a) basal height and b) thickness		
Drawn MJG	Checked FS	Approved SS
Date 01/07/2016		Sheet Size A3
Drawing Number Figure 11	Rev	Scale 1:2800



BGS (1975) Boreholes	Bates (2008) Boreholes	Bates et al. (2009) Boreholes	Bates et al. (2012) Boreholes	Made Ground	Buried topsoil (1970 surface)
Area of Model Comparisons	Topography (m ODN) 25.6 1.8	Holocene peats and clays	Reworked Norwich Crag / Pleistocene Deposits	Norwich Crag Formation	Top of Norwich Crag Formation (Resistivity Tomography Survey; Bates et al. 2012)
	Borehole Taken 1975				
	Borehole Taken 2008-2011				

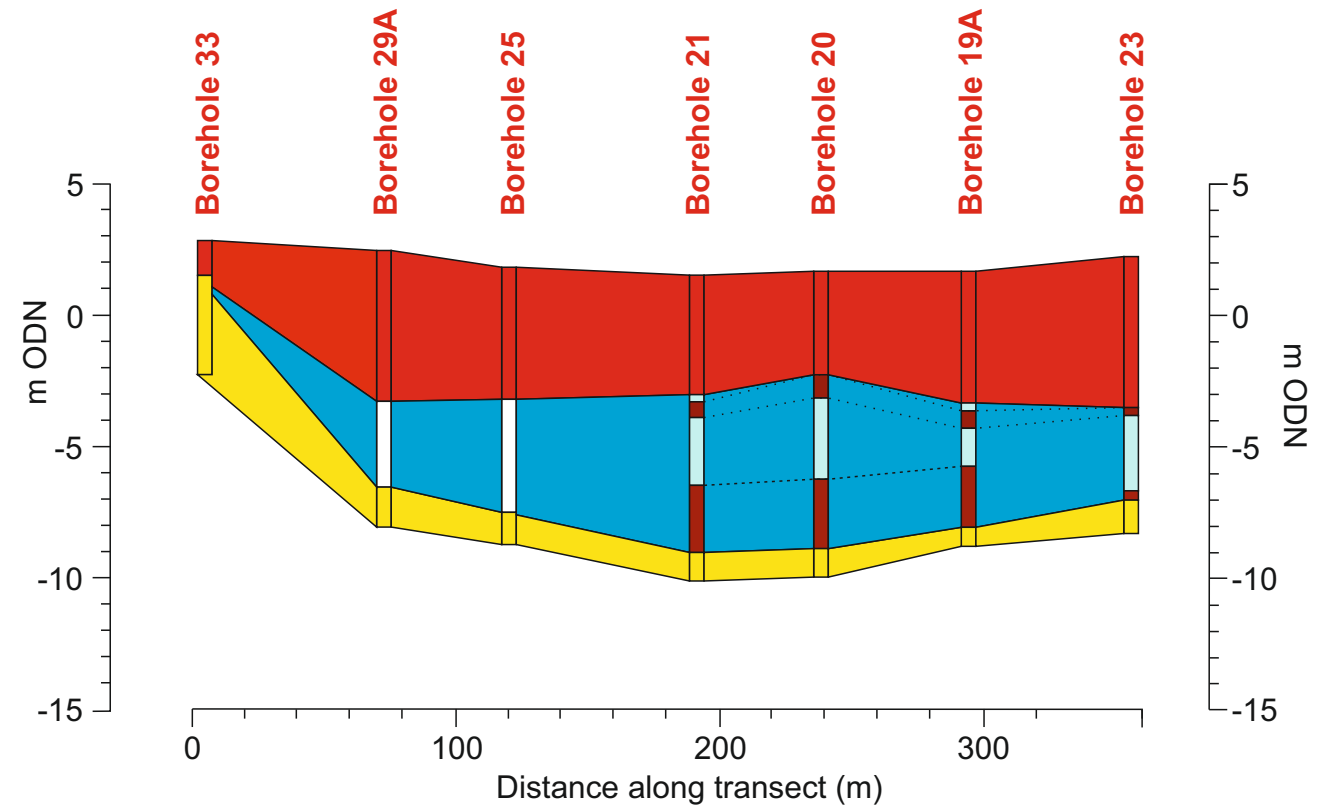
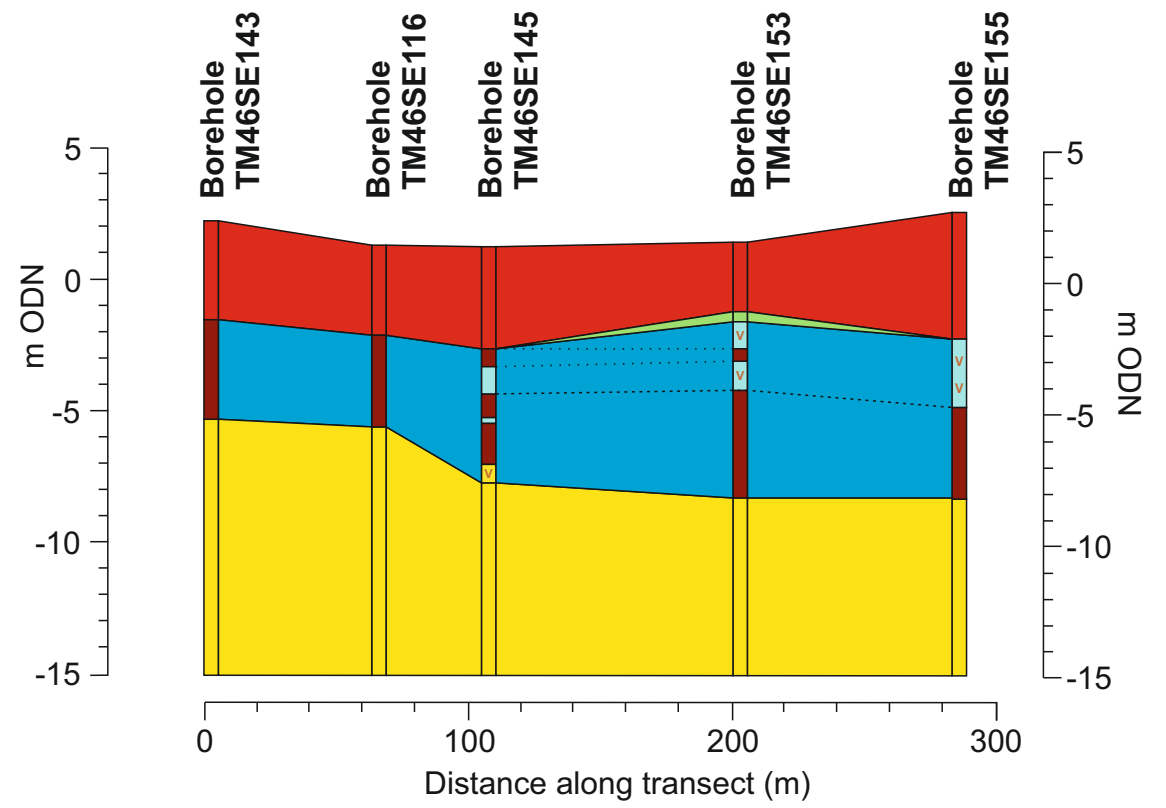
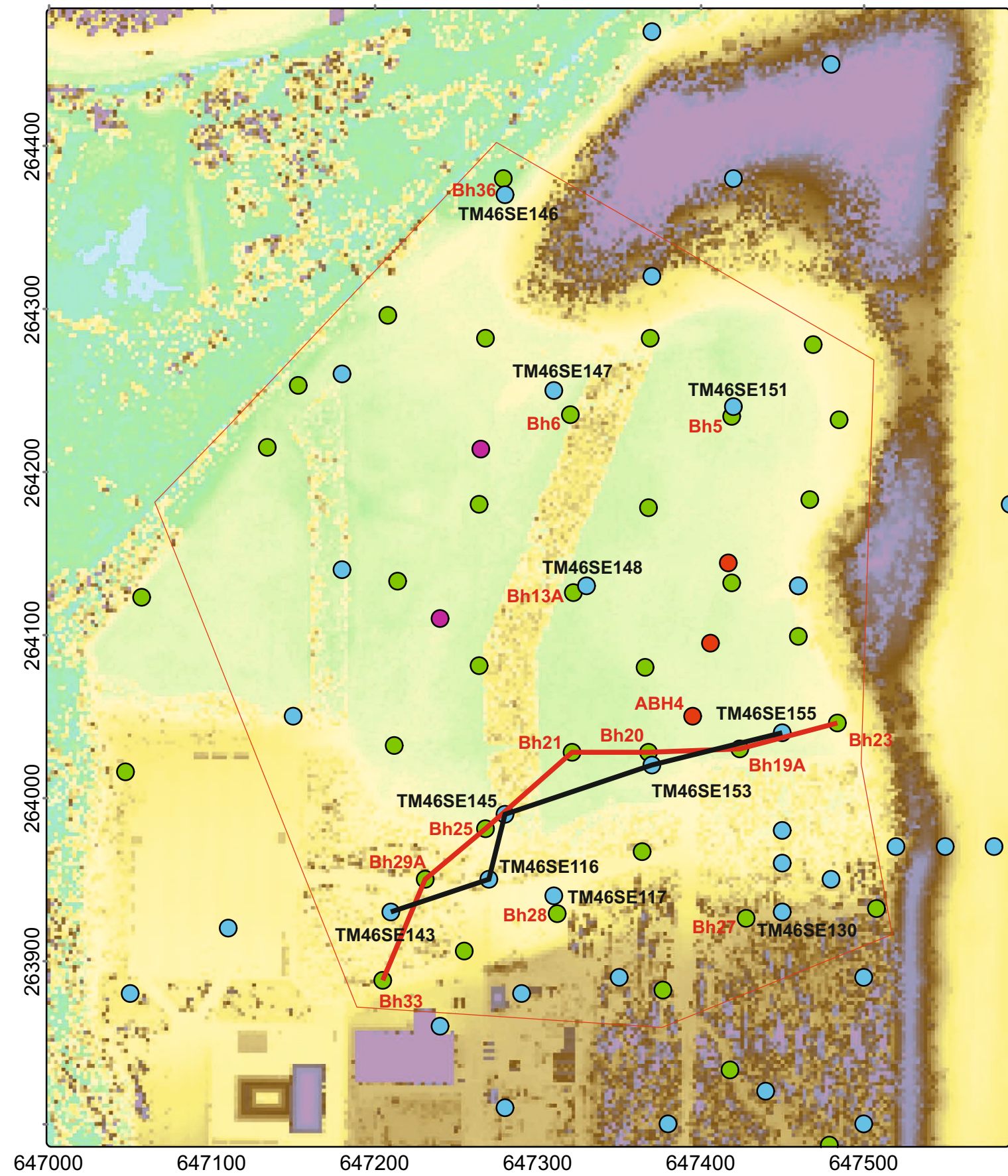


Orientation

0 12.5 25 50 Metres

Client Name
EDF Development Ltd.

Project SZC Main Platform Peat Strategy		
Title Comparison of 1975 and 2008 boreholes, along with Norwich Crag surface inferred from 2012 Resistivity Tomography Survey		
Drawn MJG	Checked FS	Approved SS
Date 01/07/2016		Sheet Size A3
Drawing Number Figure 12	Rev	Scale 1:3000



Clay
 Silt
 Sand
 v Organics
 Peat
 No data available

<ul style="list-style-type: none"> ● BGS (1975) Boreholes ● Bates (2008) Boreholes ● Bates et al. (2009) Boreholes ● Bates et al. (2012) Boreholes Area of Model Comparisons 	<p>Topography (m ODN)</p> <div style="text-align: center;"> <p>25.6</p> <p>1.8</p> </div> <p>Borehole Taken 1975</p> <p>Borehole Taken 2008-2011</p>	<ul style="list-style-type: none"> Made Ground Buried topsoil (1970 surface) Holocene peats and clays Reworked Norwich Crag / Pleistocene Deposits Norwich Crag Formation
--	--	---

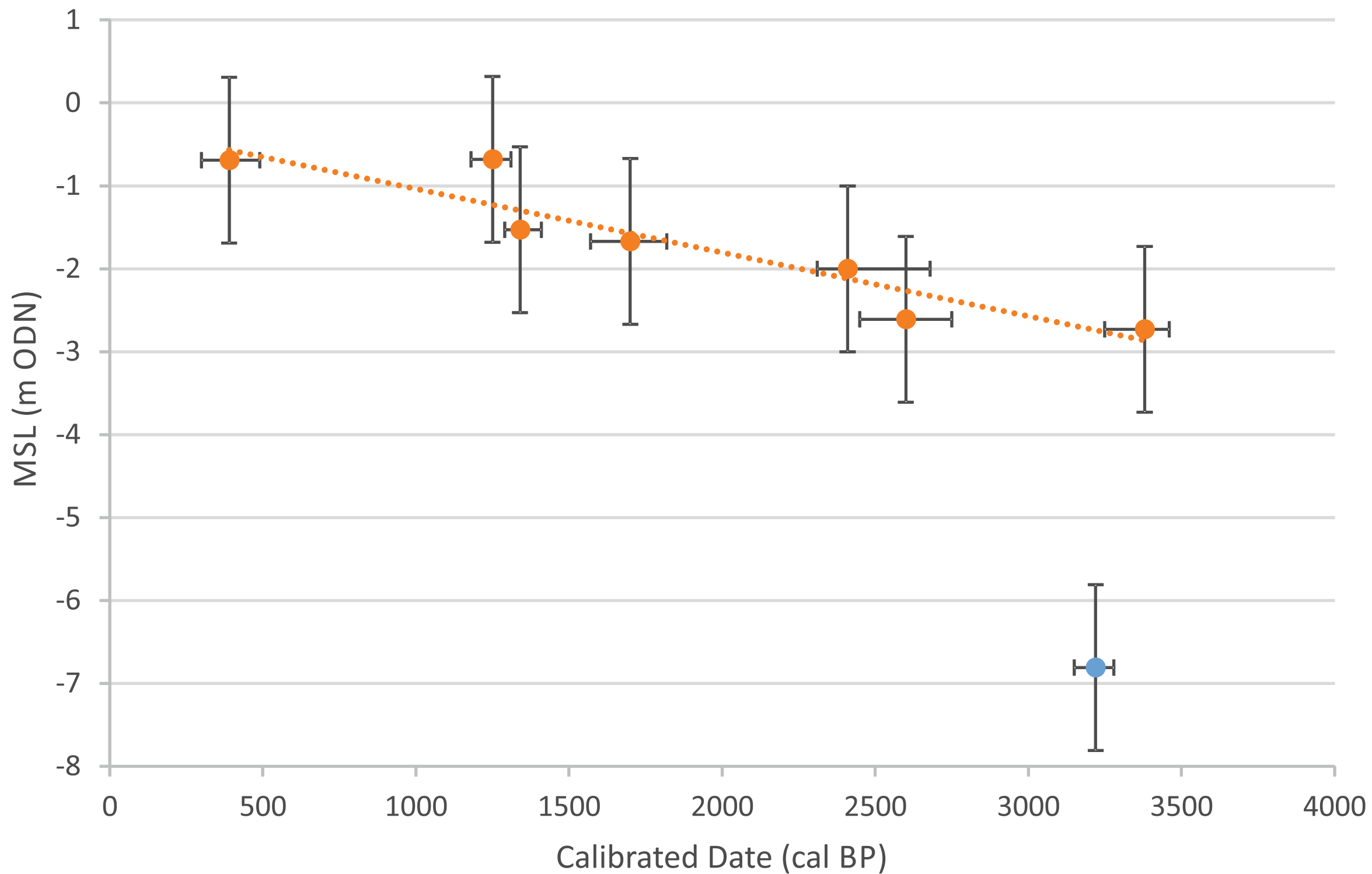


Orientation

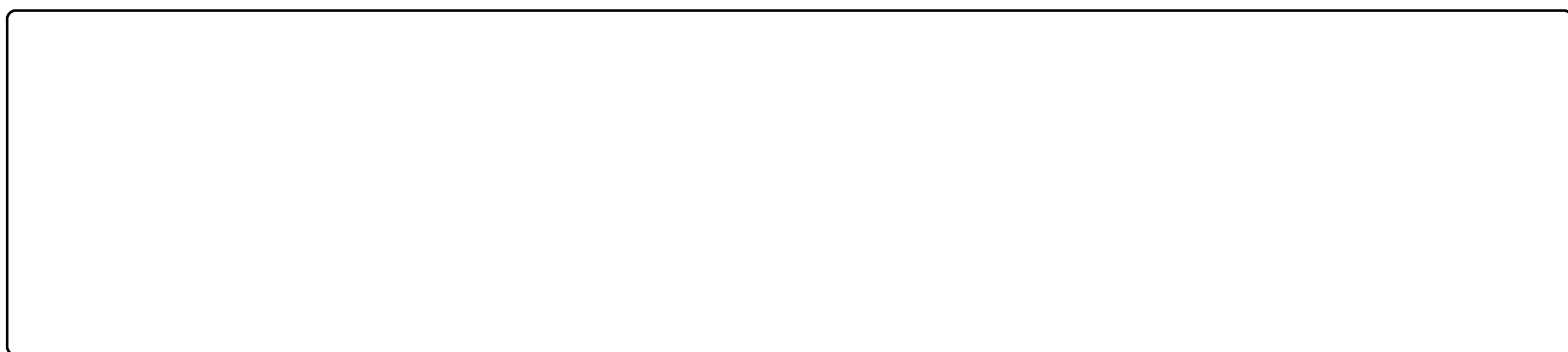
0 12.5 25 50 Metres

Client Name
EDF Development Ltd.

Project SZC Main Platform Peat Strategy		
Title Comparison of overlapping borehole transects from 1975 and 2008 site investigations		
Drawn MJG	Checked FS	Approved SS
Date 01/07/2016		Sheet Size A3
Drawing Number Figure 13	Rev	Scale 1:3000

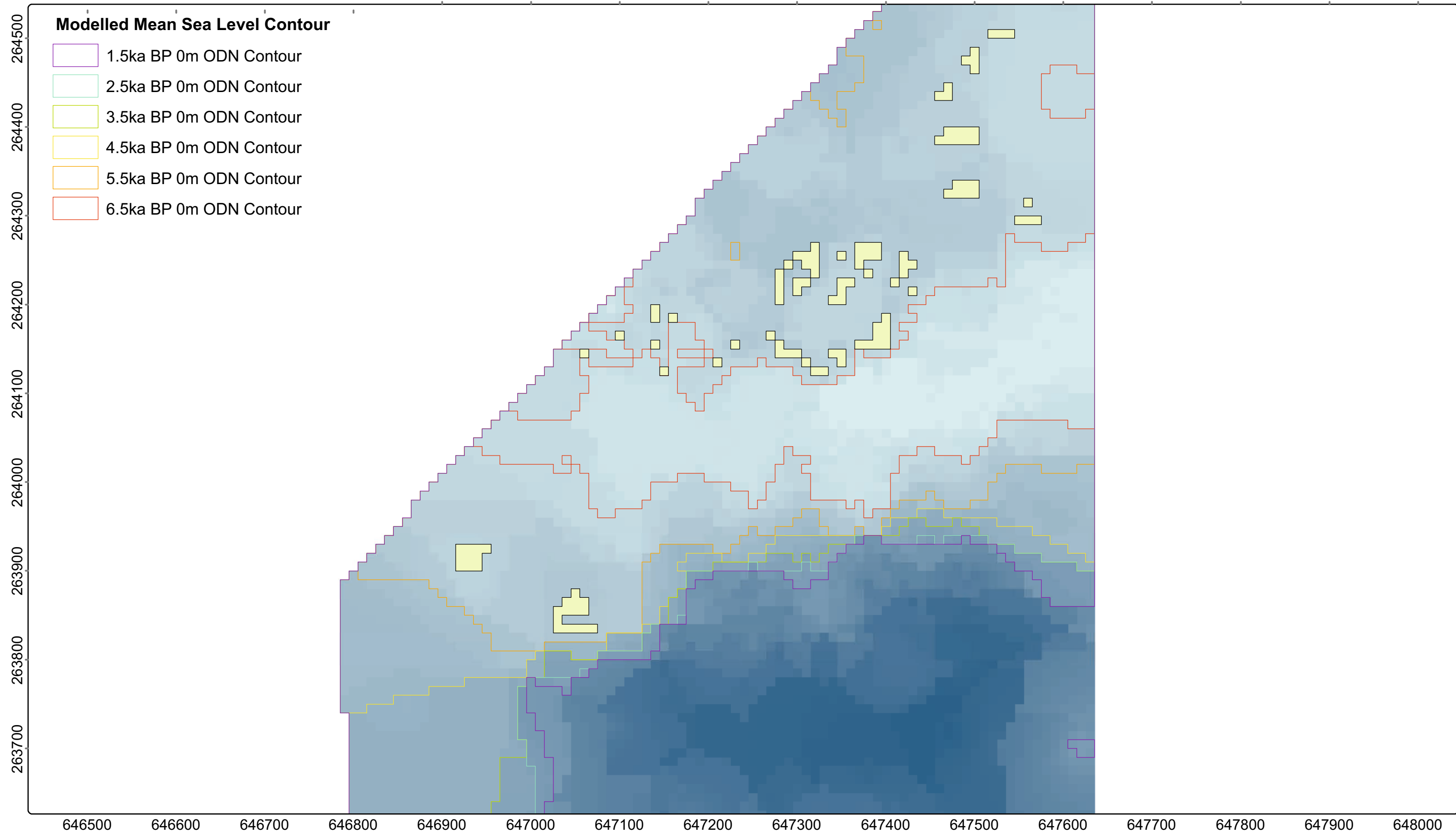


● Lloyd et al. 2008 ● Bates et al. 2008: ABH4



Client Name	EDF Development Ltd.
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Project			SZC Main Platform Peat Strategy		
Title					
Comparison of Sea Level Index Points derived from Goose Hill (Lloyd et al., 2008) and Sizewell C Main Development Site (Bates et al., 2009)					
Drawn	MJG	Checked	FS	Approved	SS
Date	01/07/2016			Sheet Size	A3
Drawing Number	Figure 14		Rev	Scale	

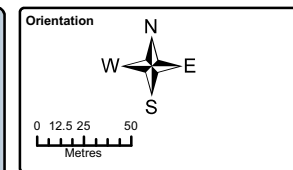


Modelled Mean Sea Level Contour

- 1.5ka BP 0m ODN Contour
- 2.5ka BP 0m ODN Contour
- 3.5ka BP 0m ODN Contour
- 4.5ka BP 0m ODN Contour
- 5.5ka BP 0m ODN Contour
- 6.5ka BP 0m ODN Contour

Crag Surface (m ODN)

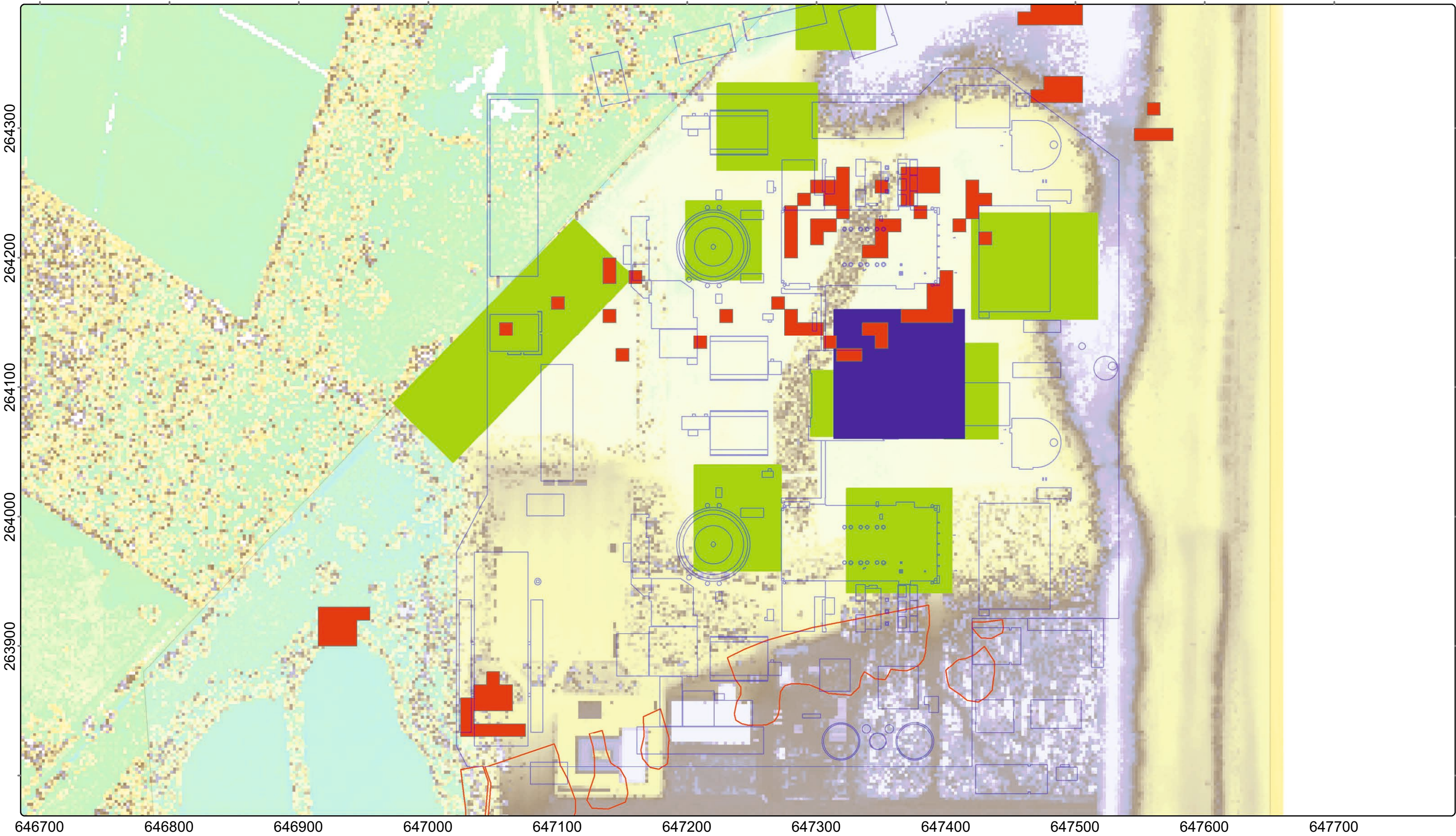
- 7.9
- 10.4
- Highest Archaeological Potential



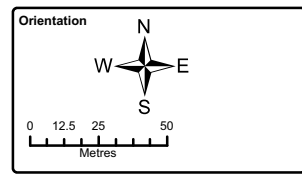
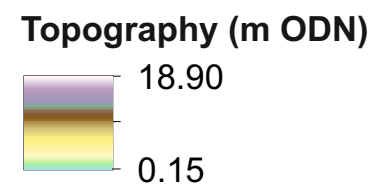
Client Name
EDF Development Ltd.

Project: SZC Main Platform Peat Strategy
 Title: Palaeogeographic model showing the predicted land coverage of mean sea level at 500 year intervals

Drawn	MJG	Checked	FS	Approved	SS
Date	01/07/2016			Sheet Size	A3
Drawing Number	Figure 15		Rev	Scale	1:4,000



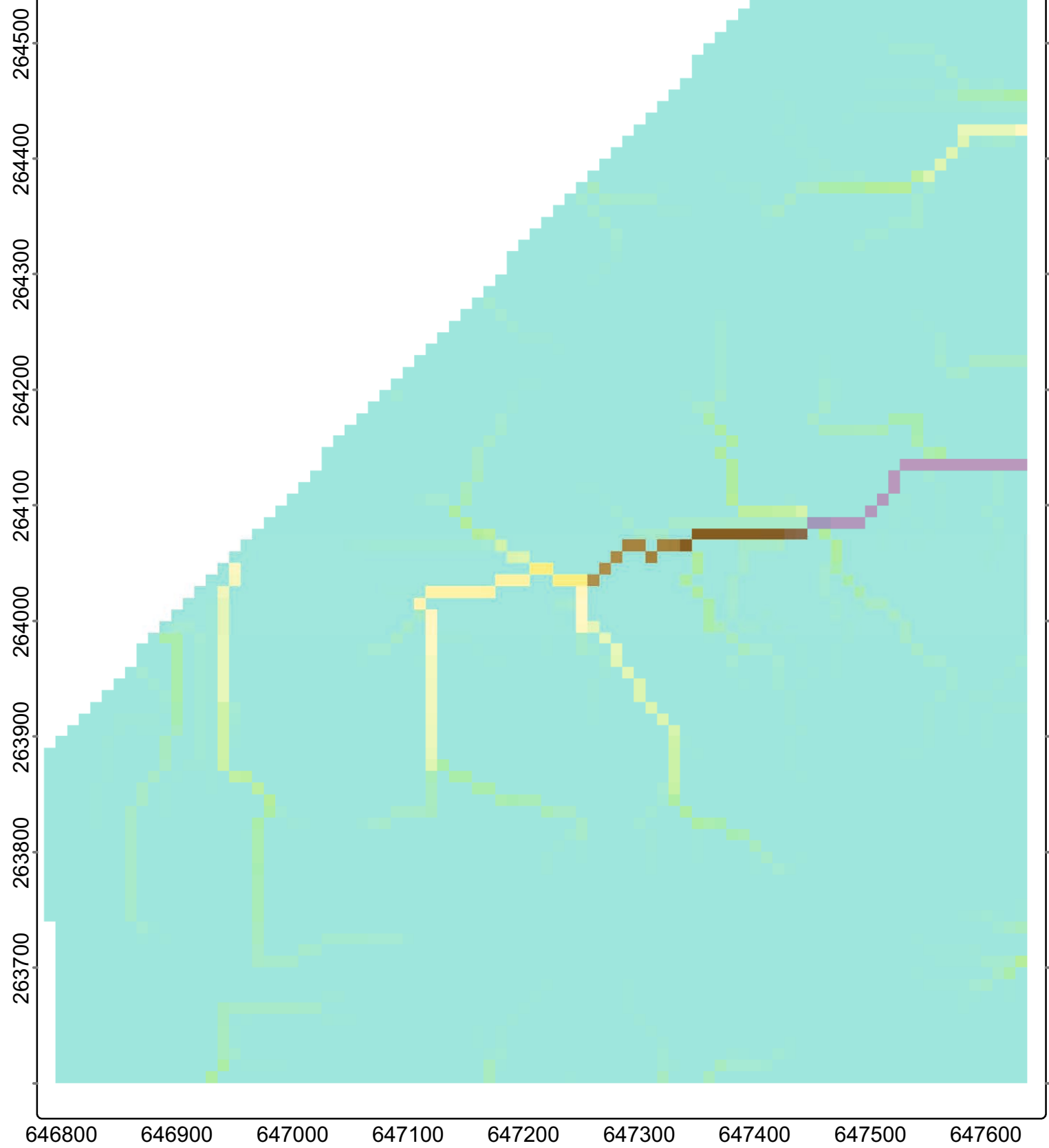
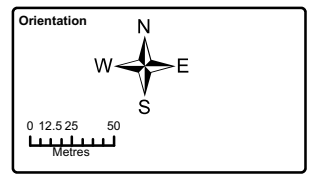
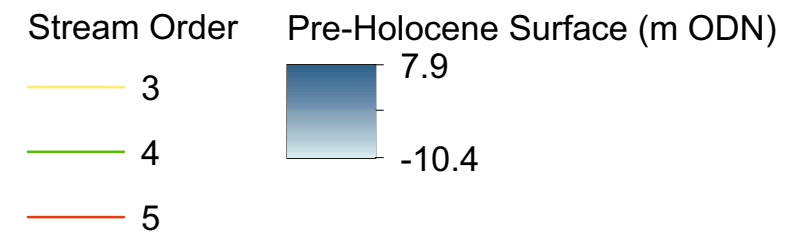
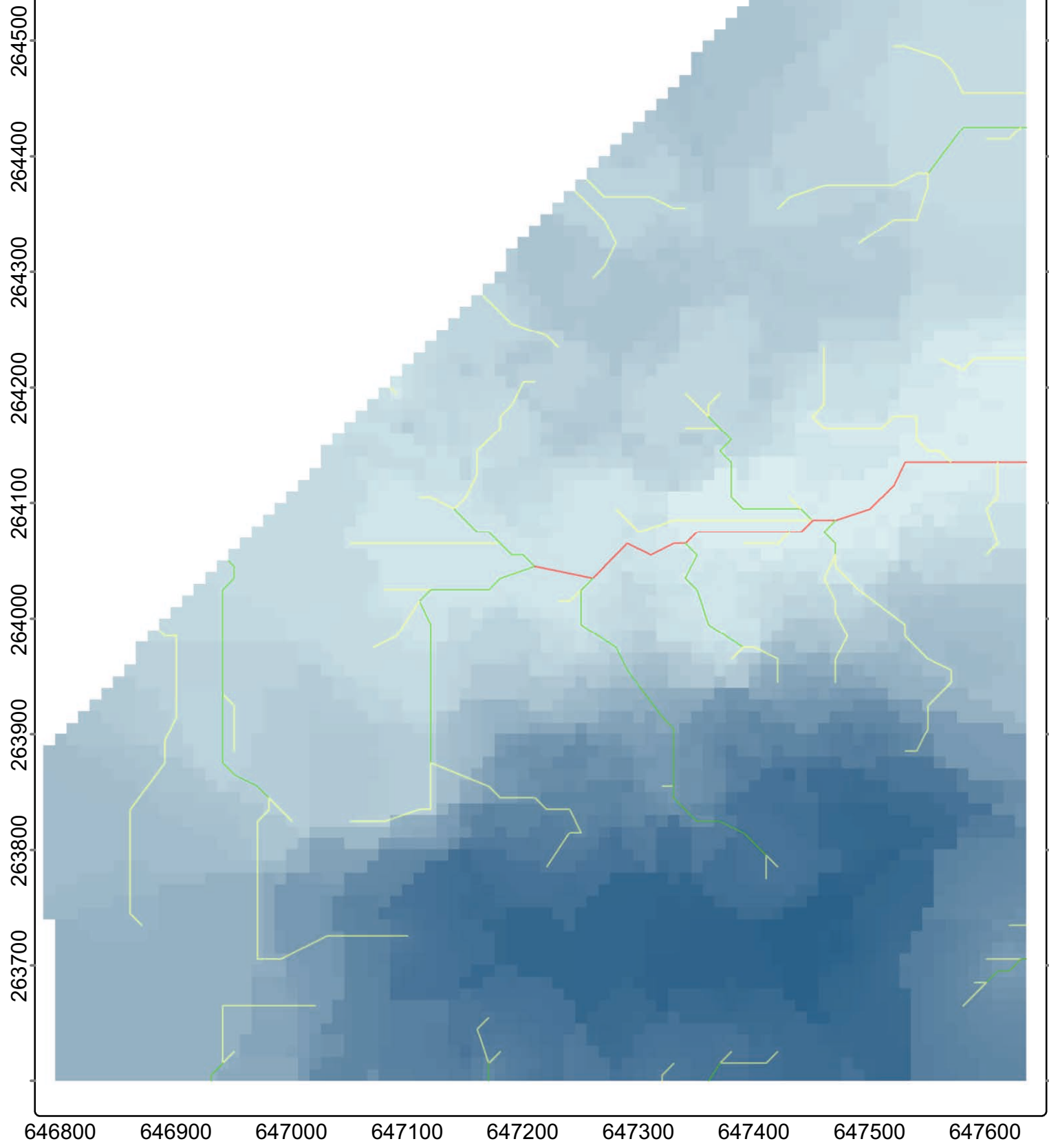
- Proposed Main Site Building Plan
- Mapped Quarry Areas
- Highest Archaeological Potential (Crag Surface)
- 2009 Heath Creation Extraction Area
- Areas of Possible Disturbance (deep Made Ground)



Client Name	EDF Development Ltd.	
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Project	SZC Main Platform Peat Strategy	
Title	Areas defined as having deep disturbance where archaeological potential may have been lost	

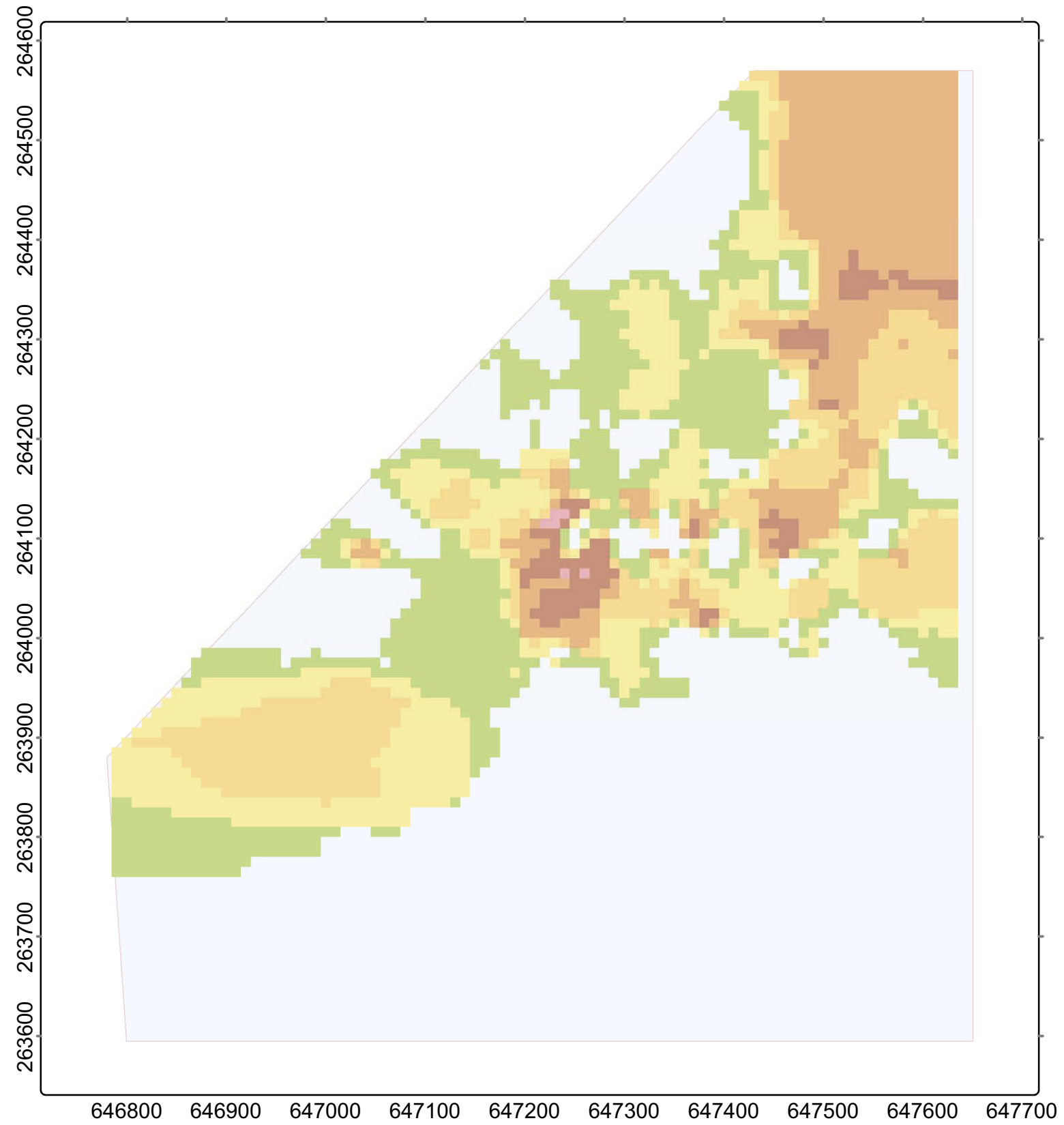
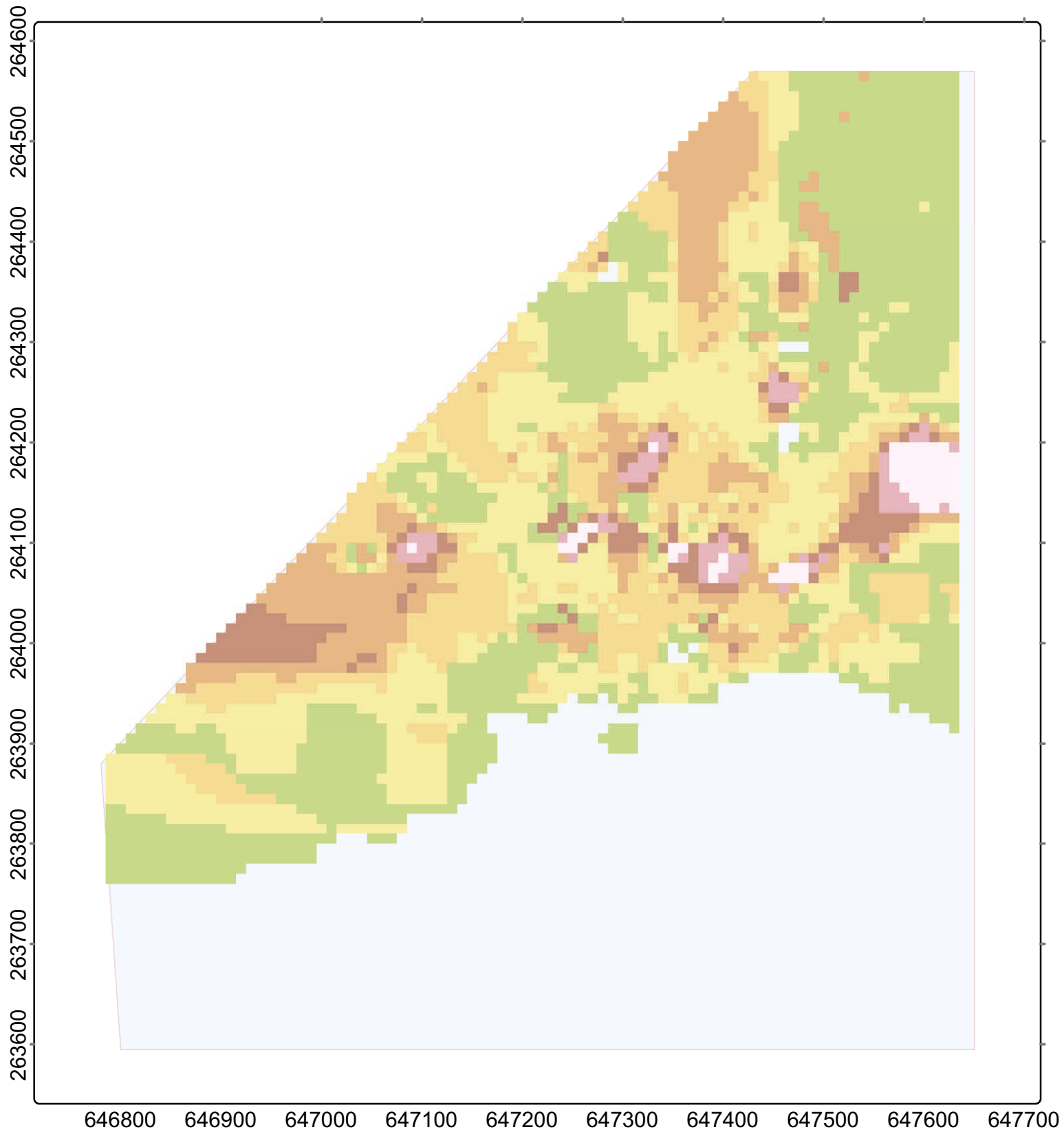
Drawn	MJG	Checked	FS	Approved	SS
Date	01/07/2016			Sheet Size	A3
Drawing Number	Figure 16	Rev		Scale	1:2,750

A**B**

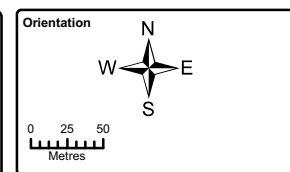
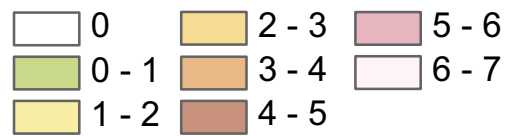
Client Name	EDF Development Ltd.
-------------	----------------------

Project	SZC Main Platform Peat Strategy	
Title	Hydrological modelling of the pre-Holocene surface: a) Flow Accumulation calculation to create a stream network; b) highest order streams shown overlying the pre-Holocene surface.	

Drawn	MJG	Checked	FS	Approved	SS
Date	01/07/2016			Sheet Size	A3
Drawing Number	Figure 17	Rev		Scale	1:4,500



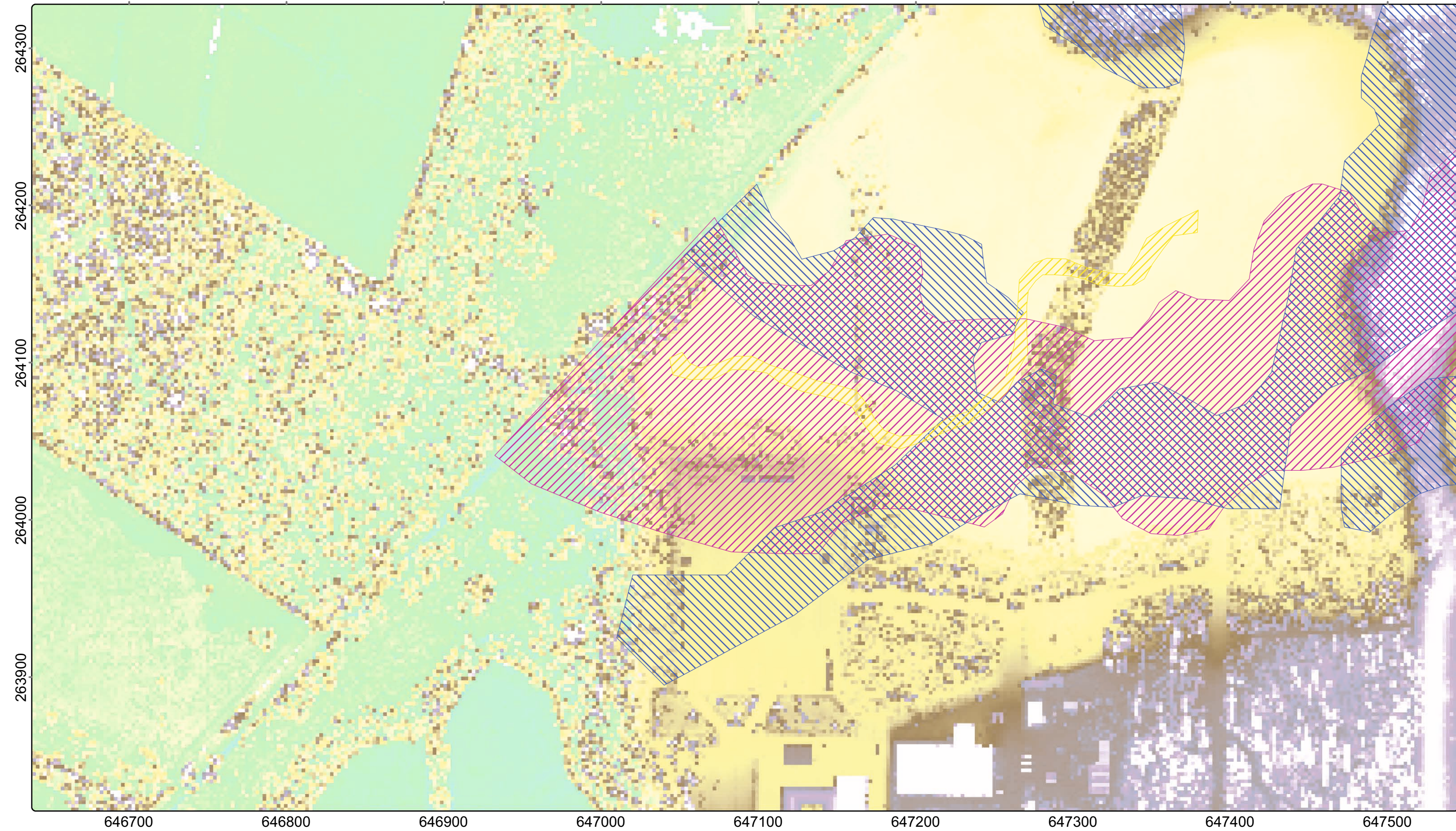
Thickness (m)


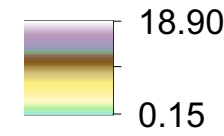




Client Name
EDF Development Ltd.

Project SZC Main Platform Peat Strategy		
Title Thickness of a) organic and b) non-organic Holocene deposits		

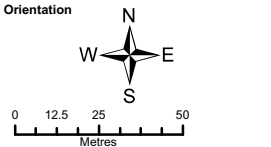
Drawn MJG	Checked FS	Approved SS
Date 01/07/2016		Sheet Size A3
Drawing Number Figure 18		Rev Scale 1:5,200



	Modern (20th Century) channel meander: -2 to -3m ODN	Topography (m ODN)  18.90 0.15
	Late Prehistoric / Historic Palaeochannel: -4 to -6m ODN	
	Early Holocene Palaeochannel: -9 to -11m ODN	

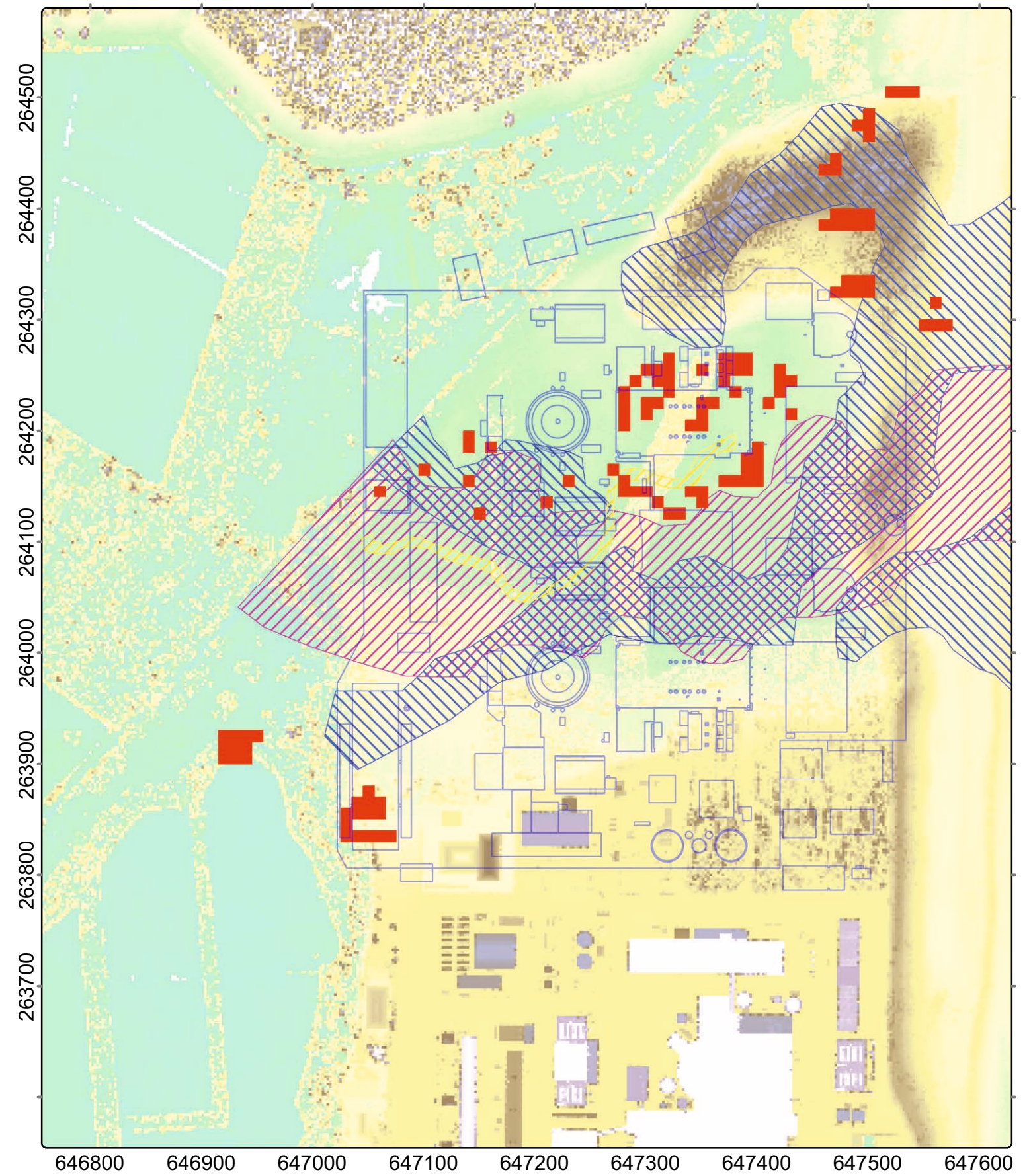
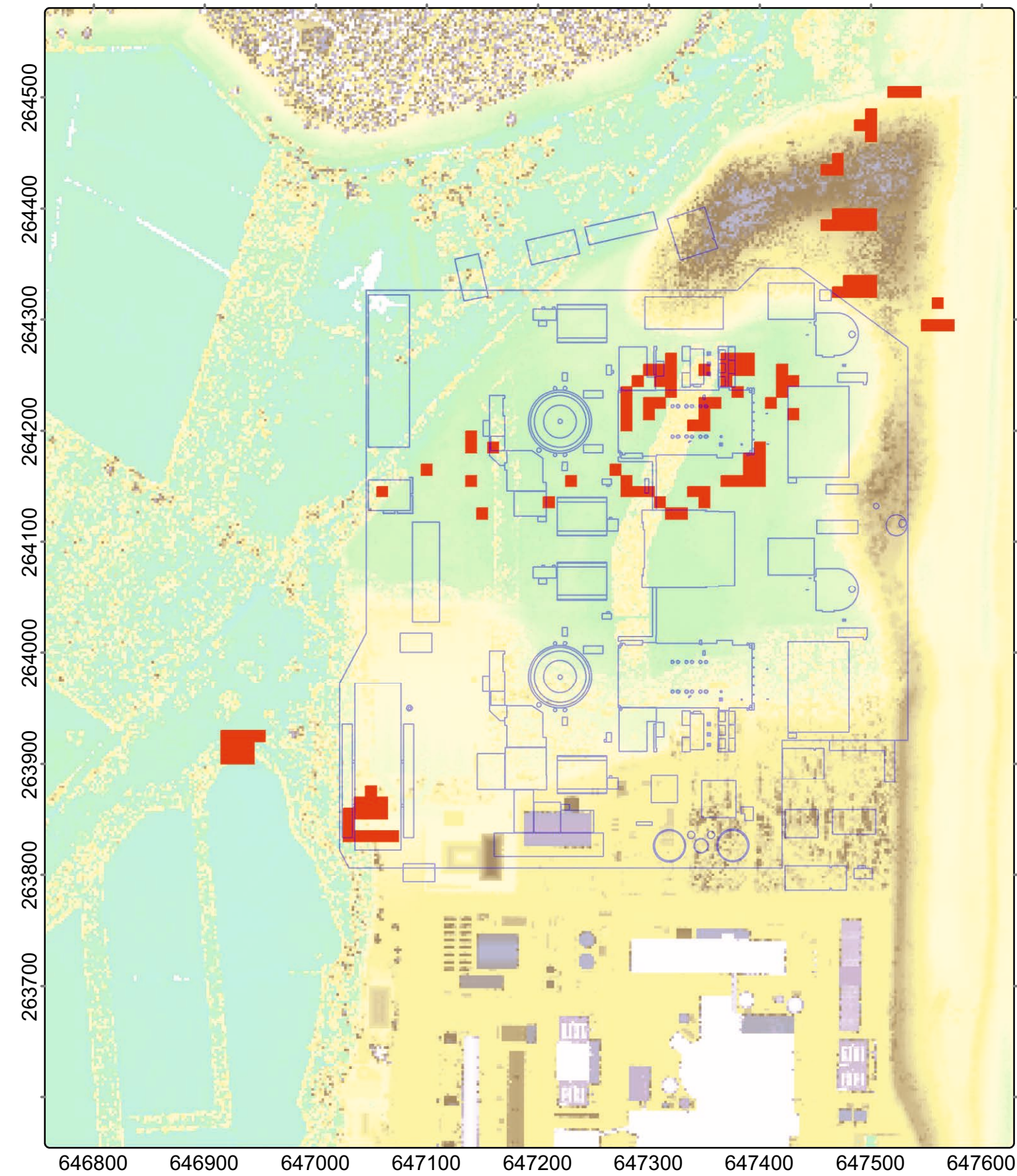


Orientation



Client Name
EDF Development Ltd.

Project SZC Main Platform Peat Strategy			
Title Distribution of identified Holocene palaeochannel networks			
Drawn MJG	Checked FS	Approved SS	
Date 01/07/2016			Sheet Size A3
Drawing Number Figure 19		Rev	Scale 1:2,250



	Proposed Main Site Building Plan	Topography (m ODN) 76.0 0.6
	Highest Archaeological Potential	
	Modern (20th Century) channel meander: -2 to -3m ODN	
	Late Prehistoric / Historic Palaeochannel: -4 to -6m ODN	
	Early Holocene Palaeochannel: -9 to -11m ODN	

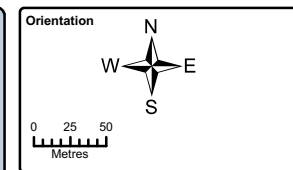
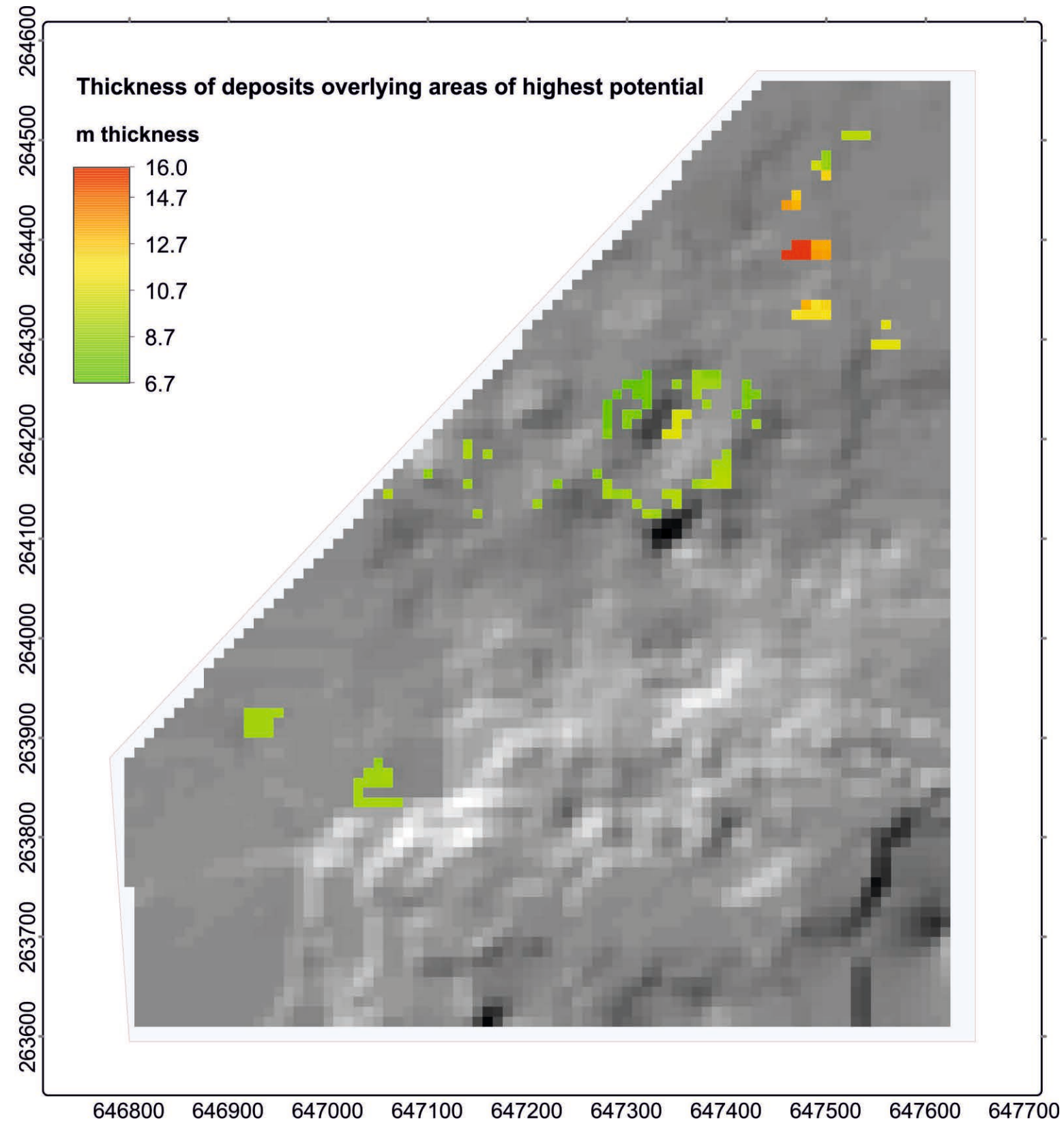
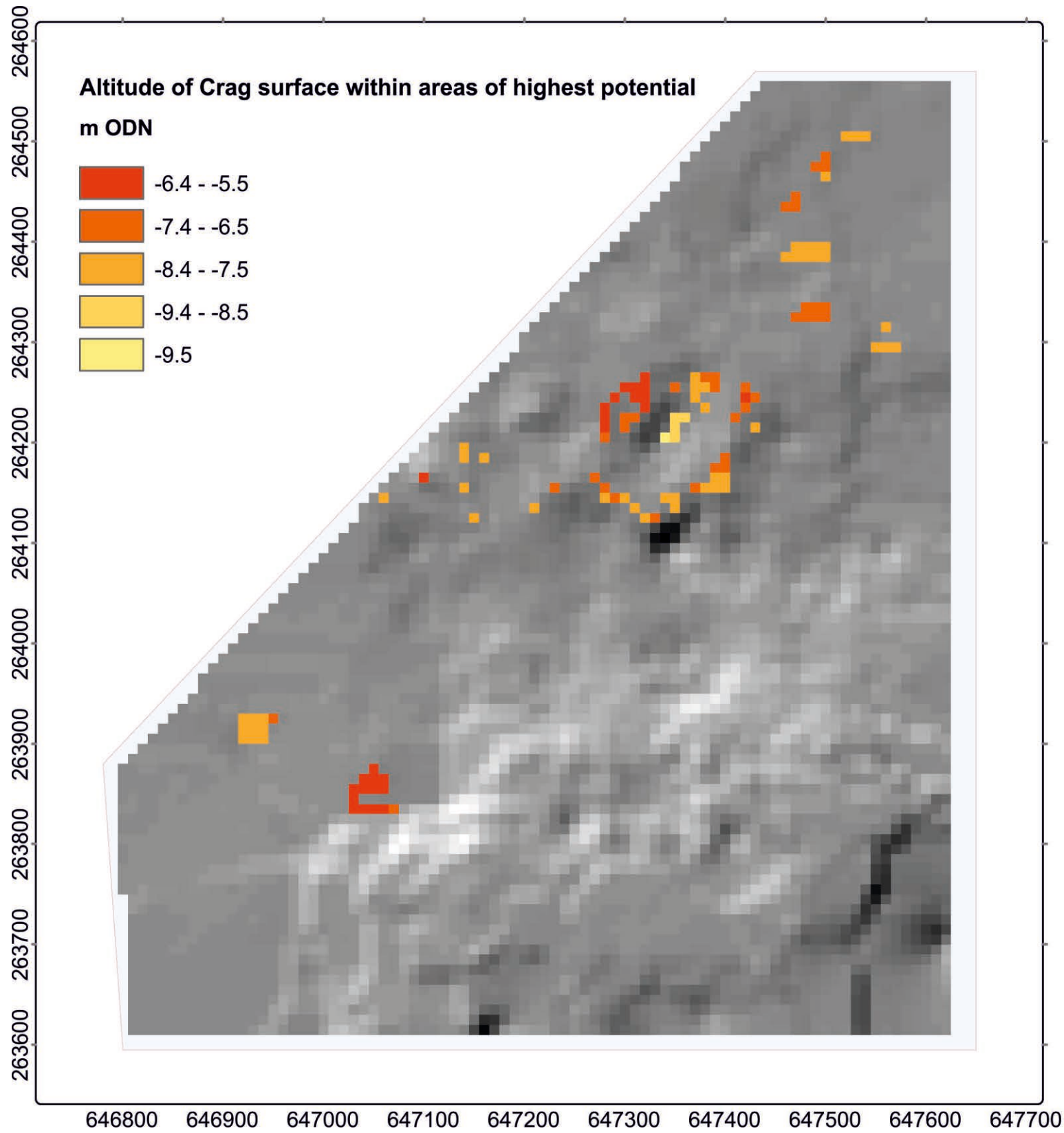


Orientation

0 12.5 25 50 METRES

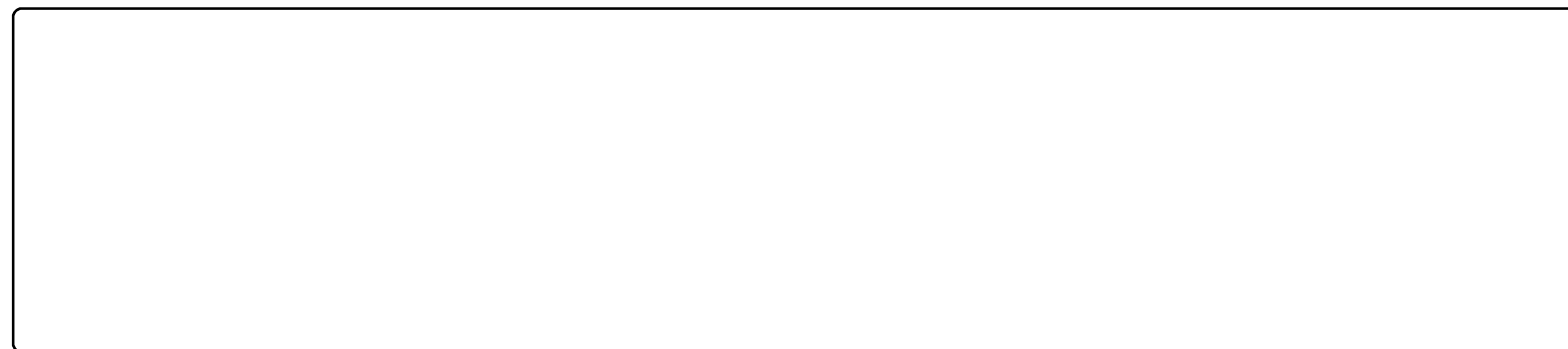
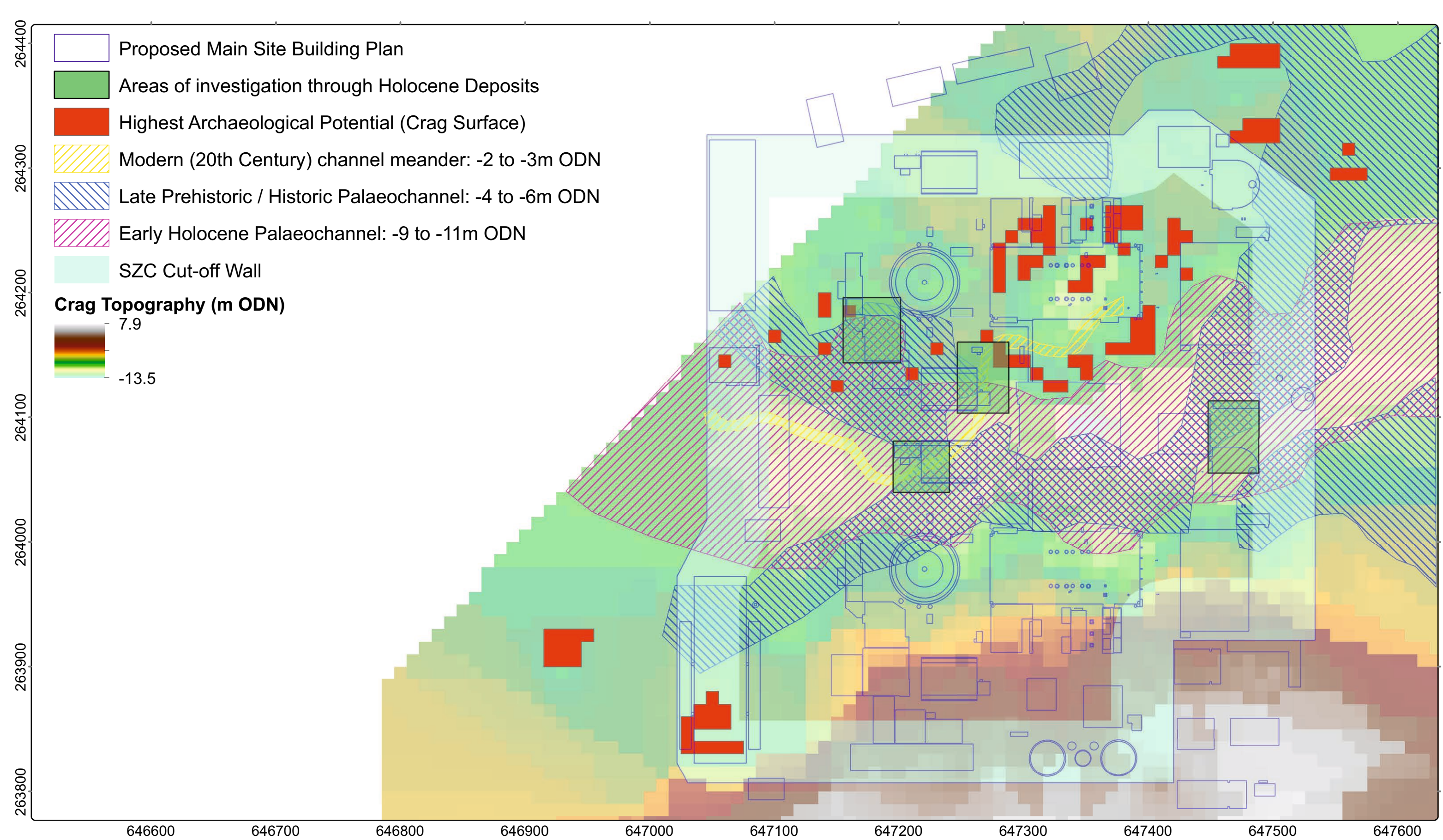
Client Name
EDF Development Ltd.

Project SZC Main Platform Peat Strategy		
Title Areas of highest archaeological potential upon the pre-Holocene Norwich Crag surface		
Drawn MJG	Checked FS	Approved SS
Date 01/07/2016		Sheet Size A3
Drawing Number Figure 20	Rev	Scale 1:4,500



Client Name
EDF Development Ltd.

Project SZC Main Platform Peat Strategy		
Title Areas of highest archaeological potential upon the pre-Holocene Norwich Crag surface		
Drawn MJG	Checked FS	Approved SS
Date 01/07/2016		Sheet Size A3
Drawing Number Figure 21	Rev	Scale 1:5,200

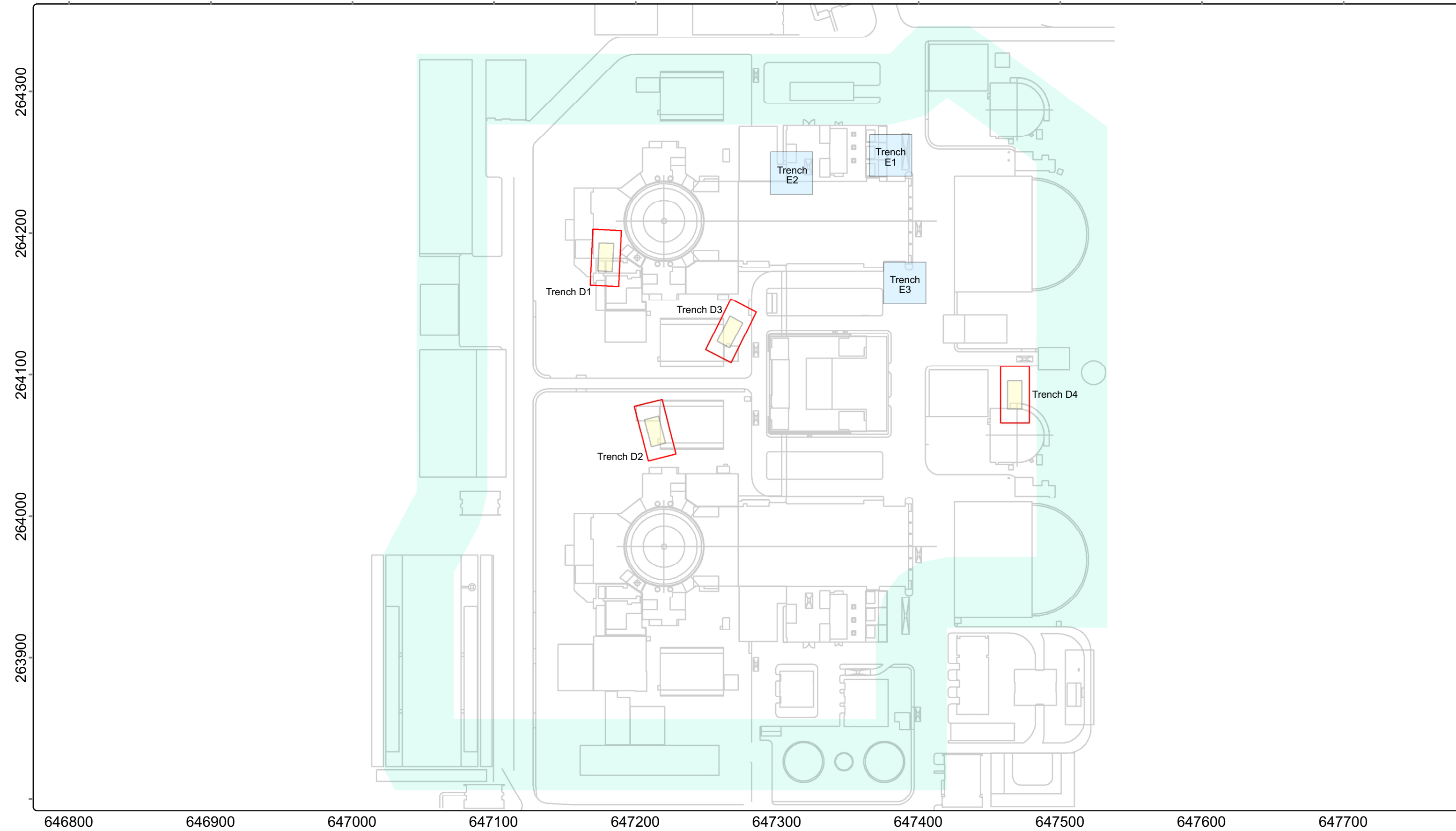


Orientation

 0 12.5 25 50
 Metres

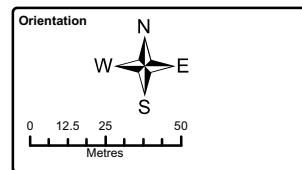
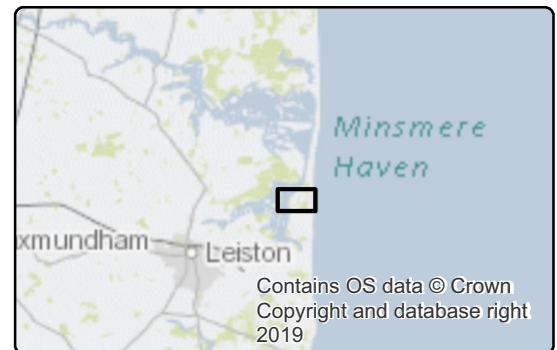
Client Name
 EDF Development Ltd.

Project			SZC Main Platform Peat Strategy		
Title			Areas of highest archaeological potential on the Norwich Crag surface, showing Main Site plan and location of the Cut-off wall.		
Drawn	MJG	Checked	FS	Approved	SS
Date	01/07/2016			Sheet Size	A3
Drawing Number	Figure 22		Rev	Scale	1:2,800



Legend

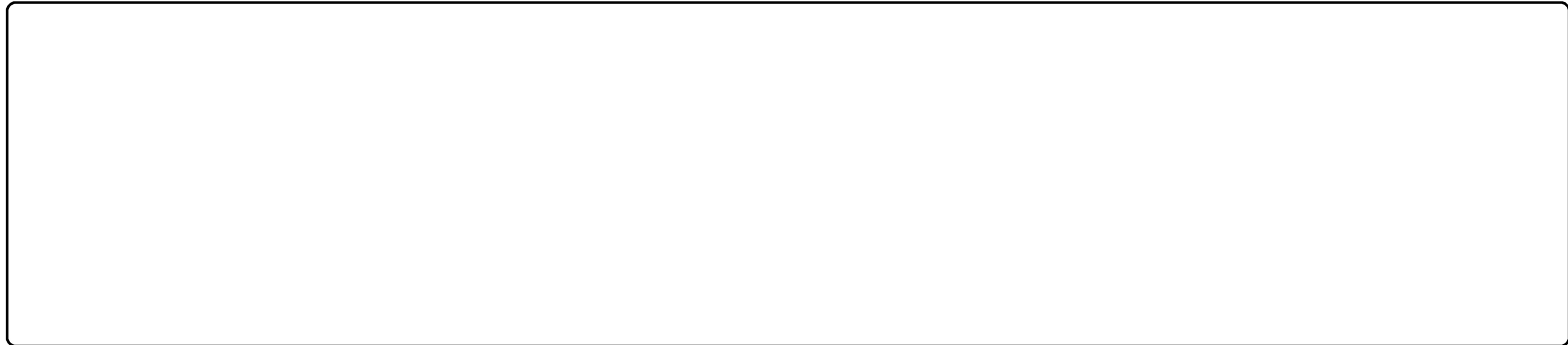
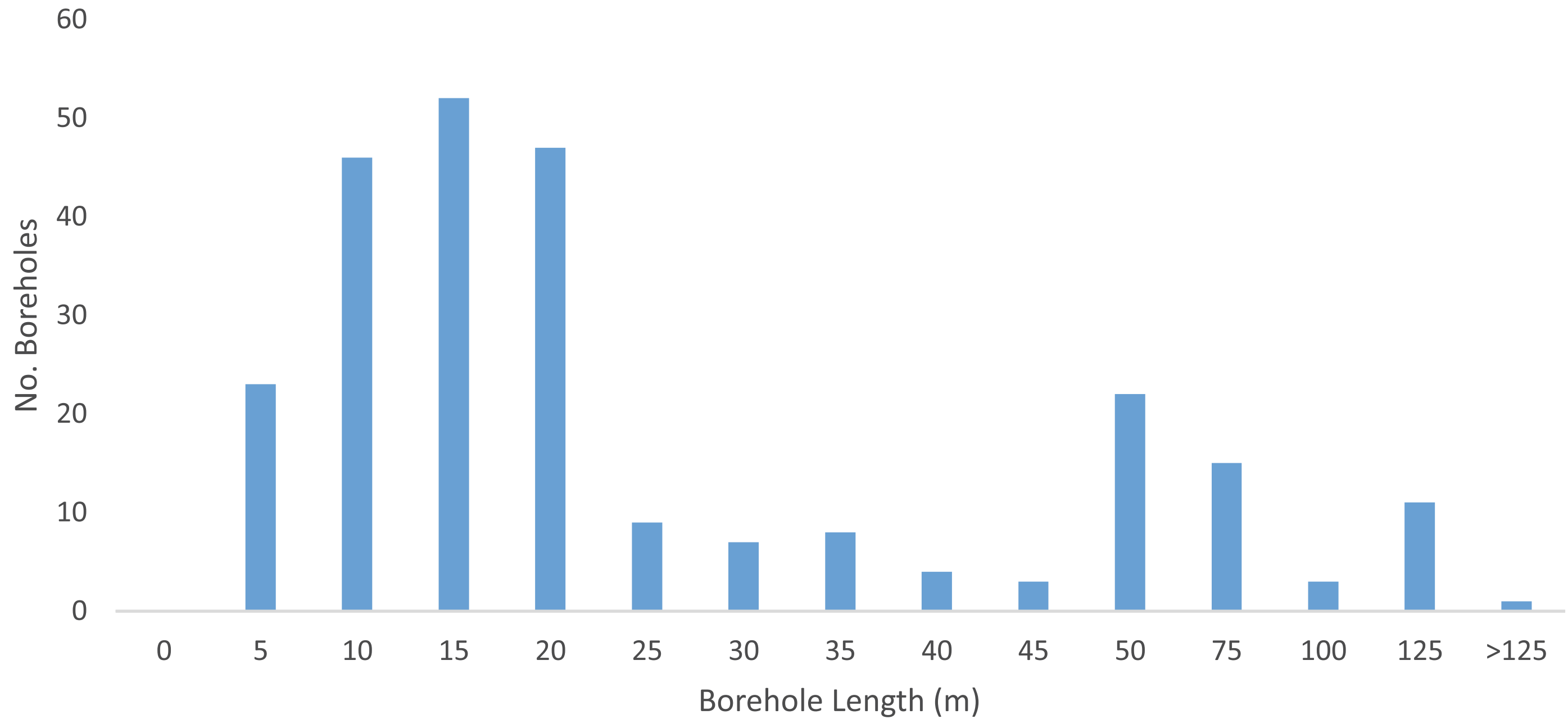
- Crag Surface Excavation
- Deep Trench
- Deep Trench Working Area
- Sizewell C Cut-off Wall



Client Name	EDF Development Ltd.		
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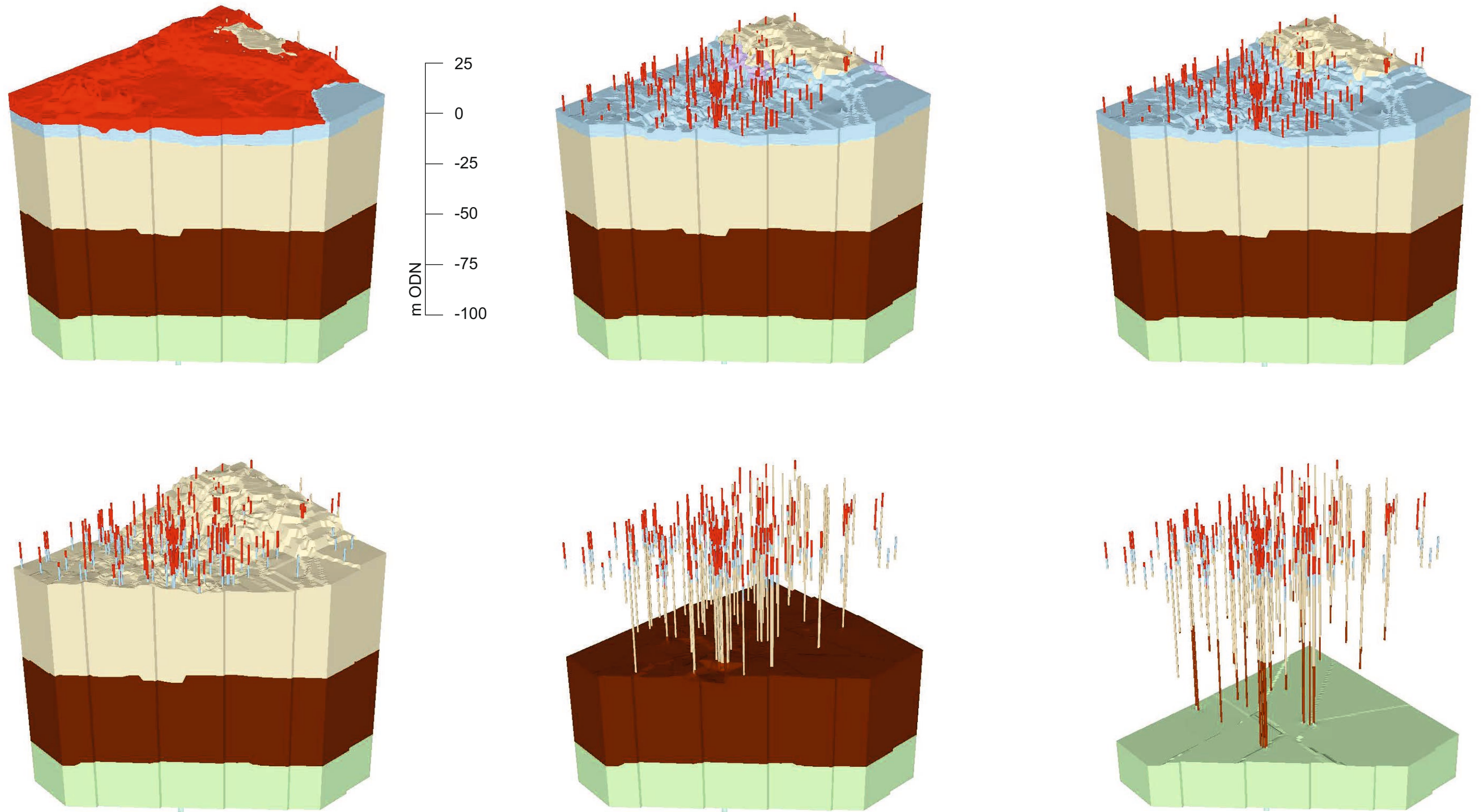
Project	SZC Main Platform Peat Strategy		
Title	Sizewell C Project Main Development Proposed Archaeological Excavations		

Drawn	MJG	Checked		Approved	
Date	09/09/2019			Sheet Size	A3
Drawing Number	Figure 23	Rev		Scale	1:2,500



Client Name EDF Development Ltd.

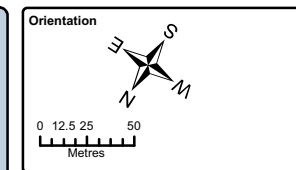
Project SZC Main Platform Peat Strategy		
Title Total depth of cores used within the deposit model		
Drawn MJG	Checked FS	Approved SS
Date 01/07/2016		Sheet Size A3
Drawing Number Figure A1		Rev
		Scale



25
0
-25
-50
-75
-100
m ODN

Stratigraphy

- Made Ground
- Buried topsoil (1970 surface)
- Holocene peats and clays
- Norwich Crag Formation
- Palaeogene deposits
- Cretaceous Chalk



Client Name	EDF Development Ltd.	
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Project	SZC Main Platform Peat Strategy	
Title	Stratigraphic Model, including borehole locations, for the Sizewell C study area, looking southeast.	

Drawn	MJG	Checked	FS	Approved	SS
Date	01/07/2016			Sheet Size	A3
Drawing Number	Figure A2	Rev		Scale	1:4500



VOLUME 2, CHAPTER 16, APPENDIX 16H : OVERARCHING WRITTEN
SCHEME OF INVESTIGATION

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Figures

None provided.

Plates

None provided.

Annexes

- Annex 16H.1 Standards for Field Archaeology in the East of England
- Annex 16H.2a Requirements for a Trenched Archaeological Evaluation
- Annex 16H.2b Requirements for Archaeological Excavation
- Annex 16H.2c Requirements for a Geophysical Survey
- Annex 16H.2d Additional Requirements for a Palaeoenvironmental Assessment

1. Introduction

1.1 Scope

- 1.1.1 This document sets out the archaeological response to the disturbance of remains resulting from work carried out at the Sizewell C main development site, and associated development sites. This will be collectively referenced as the Sizewell C Project.
- 1.1.2 It is intended to provide an introduction to the overall scheme, archaeological background, and regional research agenda, as well as setting out the overarching procedures and standards for archaeological works.
- 1.1.3 Individual written schemes of archaeological investigation (WSIs) will be produced for each site on the basis of geophysical survey and evaluation trial trenching completed to date. Where required, for example where it has not been practicable to complete surveys in advance of the Development Consent Order (DCO), site-specific WSIs will include proposals for additional evaluation survey.
- 1.1.4 Any preserved peats within the Sizewell C Project area are the subject of a specialised Peat Strategy, provided in **Appendix 16G** of **Volume 2** of the **Environmental Statement**, and are not discussed further in this document.

2. Archaeological and Historical Background

2.1 Chronological summary

- 2.1.1 The historical and archaeological background of sites incorporated within the proposed Sizewell C development have been documented in previous Historic Environment Desk-Based Assessment (DBAs), geophysical survey and archaeological evaluation reports. A summary of which with relevant points are set out within this section. For a more detailed summary, refer to the completed DBAs, and final evaluation reports for the individual sites.

a) Prehistoric

- 2.1.2 Within the proposed Sizewell C Project there is a potential for prehistoric remains to be present. These mainly relate to Iron Age occupation, and reflect scattered remains of possible agricultural activity.
- 2.1.3 Previously observed evidence of prehistoric activity has been concentrated to the east and south-east of these sites, on the well-drained Sandlings soils, and the wetland margins of the coastal marshes of the main development site. It is not clear whether this evidence suggests a genuinely

reduced archaeological potential, or the relative absence of past fieldwork, and the reduced visibility of some prehistoric remains in clay soils.

- 2.1.4 To date, there are no records of archaeological material dating from the Palaeolithic or Mesolithic period, within the proposed Sizewell C development, though Mesolithic peats have been identified in the infilled former river channel, which runs to the west and north of the existing Sizewell A and B sites.
- 2.1.5 A Neolithic axehead has been found in the well-drained Sandlings soil within the main development site, and another on Sizewell beach. Neolithic peats have been identified in the infilled former river channel which runs to the west and north of the existing Sizewell A and B sites. No stratified or settlement remains dating from this period have yet been observed.
- 2.1.6 At the Sizewell C main development site, Bronze Age activity is also scarce. Historic Environment records (HER) for the main development site include two cinerary urns from Leiston, and a possible round barrow recorded at the southern end of the parkland around Theberton House. Several undated cropmarks have also been located near the Theberton bypass site.
- 2.1.7 During trial trenching (Ref. 1.1), Iron Age ditches and pits were identified in several fields (12 Acres, Badgers Burrows, Broom Walk and Stone Walk North and Land East of Eastlands Industrial Estate) across the main development site, representing a low-density spread of enclosures and settlement across the landscape. Scattered evidence of Iron Age activity was recently exposed in the southern portion of Red Rails field during trial trenching. Isolated pits and narrow linear features, perhaps representing late Iron Age field systems, were identified in areas of lower elevation.
- 2.1.8 Trial trenching in 2016 (Ref. 1.2) also revealed features dating to the Iron Age at Wickham Market, including three cremation burials and ditches thought to represent a pre-Romano-British field system. Iron Age features were concentrated towards the centre of the site, but sherds of prehistoric pottery were also found in later features in the southern part of the site. These findings correlate with earlier excavations in the 1970s, which found evidence of a Late Iron Age settlement pre-dating the Romano-British activity at Lower Hacheston (Ref. 1.3).
- 2.1.9 Although the limited quantity of stratified Iron Age material elsewhere within the Sizewell C site boundary is more a reflection of the amount of fieldwork carried out in the area, it does suggest that the potential for remains dating to this period may be low. It is worth noting, however, that a characteristic of late Iron Age settlement in East Suffolk is the preference for relatively high ground on spurs overlooking the valleys (Ref. 1.3), which is

comparable to the topography of areas of some elements of the proposed development sites, particularly the Two villages bypass west of Farnham. Limited evidence for prehistoric activity was also observed during evaluation trenching at Yoxford.

2.1.10 The contextual evidence suggests that there is the potential for Iron Age agricultural settlement within the main development site at Land to the East of Eastlands Industrial Estate (LEEIE), and at the Wickham Market park and ride site, while the topographic location of the Sizewell link road and Two village bypass, along the flank of the ridge above the river valley, would have provided a favourable location for similar activity. The nature and location of other prehistoric activity remains difficult to predict with any confidence.

b) Romano-British

2.1.11 The Romano-British finds recorded within the main development site are largely chance finds, and very few definitive stratified features dating to this period are known within the site boundary. Within the associated development sites, Yoxford and Wickham Market are close to settlements thought to have originated in the Romano-British period.

2.1.12 Apart from artefact scatters recorded around Leiston, there is little recorded evidence of Romano-British activity at the main development site. Preliminary trial trenching results from East Meadow may have exposed a Romano-British occupation layer, suggesting a localised presence in certain areas of the main development site. Romano-British settlements are usually readily discernible on geophysical survey, and aerial photography and are frequently evidenced by discernible surface scatters of artefactual material in arable land. Consequently, the relatively low number of observed Romano-British features appears likely to reflect a genuine absence of material in this coastal area.

2.1.13 It is conjectured that the Romano-British settlement at *Sitomagus* was located near Yoxford: the A1120, which enters the village of Yoxford from the north west, runs, in part, along stretches of Romano-British road. It is possible that Yoxford may have been located at the junction of several Romano-British roads, close to the fording of the River Yox. These inferences are by no means secure and no evidence for activity of this date was observed in evaluation trenching at Yoxford.

2.1.14 Elements of a Romano-British settlement were partially excavated in 1973-4 in advance of the construction of the A12 Wickham Market bypass (Ref. 1.3). Cropmarks visible on aerial photography and subsequent geophysical survey suggest that further remains of this settlement, comprising enclosures and building plots, are in the fields immediately to the south-

western part of the Wickham Market park and ride site. Further artefactual material and structural remains, including an oven or kiln and artefactual material, have been observed to the south-west of the site between Wickham Market and the B1116/B1078. Subsequent evaluation demonstrated that the park and ride site is located on the fringes of this small town. Similarly, road improvement works at the junction of Easton Road and the B1116 Hacheston Road may affect peripheral elements of the small town.

- 2.1.15 At Darsham, recent evaluation trenching found a low number of isolated ditches and pits dated to the Romano-British period in the central and eastern parts of the site. These are most likely associated with agricultural activity, rather than core settlement areas. Further remains of Romano-British activity have been observed during trenching on the Sizewell link road to the west of Theberton and on the green rail route.

c) **Early-medieval**

- 2.1.16 Sites of this period are difficult to identify owing to the relative lack of artefactual material, and the characterisation of rural settlement with dispersion and mobility. Significantly, sites related to the earlier part of this period have limited correlation with their Romano-British predecessors, or later medieval successors, and are often situated some distance from the known historic village centres.

- 2.1.17 Apart from a concentration of material and features discovered in LEEIE, there is no observed early-medieval activity within the proposed Sizewell C development.

- 2.1.18 At LEEIE, two sunken-featured buildings were identified in the north of the site, along with several post-holes that may have been the remains of further post-built structures. This early-medieval activity was focused on either side of a palaeochannel, still visible as a depression in the landscape.

- 2.1.19 The villages of Leiston, Wickham Market, Yoxford and Theberton are all recorded in the Domesday survey of 1086. The settled manorial geography, which formed the basis for the medieval settlement pattern of the area, appears to have been established in part during the early-medieval period, and it is anticipated that sites relating to the later part of this period would be located in close proximity to the later settlement centres.

d) **Medieval**

- 2.1.20 In contrast with prehistoric, Roman and early-medieval contexts, a large amount of archaeological evidence relating to the medieval period has been observed in the vicinity of several sites within the proposed Sizewell C

Project, and there is a relatively clear understanding of land use and settlement geography in this period. This is principally focused on five specific locations; the two sites of Leiston Abbey and the medieval villages of Sizewell, Leiston and Theberton.

- 2.1.21 Leiston Abbey was originally founded in 1182, approximately 1 kilometre north of the main development site. Due to coastal erosion, and following unsuccessful attempts at land reclamation, the Abbey was relocated in 1363 from its original site on the shore of the estuary to a more favourable location inland, approximately 200 metres (m) west of the main development site. The original building was retained as a monastic cell.
- 2.1.22 Although the monastic sites would have comprised relatively small, and tightly grouped complexes that did not extend onto the proposed development sites, these areas would have included elements of the wider monastic landholdings. Similarly, although the nearby villages of Leiston and Theberton would not have extended onto the proposed development sites, elements of agricultural landscapes primarily in the form of grazing land associated with these villages may be present.
- 2.1.23 The village of Sizewell was substantially larger in this period than at present, and the full extent of the village and its associated agricultural landscape has been reconstructed through detailed documentary survey. Pillbox Field appears to encompass fields associated with the former medieval village.
- 2.1.24 An excavation undertaken in advance of the Greater Gabbard onshore works, to the south and west of Pillbox Field in the main development site, recorded a medieval site including ovens and associated structures (granaries), and possible fishing equipment, representing the periphery either of an ‘industrial suburb’ or the medieval centre of Sizewell. A trackway associated with this settlement was observed in Pillbox Field, which forms part of the land within the Sizewell B Relocated Facilities application.
- 2.1.25 Sub-rectangular enclosures were found in several discrete areas during the recent evaluation at the main development site: namely, at Badgers Burrow, Broom Walk, and Stone Walk North. Near the enclosures in Broom Walk and Stone Walk North were further large pits and possibly clay-built ovens/kilns. A series of possible medieval driveway tracks were found in Long Walk, likely re-cut over several phases, linking two clear deposits of burnt clay containing medieval pottery.
- 2.1.26 At associated development sites, the study area of the Two village bypass includes the medieval settlements at Farnham and Stratford St Andrew, as

well as a medieval square moat filled with water, recorded in the HER at the south edge of the bypass site.

2.1.27 At Theberton, several records of artefact scatters and chance finds dating to the medieval period are known within the study area around the proposed bypass. These include metalwork and coins found just outside the village. A former deer park, lodge, large fishpond and dovecote north of Kelsale Hall lie 750m west of Theberton, to the west of the A12.

2.1.28 The archaeological evidence illustrates that medieval settlement remained relatively dispersed in the area. Recent evaluation results at the main development site suggest scattered agricultural and industrial activity, rather than discrete settlements which were focused on settlement cores that persist as modern villages. It is likely, therefore, that outlying medieval farmsteads or activity areas, associated with the hinterland of the two Abbeys and nearby villages, may be present in other areas of the proposed Sizewell C development.

e) Post-medieval

2.1.29 The basic settlement geography of the proposed Sizewell C Project, established in the medieval period, remained relatively consistent during the post-medieval period. Many of the post-medieval historic records for the Sizewell C Project reflect the agricultural nature of the area at the time.

2.1.30 For instance, in 1831, in the villages of Farnham and Stratford St Andrew, over half the population were employed in agriculture, with the population falling in number over the next couple of centuries. The only principal change in this period was in terms of the use and demarcation of land, with the steady enclosure and 'improvement' of lands within the Sandlings and marshland to provide more productive land.

2.1.31 Heritage assets within the main development site dating from this period primarily comprise agricultural features and buildings, including those associated with the drainage and improvement of the marshes. These include features such as marl pits and enclosure period field boundaries. Assets also include extant farmsteads and evidence of quarrying.

2.1.32 At Wickham Market, a geophysical survey carried out in 2013 and 2014 identified linear anomalies consistent with field boundaries, and a footpath which is also recorded on historic mapping. There is, however, no further evidence of post-medieval archaeological remains in this area.

2.1.33 In Theberton, recorded assets include village buildings, agricultural buildings (Dovehouse Farmhouse and Valley Farmhouse), and larger estate houses (Theberton House). A post-medieval mill, which once lay to the south of Middleton, and a five-storey tower mill built in the 18th century

in fields to the east of Theberton, further attest to the agricultural nature of the study area during this period. Both were demolished in the early 1900s.

2.1.34 Mapping evidence does not suggest the presence of any significant post-medieval sites within the Sizewell C Project, other than a series of farmsteads, which are largely still extant. It is not anticipated that there would be significant post-medieval remains present within the sites included in the Sizewell C Project, although elements of dispersed farmsteads or industrial sites may be present.

f) Modern

2.1.35 During the modern period, several sites encompassed by the proposed Sizewell C Project experienced continuity of settlement and agricultural land use.

2.1.36 There are extensive records of the defensive works and activities undertaken within the main development site, as part of the defence of the east coast of England during the Second World War (WWII). A complex of WWII emplacements is known to the north of Sizewell B, comprising a variety of earthworks and structures, and which formed part of the wider coastal anti-invasion defences. Also, to the north-west of Sizewell B, on Goose Hill and in Dunwich Forest, was an extensive WWII site comprising two anti-aircraft batteries, associated buildings and numerous practice trenches. Further remains at the main development site include pillboxes, the site of a probable WWII ‘SOS’ field artillery position and slit trenches. Anti-invasion obstacles made of scaffolding were constructed on Sizewell beach, and appear to have been partially dismantled after WWII.

2.1.37 Key sites of this type and period can be confidently located, as they either survive as visible features, or are recorded on aerial photographs or in documentary records. Many of these sites have been demolished, leaving fragmentary sub-surface remains, while others (particularly entrenchments), may include more extensive below-ground remains.

2.1.38 It is likely that the elements of the coastal ‘crust’ (the heavily fortified defensive line along the coast), are present within the eastern part of the main development site, but that the area inland was never fortified to the same extent as the coastal strip. There may be military features associated with RAF Leiston within the Green Rail Route and Theberton bypass site boundaries, although this seems unlikely given the distance between these sites and the former airfield. A secondary stopline was proposed along the line of the railway between Campsea Ash and Halesworth, meaning that there is a potential for associated features to be present in associated development sites close to the railway.

3. Research Context

- 3.1.1 As mitigation by investigation and recording primarily mitigates loss of archaeological interest, it is important to set the results of any archaeological fieldwork into a wider framework for archaeological research and investigation.
- 3.1.2 Overarching research agendas for the East of England set out key themes that archaeological investigation can inform. The publication of ‘Research and Archaeology Revisited’ (Ref. 1.4) augments the regional research framework for the East of England, originally published as a Research Agenda and Strategy in 2000 (Ref. 1.5). The regional research framework for the eastern counties is continuously under review, and several chapters from the latest draft research agenda (Ref. 1.6) have also been included to provide an updated reference. **Table 3.1** maps the archaeological remains anticipated to be present within the site against these identified research agendas.
- 3.1.3 Individual site-specific WSIs provide further detail and set out how the research potential of individual sites will be realised against the East of England.

Table 3.1: Archaeological research agenda

Anticipated Remains	Mapping To East Of England (2011)	Mapping To DRAFT East Of England (2018)
<p>Artefactual material associated with the Mesolithic and Palaeolithic.</p>	<p>Develop predictive model for identifying potentially important Mesolithic sites, such as the collation of existing regional data.</p>	<p>Recognising that important in situ Upper Palaeolithic and Mesolithic scatters continue to be recovered beneath colluvial deposits, and within sub-soil layers, highlighting need for affective modelling and sampling of deposits encountered during evaluation phases.</p> <p>Intensive sampling and sieving through excavation of ploughzone sites, where Palaeolithic and Mesolithic lithic material often exists as a component of multi-period assemblages.</p>
<p>Features associated with Neolithic occupation.</p>	<p>Applying methods which enable the testing of the plough soil in this region, given the plough damage to Neolithic sites.</p> <p>Further analysis of the human impact on the natural landscape, including changing patterns of alluviation, woodland management and clearance.</p> <p>Strengthening palaeoenvironmental sampling strategies in Neolithic deposits; such as 100% floatation of well-sealed pits to maximise the chance of recovering macrobotanical evidence.</p>	<p>Understanding the variability between Neolithic pit sites, enclosures and other monuments, and surface spreads and ploughzone scatters, to ensure a more focused approach.</p> <p>Examining landscape change, especially the extent of both the Early Neolithic woodland clearance and Later Neolithic woodland regeneration.</p>
<p>Features associated with Later Prehistoric occupation.</p>	<p>Analysing Bronze Age artefacts and monuments to determine the extent and reasons for the marked divide between northern and southern parts of the region during the second millennium BC; regionalisation of settlement patterns and field systems requires further study.</p> <p>Examining the Bronze Age – Iron Age transition, in relation to the abandonment of many late Bronze Age field systems and contraction in settlements and populations in the region.</p> <p>Utilising great potential for investigating relationship between Iron Age field systems and long-distance trackways, with settlements and enclosures.</p>	<p>Analysing the shifting contexts of monumentality, from Early Bronze Age emphasis on circular monuments, to creation of landscape-scale structures in Middle/Late Bronze Age.</p> <p>Examining the connection between adjacent Iron Age sites thought to be contemporary; how did they relate physically, socially and economically?</p> <p>Further study of how Late Bronze Age and Early Iron Age agrarian regimes on clayland sites complement or contrast with those situated on other geologies.</p>

Anticipated Remains	Mapping To East Of England (2011)	Mapping To DRAFT East Of England (2018)
<p>Features associated with Later Prehistoric ritual, funerary activity.</p>	<p>Developing our understanding of Bronze Age burial practices, including the relationship between settlement and burial sites.</p> <p>Analysing the chronology, distribution and range of Iron Age burial types. Are cremation burials and the pyre goods an indication of social hierarchies?</p>	<p>Looking at to what extent different burial traditions can be identified, and if they vary over space and time across this region.</p> <p>Examining Late Bronze Age cremations to see if changes in practice can be recognised over time.</p>
<p>Features associated with Romano-British settlement and agriculture.</p>	<p>Analysing the form of Roman buildings in the region to see if functions can be attributed to them.</p> <p>Assessing whether there are chronological, regional or landscape variations in Roman settlement location, density or type. Can we identify continuity as well as new settlement structures?</p> <p>Examining the economic and social impact of the early Roman military on the region.</p>	<p>Recognising that some landscapes were packed with Roman farmsteads, assessing to what degree the land was ‘managed’, and their practices sustainable?</p> <p>Recognising that insufficient attention has been paid to what processes and stock facilities occurred in the Roman fields in the region.</p>
<p>Features associated with early-medieval settlement and burial activity.</p>	<p>Utilising aerial photography of known Anglo-Saxon sites as a template for identifying settlement patterns.</p> <p>Further investigation applied to Anglo-Saxon fieldscapes; to what extent are Roman field systems used? What is the evidence for open field systems in the region during the Anglo-Saxon period?</p> <p>Establishing detailed environmental sampling strategies in understanding the role of water management – i.e. reclamation of coastal marshes and the creation of water meadows.</p>	<p>Utilising Geographical Information Systems as a core landscaping studies tool to understand the transition between the dispersed, transitory settlements of the Early Anglo-Saxon period, and the more settled, nucleated and increasingly regularly laid out settlements of the Middle and Later Anglo-Saxon periods.</p> <p>Focusing on the excavation and analysis of good animal bone assemblages, and charred cereal deposits in ascertaining different Anglo-Saxon agricultural practices, crops grown, animals reared, and products obtained.</p>
<p>Features associated with medieval agriculture and settlement.</p>	<p>Investigating further the role of water management and land reclamation during this period.</p> <p>Recognising that much of the region has a primarily dispersed settlement pattern during the Medieval period; obtaining more data will add to our understanding of the way settlements appear, grow, shift and disappear.</p>	<p>Establishing the need to study Medieval settlement change, evolution and abandonment, especially with reference to greens and green-side settlements.</p> <p>Recognising that more research is required to establish more conclusive evidence for the origins and development of the church and church-and-hall complexes.</p>

Anticipated Remains	Mapping To East Of England (2011)	Mapping To DRAFT East Of England (2018)
	Seeing that more work is required to establish what form Medieval farms and field systems took.	Further exploration is needed into the origins of the dispersed settlement patterns, and its implications for social organisation and landscape development.
Features associated with post-medieval agriculture and settlement.	Further study of the growth and impact of settlements on the post-medieval landscape, including effects on agricultural production. Improved research into the role of water management and land reclamation, which is a dominant theme of the post-medieval landscape in this region.	Any study of farm buildings should consider how they have been used and their relationship to the farmstead and the wider landholding. Acknowledge that well-preserved 18th and 19th Century structures are rare in this region, and the opportunity to investigate them should be taken, especially if artefact assemblages are also present.
Features associated with WWII coastal defences.	Develop a good model for understanding how fixed defences operated within the landscape. More opportunities should be sought to broaden an appreciation of recent military heritage through collaborations with artists and oral testimony projects. The effect on the historic environment and communities of the decline, or abandonment of military sites should be considered.	N/A

4. Likely Effects and Archaeological Response

4.1.1 Likely effects of the proposed Sizewell C Project have been considered in relation to potential ground disturbance, and areas of archaeological potential have been identified to allow specific investigations to be proposed.

4.1.2 The detail of mitigation proposals, including the most appropriate methodology, and the exact extent of any intervention will be agreed with the Suffolk County Council Archaeological Service (SCCAS) archaeologist, and will be set out within the site specific WSIs.

4.1.3 The proposed archaeological investigation methods which may be used on a site-specific basis include:

- geophysical survey;
- evaluation trenching;
- set piece excavation;
- strip, map, and sample; and
- archaeological monitoring.

5. Archaeological Response

5.1 General principles

5.1.1 Archaeological work is intended to:

- mitigate loss of archaeological interest of at-risk heritage assets; and
- inform planning of non-archaeological (i.e. avoidance and design) mitigation.

5.1.2 All archaeological mitigation will be proportionate to the significance and extent of the potential effects on archaeological remains, and will be designed to address the specific research agenda set out at **section 3**.

5.1.3 The following professional standards apply:

- Chartered Institute for Archaeologists 2014 Standard and Guidance for Archaeological Excavation (Ref. 1.7);

- Chartered Institute for Archaeologists 2014 Guidelines for the Collection, Documentation, Conservation and Research of Archaeological Materials (Ref.1.8);
- Chartered Institute for Archaeologists 2014 Code of Conduct (Ref. 1.9);
- Standards for Field Archaeology in the East of England provided in **Annex 1** of this appendix; and
- SCCAS Fieldwork Guidance Documents provided in **Annex 2a-d** of this appendix; and

5.2 Proposed methodology and application

a) Rapid Identification Survey

5.2.1 Rapid Identification Survey will be undertaken where reasonably practicable in areas which could not be evaluated pre-determination due to the presence of tree cover after felling of trees, and clearance of undergrowth but in advance of any grubbing, or grinding out of stumps.

b) Geophysical Survey

5.2.2 Geophysical survey will be carried out where reasonably practicable in areas where no prior archaeological survey or investigation has been undertaken, unless otherwise set out in a site-specific WSI or agreed with the SCCAS archaeologist.

5.2.3 Geophysical survey will comprise the archaeological magnetometry survey of identified areas in order to identify geomagnetic anomalies of potential archaeological origin. This survey would aim to cover the developable extent of these areas, but would exclude any confirmed safeguarded areas, areas of demonstrable past disturbance (e.g. hardstandings and modern building footprints), and any areas where safe access cannot be confirmed.

5.2.4 Geophysical work and reporting will be carried out in line with the standards set out at **sections 5.3** and **5.5**; the SCCAS and regional standards at **Appendices A** and **B**; the EAC Guidelines for the Use of Geophysics in Archaeology (Ref. 1.10) and the Chartered Institute for Archaeologists Standard and Guidance for archaeological geophysical survey (Ref. 1.11).

c) Evaluation trenching

5.2.5 This will be carried out in areas where evaluation has not been practicable in advance of the DCO being granted, and provision will be made in the site-specific WSI for further trenching as appropriate.

- 5.2.6 Evaluation trenching will comprise the excavation of a 3% sample of areas which have been subject to geophysical survey, but not any further archaeological investigation, and 5% of areas where geophysical survey has not been practicable, using 30m by 2m trenches unless otherwise agreed with SCCAS.
- 5.2.7 The area sample to be investigated in formerly wooded areas subject to Rapid Identification Survey will be agreed with SCCAS, and will have regard to the visibility of archaeological remains, the extent of prior disturbance, including that observed in other woodland areas on-site, and the results of archaeological evaluation in adjacent fields.
- 5.2.8 The purpose of the evaluation is to identify and characterise the nature, extent and significance of specific archaeological foci, within an extensive area. This information will be used to allow more detailed proposals for mitigation to be developed.
- 5.2.9 Archaeological evaluation trenching and recording will be carried out to the standards set out at **sections 5.3** and **5.5**, and in accordance with the SCCAS and regional standards at **Annex 1** and **2a–d** of this appendix.
- d) [Archaeological monitoring \(watching brief\)](#)
- 5.2.10 Archaeological monitoring (watching brief) will be used to:
- provide opportunities for archaeological investigation, and recording in circumstances where investigation would otherwise be impracticable;
 - where archaeological remains of limited value or extent are suspected within a working area; and
 - it will comprise an archaeologist being present, either continuously or on an agreed schedule of inspection-based visits, during intrusive groundworks so that the presence, or absence, of archaeological remains could be confirmed, and any such remains be appropriately recorded.
- 5.2.11 The risk that archaeological remains might be present will be well-established on the basis of previous stages of evaluation, and/or mitigation works, and the areas identified within the individual site WSIs. Any site-specific requirements will be set out within the individual site WSIs
- 5.2.12 The need to monitor construction works will be predictable, and appropriate arrangements for SCCAS inspection visits will be acceptable in most instances.

- 5.2.13 Where archaeological deposits are encountered, sufficient excavation will take place to allow appropriate records to be compiled, as might be reasonably achieved. Provision will be allowed for access in keeping with health and safety considerations.
- 5.2.14 Should extensive and well-preserved remains be found, which cannot be addressed within the scope of a watching brief, the requirements for any further excavation will be discussed with the client and the SCCAS archaeologist.
- 5.2.15 Archaeological monitoring and recording will be carried out to the standards set out at **sections 5.3** and **5.5** and in accordance with the SCCAS and regional standards at **Annex 1** and **2a-d** of this appendix.
- e) **Strip, map and sample**
- 5.2.16 Strip, map and sample mitigation will be undertaken to identify specific archaeological foci within an extensive area of potential, or to expose the spatial characteristics of extensive archaeological landscape elements, such as field systems, prior to selecting locations for targeted sample excavation. This work is to be undertaken within a framework of evidence-based research objectives.
- 5.2.17 Following initial machine excavation (which will be directed and monitored by the archaeological contractor), the area should be examined, and a plan of identified and potential archaeological features and deposits prepared at an appropriate scale. This will inform proposals for sample excavation, to be agreed with the SCCAS archaeologist.
- 5.2.18 Where necessary to allow construction works to continue, the release of a part of an area may be agreed with the SCCAS archaeologist. In this situation, areas which have not been released will be clearly demarcated.
- 5.2.19 Key stages in strip-map-and-sample are:
- careful stripping of identified area(s) to reveal the site plan;
 - immediate planning (mapping) of the area while the uncovered surface is fresh. The area should be subsequently checked to see if weathering reveals further features and the plan updated as appropriate; and
 - sampling, concentrating on established a relative chronology through feature intersections investigations, and by attempting to establish a more precise chronology.

- 5.2.20 Areas for strip, map, and sample will be identified following geophysical survey, and/or evaluation trenching, and will be agreed with SCCAS. Individual areas and the justification for their selection will be set out within the individual site WSIs.
- 5.2.21 Following the planning stage, an appropriate sample of identified features will be investigated. Key areas and nodes will be investigated in sufficient detail to understand them both in respect of themselves and also in relation to their surroundings. This work will be focused on adding to the spatial, chronological, functional and environmental context of the investigated area drawing on the standards set out in **section 5.3**, and in accordance with the SCCAS and regional guidance provided in **Appendices A** and **B**. Any site-specific variations will be set out within the individual site WSIs, and/or agreed with the SCCAS archaeologist.
- 5.2.22 This requirement to sample and record identified features will be continually monitored during the course of fieldwork, and amended according to its effectiveness in meeting research objectives. In particular, consideration of strip, map, and sample operations will be discussed with the SCCAS archaeologist, with a view to extending these operations where significant archaeological remains have been observed, or scaling back operations where the potential presence of archaeological features is demonstrably low, based on:
- identified prior truncation/disturbance;
 - absence of observed features; or
 - confirmation of prior survey results which suggest poor survival of archaeological features.
- 5.2.23 Any decision to scale back the scope of strip, map, and sample mitigation will only be undertaken after agreement of the SCCAS archaeologist has been confirmed.
- 5.2.24 Following completion of archaeological investigation to the satisfaction of the SCCAS archaeologist the relevant area, or agreed parts thereof, will be released to the main contractor so that construction works may proceed.
- f) **Set-piece excavation**
- 5.2.25 Set-piece excavation will be undertaken where evaluation to date has clearly defined the extent, and character of significant archaeological remains, allowing for a definitive investigation area, sampling and finds recovery policy to be defined.

5.2.26 The individual defined areas identified for set-piece excavation will be set out in the relevant individual site WSI.

5.2.27 Set-piece excavation and recording will be undertaken to the standards set out at **section 5.3**, and in accordance with the SCCAS and regional excavation standards set out at **Appendices A** and **B**. Any site-specific sampling requirements will be set out within the individual site WSIs.

g) **Archaeological buildings recording**

5.2.28 Where historic buildings within the site are to be retained, it is proposed that recording to Level 2 as set out in Historic England 2016 Understanding Historic Buildings (Ref. 1.12) will be carried out to ensure that the appearance of the structures in their present setting can be recorded.

5.2.29 Where historic buildings are to be demolished or altered, it is proposed that recording to level 3 or 4 as set out in Historic England 2016 Understanding Historic Buildings will be undertaken. The level of recording will be at a level appropriate to their significance, and determined in consultation with SCCAS, the East Suffolk conservation officer and, or Historic England.

5.3 **Standards for archaeological work**

5.3.1 The standards set out below draw upon, and should be used in conjunction with, the SCCAS fieldwork requirement documents, and regional excavation standards provided in **Annex 1** and **2a-d** of this appendix.

5.3.2 A parish event number will be obtained from the County HER in advance of each phase of the works, and a unique site code will be assigned as agreed with SCCAS.

a) **Rapid Investigation Survey**

5.3.3 Areas will be walked systematically on regular transects, typically at 25m intervals with the aim of identifying and recording any surviving earthwork features, or structural remains. Each feature or observation will be given a unique record number, and will be recorded in plan and by photography. A record will also be made of any artefactual material observed, although modern material would not normally be retained.

b) **Geophysical Survey**

5.3.4 It is anticipated that the survey will be carried out using a Bartington Grad601-2, or equivalent instrument. Readings will be taken every 0.25m along lines 1m apart.

NOT PROTECTIVELY MARKED

- 5.3.5 The survey will be carried out using a grid system accurately tied in with the Ordnance Survey (OS) National Grid. Any variations to the survey area set out within the individual WSIs caused by crop growth, or ground conditions will be agreed with SCCAS.
- 5.3.6 A record of surface conditions, and of possible sources of modern geophysical interference that may have a bearing on subsequent interpretation of field data. Any areas where it is considered unsafe to work will be excluded from the survey.
- 5.3.7 If any problems are encountered during the geophysical survey these will be reported to the client.
- c) **Machine excavation**
- 5.3.8 In all areas identified as requiring intrusive archaeological work in the individual site WSIs, removal of topsoil, overburden, and 19/20th Century and later remains to the first significant archaeological horizon will be undertaken by a back-acting excavator fitted with a wide (1.8m) toothless ditching bucket, under the continuous supervision of the archaeology contractor with the authority to halt and direct machine excavation.
- 5.3.9 Spoil will be temporarily stockpiled on-site at an identified location, at a safe distance from the stripped areas, and other constraints, to the satisfaction of the main contractor. Topsoil, subsoil, and archaeological deposits should be kept separate during excavation, to allow for sequential backfilling of excavation. Topsoil should be examined for archaeological material.
- 5.3.10 Avoidance of the excavated area is essential so that the area is not tracked over until the area is clear of archaeological remains, the supervising site archaeologist will confirm to the contractors when an area has been released from archaeological control, and vehicles can track over the specified area.
- 5.3.11 The first significant archaeological horizon, and all subsequent archaeological deposits will be cleaned by hand. Excavation of any archaeological deposits identified will proceed by hand, to the standards set out below, unless specifically agreed with the SCCAS archaeologist, or to any site-specific requirements set out in the individual site WSIs.
- 5.3.12 Following completion of archaeological investigation to the satisfaction of the SCCAS archaeologist, and the main contractor, each trench, or excavation area, will be backfilled with the spoil and compacted by machine to level fill, unless otherwise instructed by the main contractor.

d) Hand excavation

5.3.13 There is the presumption that excavation of all archaeological deposits will be done by hand, unless it can be shown there will not be a loss of evidence by using a machine.

5.3.14 Archaeological features will be hand cleaned prior to excavation, to provide accurate definitions. For linear features such hand cleaning will be targeted at sample excavation points. Deposits interpreted as natural subsoil should be tested by hand, or machine excavation to determine the validity of this interpretation.

i. Evaluation trenching

5.3.15 In evaluation trenching, there is the presumption of the need to cause minimal disturbance to the site; and that significant archaeological features (e.g. building slots or postholes) should be preserved intact even if fills are sampled.

- For linear features, 1.00m wide slots (min.) should be excavated across their width.
- For discrete features (e.g. pits), 50% of their fills should be sampled.
- Any natural subsoil surface revealed should be hand cleaned, and examined for archaeological deposits and artefacts. Sample excavation of any archaeological features revealed may be necessary in order to gauge their date and character.

ii. Excavation

5.3.16 Features will be excavated according the following sampling strategy:

- Features which are, or could be, interpreted as structural must be fully excavated.
- Post holes and pits must be examined in section. Full excavation may be appropriate for specific problem-solving, complex depositional sequences and finds recovery.
- Fabricated surfaces (e.g. yards and floors) must be fully exposed and cleaned.
- All burial deposits and associated remains will be subject to 100% excavation and recorded in accordance with an agreed methodology.

- Other features must be sufficiently examined to establish, where possible, their date function. In general 50% percent of the representative non-structural linear cut features; 10% percent of the fills of substantial linear features (e.g. ditches) in order to establish the feature's character, date and morphology and to provide information on activities taking place in close proximity to the feature. These samples may be varied with the agreement of SCCAS to reflect specific site conditions observed during excavation.
- Any stratified layers should be subject to hand excavation in 2.5m or 1.0m systematic, and gridded squares on the basis of the complexity and extent of the layers. The details of which will be agreed with SCCAS and set out within site-specific WSIs where required

5.3.17 The sampling excavation strategy will be reviewed continuously throughout the course of fieldwork and, if necessary, amended in order to take account of changing circumstances and understanding. Any changes or amendments will be agreed in advance of implementation with the SCCAS archaeologist and confirmed in writing.

5.3.18 Where insufficient dating material or information has been retrieved from a partially sectioned feature, further sampling may be undertaken, subject to consideration of residuality, or other factors that might limit the integrity of archaeological data, with reference to the research objectives, and in consultation and agreement with the SCCAS archaeologist.

5.3.19 Guidelines for developing site-specific sampling strategies are set out in the individual site WSIs. The sampling strategy will be kept under review during the excavation work, and will take into account the following:

- a robust spatial framework of excavation to provide an understanding of the distribution of past activities across the investigation area, including any 'special' deposits and any patterning in artefact distribution. Such a framework will take into account the inter-relationship of major features;
- the investigation of the intersections of features of archaeological date to obtain a phasing of the site; and
- structural remains and other areas of significant and specific activity (domestic, industrial, religious, hearths, 'special'/ patterned deposits etc.) will be excavated, and recorded to a degree whereby their extent, date form, function and relationship to other features and deposits can be established.

5.3.20 Metal detector searches must take place during excavation, including the scanning of areas before they are stripped, by an experienced metal detector user.

e) Survey

5.3.21 Surveying will be done using a survey-grade GPS (e.g. Leica CS20/GS08 or Leica 1200).

5.3.22 The site grid will be accurately tied into the OS National Grid, and located on the 1:2500 or 1:1250 map of the area. Elevations will be levelled to the Ordnance Datum.

f) Recording

5.3.23 A full and proper record (written, graphic and photographic, as appropriate) will be made for all work in line with the standards set out in the SCCAS and regional guidance provided in **Appendices A** and **B**.

5.3.24 A register of all trenches, features, photographs, survey levels, small finds and human remains will be kept.

5.3.25 Unique context numbers will be issued for all features, layers and deposits. Each will be individually documented on a context sheet and drawn in section and plan.

- Plans of any archaeological features on-site are to be drawn at 1:20, or 1:50 depending on the complexity of the feature being recorded.
- Sections should be drawn at 1:10, or 1:20 depending on the complexity of the feature being recorded.
- All levels should relate to Ordnance Datum.
- A photographic record of the work will consist of digital images (minimum file size of 6MP) taken on a high-resolution digital camera.
- Photographs will include general site shots and photographs of specific features. Photographs will include a scale, north arrow, site code and feature number (where relevant), and will be listed on the photograph register.

g) Environmental sampling

5.3.26 The on-site sampling policy will be inclusive, as the significance of individual features may not be fully understood, until wider patterns of spatial distribution and phasing are understood. As set out in the general

methods above, arrangements for the processing of bulk samples taken for the recovery of environmental materials should be confirmed. The final sampling and discard policy for individual sites will be agreed in consultation with the Sizewell C Project environmental specialist, the SCCAS archaeologist, and the Regional Scientific Advisor, and set out within the site-specific WSI.

- 5.3.27** Archaeological deposits will be sampled systematically in bulk samples. All samples will be collected from the fills of cut features, and from any other securely stratified deposits that have the potential to provide environmental or economic information, such as occupation layers or material accumulating on use surfaces. Particular emphasis will be placed on contexts that may supply material suitable for scientific dating of potential early medieval and prehistoric features. Decisions on sampling must also take account of stratigraphic factors, and consider the opportunity to employ chronological, and spatial controls, in the recovery of samples in order to generate environmental information of sufficient quality to meet the research objectives.
- 5.3.28** Provision will be made for column and other appropriate samples to be taken for geoarchaeological assessment, and analysis as appropriate and in line with technical guidance including Historic England guidance (Ref. 1.13). Due consideration will be given to the collection of samples suitable for microfossil analysis, and other specialised analysis from suitable deposit sequences, that might inform the pattern of changing environmental conditions over time. Waterlogged and cess deposits will be specifically sampled for microfaunal and invertebrate analysis. Bulk samples will also be taken from any waterlogged deposits present for assessment of organic remains. Any organic artefacts that are retrieved during the excavation will be stored in appropriate conditions, and assessed by a qualified archaeological conservator.
- 5.3.29** Industrial residues and waste from craft, and manufacturing processes will also be routinely sampled.
- 5.3.30** If required, a detailed site-specific sampling policy in line with the SCCAS regional, and national guidance will be set out in the individual site-specific WSI in consultation with the Historic England Regional Advisor for Archaeological Science (East of England). This will detail specific categories of material that are of interest for the individual sites, and identify a programme of work to support the research objectives. Revised as appropriate throughout the excavation and post-excavation phases.

h) Artefact recovery and conservation

- 5.3.31 The recovery of material that can adequately date major archaeological phases is a key requirement. It is recognised that the incidence of artefacts may limit the quality of datable assemblages, and measures for scientific dating are also set out below. However, artefacts remain a key source of dating information.
- 5.3.32 All finds will be collected and processed, unless variations are agreed with the SCCAS archaeologist during the course of excavation.
- 5.3.33 Ceramic finds should be processed concurrently with the excavation, to allow immediate assessment and input into decision-making.
- 5.3.34 Bulk finds such as pottery and animal bone will normally be collected by context. Where it is appropriate and following additional instruction, enhanced recovery techniques and sampling strategies for the recovery, and recording of waterlogged wood and timber, will be set out in respect of specific sites in the individual site WSIs as appropriate.
- 5.3.35 Finds will be temporarily stored on-site and removed from site to a secure location as required.
- 5.3.36 All finds and samples will be exposed, lifted, cleaned, conserved, marked, bagged, boxed and stored in line with the standards in:
- Watkinson & Neal (1988) First Aid for Finds (Ref. 1.14);
 - Chartered Institute for archaeologists (2014) Standard and Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials (Ref. 1.15);
 - English Heritage (1995) A Strategy for the Care and Investigation of Finds (Ref. 1.16); and
 - the requirements of the recipient museum (the receiving museum will be identified in the relevant site-specific WSI).
- 5.3.37 A discard policy acceptable to the relevant receiving museum will only be implemented following quantification, assessment, and recommendation from artefactual and environmental specialists. Certain classes of material, such as post-medieval pottery and building material, may be discarded after recording if a representative sample is kept, but no finds will be discarded without the prior approval of the SCCAS archaeologist and the receiving museum.
- 5.3.38 Where finds require conservation, this will be done in accordance with the guidelines of the Institute for Conservation.

i) Scientific dating

- 5.3.39 Achieving coherent intra and inter-site chronologies across all phases of activity is a key objective, as this may help resolve problems in the identification of cultural activity during period when ceramics were not generally available to communities, or where features do not contain readily datable artefacts. A strategy for the selection of samples for scientific dating will be set out for each site in the relevant site-specific WSI, taking into consideration statistical procedures designed to enhance the accuracy of site chronologies.
- 5.3.40 Samples of material suitable for scientific dating techniques including AMS C14 dating, archaeomagnetism (for example, charred seeds or in situ burnt clay from appropriate contexts), or thermoluminescence will be collected where available in accordance with individual site WSIs.
- 5.3.41 Scientific dating will be a significant consideration during the post-excavation assessment and will inform the updated project design provided in **section 5.5.13**.

5.4 Procedures in respect of statutorily designated remains

a) Human remains

- 5.4.1 In the event of archaeological human remains being encountered they will be left in situ, covered and protected and the Coroner, and the Suffolk County archaeologist will be informed.
- 5.4.2 The Archaeological Contractor will arrange receipt of the appropriate documentation and license from the Department of Justice, to enable the legal removal of any human remains encountered in the works. The Archaeological Contractor is to comply with the conditions of any issued License.
- 5.4.3 If removal is agreed, all subsequent work will comply with relevant regulations (including local authority environmental health regulations) and technical guidance.
- 5.4.4 The Archaeological Contractor will be available within the team, or on call an appropriately qualified and experienced osteo-archaeologist, to supervise the excavation and removal of human remains from the site. The Archaeological Contractor will use an appropriately qualified and experienced archaeological conservator to assist where appropriate in the lifting of human remains, and grave goods/cremation vessels.

b) Protected military remains

5.4.5 The Protection of Military Remains Act 1986 applies to any aircraft which have crashed while in military service, and to certain wrecks of vessels which were wrecked while in military service. Protection of Military Remains Act 1986 makes it an offence to disturb, move, or unearth military remains which have been designated.

5.4.6 There are no designated protected areas or controlled sites within the site boundary, and there are no records of military vessels or aircraft having been lost within the site boundary.

5.4.7 Where remains are observed during archaeological investigation or construction work, intrusive work should cease, and the site be secured while consultation with the Ministry of Defence is undertaken.

c) Treasure

5.4.8 Any items which are recovered which could be deemed as treasure will be subject to the provisions of the Treasure Act 1996, and the Treasure (Designation) Order 2002. Such material shall normally be removed from site to a secure location at the end of the working day on which it is found. In addition to the statutory authorities, the relevant Portable Antiquities Officer should be informed.

5.5 Post-excavation work, reporting and dissemination**a) Finds**

5.5.1 All finds processing, conservation work and storage of finds must be carried out in compliance with the Chartered Institute for Archaeologists Guidelines for the collection, documentation, conservation and research of archaeological materials (Ref. 1.15).

5.5.2 The deposition and disposal of artefacts must be agreed with the legal owner and recipient museum prior to the work taking place.

5.5.3 All retained artefacts must be cleaned and packaged in accordance with the requirements of the recipient museum.

b) Site Archive

5.5.4 Before the commencement of fieldwork, contact should be made with the landowners and recipient museum to make the relevant arrangements. Details of land ownership should be provided by the developer. Details of the appropriate museum will be confirmed and agreed with SCCAS in advance of fieldwork.

- 5.5.5 The archaeological contractor will specify the receiving museum, and confirm that arrangements for receipt of archaeological material, and site archives, have been agreed before the commencement of fieldwork.
- 5.5.6 The archive and the finds must be deposited in the receiving museum, within six months of completion of the post-excavation work and report.
- 5.5.7 The SCCAS archaeologist will require confirmation that the archive has been submitted in a satisfactory form to the receiving museum.
- c) **Post-excavation reporting**
- i. **Rapid Identification Survey**
- 5.5.8 The reporting of the Rapid Identification Survey will comprise a plan of the survey areas noting any archaeological features, areas of disturbance, or findspots observed during the survey.
- 5.5.9 This plan will be supported by summary text describing each observation noted on the survey plan, and setting out any additional evidence that has supported interpretation of these observations, before setting out a summary of the anticipated presence of archaeological remains within the survey area, and recommendations for further archaeological works. Site photographs will be used to illustrate each identified feature or observation as appropriate.
- 5.5.10 Appropriate supporting evidence would typically include, but is not limited to Light Detection and Ranging digital terrain models, results of archaeological trenching or geophysical survey in adjacent fields and historic mapping.
- 5.5.11 Any further archaeological works would be carried out under the standards set out within this overarching WSI.
- ii. **Geophysical Survey**
- 5.5.12 The interpretation of the survey data will be undertaken by an experienced archaeological geophysicist. This individual will also be knowledgeable of the prevailing ground conditions within the survey area that could affect the interpretation.
- 5.5.13 The draft report on the results of the geophysical survey, including results (to include full description, assessment of condition, quality and significance of results identified); general and detailed plans showing the location of the surveyed area accurately positioned on an OS map base (to a known scale); colour/grey scale plots; an interpretative plot; and an assessment of potential will be made available to the SCCAS archaeologist within 2 weeks

of the completion of Geophysical surveys. This is to allow for trench plans for archaeological trial trenching to be developed and agreed with SCCAS.

- 5.5.14 Six bound copies, one unbound master-copy, and a digital version of the revised report will be submitted within one week of the receipt of comments on the draft report.
- 5.5.15 A project CD will be submitted containing image files in JPEG or TIFF format, digital text files in Microsoft Word format, and illustrations in an up to date AutoCAD format. A fully collated version of the report will be included in PDF format.
- 5.5.16 A hard copy of the report will be lodged with the SCCAS, upon completion.
- 5.5.17 The contractor will submit a digital version of the report with Online Access to the Index of Archaeological Investigations at <http://www.oasis.ac.uk/>.
- 5.5.18 The archiving of data associated with geophysical survey will follow the advice provided in Geophysical Data in Archaeology: A Guide to Good Practice (Schmidt 2002).
- 5.5.19 The archive will consist of the report, within which documentary and raw and processed digital data records generated during the fieldwork, will be presented. This will include a georeferenced .dxf or MapInfo .tab file copy of the interpretation of the results for the Suffolk Historic Environment Register.
- 5.5.20 This report will be part of the larger project archive.

iii. Trial Trenching

- 5.5.21 Where trial trenching is undertaken, an initial assessment of the results of the works will be undertaken, and an interim report will be made available the SCCAS archaeologist within two weeks of completion of trenching.
- 5.5.22 The purposes of the interim report are to:
- confirm the completion of fieldwork;
 - provide an indicative timetable for detailed post-excavation assessment and reporting; and
 - signpost any project findings to inform research and development management pending the production of the full report.

- 5.5.23 This interim summary reporting will incorporate the following:
- mapping of the results of the works undertaken;
 - key findings set out as bullet points highlighting any key observations and implications for the agreed Research Agenda;
 - an updated project design with indicative timetable compiled and agreed for post-excavation assessment and full reporting; and
 - indicative scope of Post Excavation Assessment.
- 5.5.24 It is intended that the interim report presents only a very brief synthesis of the results of the fieldwork to allow for early dissemination of summary results and project planning. Tables or bullet points should be used to provide a concise but intelligible summary. Detailed plans and maps or analysis of stratigraphic, artefactual or ecofactual material should not be included.
- 5.5.25 Full and detailed reporting of the results of the trial trenching should be produced within six weeks of the completion of fieldwork, except where agreed otherwise by the SCCAS archaeologist (e.g. where further works are carried out immediately and reporting of trial trenching is more logically deferred to the production of the final reporting of archaeological fieldwork).
- d) **Post-excavation assessment**
- i. **Purpose**
- 5.5.26 The intention of carrying out a Post Excavation Assessment is to provide a rapid summary of the material recovered during the excavation, and to allow costed recommendations to be made for the final reporting, which will be carried out following the completion of all of the archaeological fieldwork.
- 5.5.27 The Post Excavation Assessment is intended to be a summary document rather than a detailed record. As such, the level of reporting will provide sufficient detail to allow recommendations to be made and justified.
- 5.5.28 Where works are carried out by multiple archaeological contractors, arrangements for coordination of separate Post Excavation Assessments, or production of a single collated Post Excavation Assessment must be agreed with the SCCAS archaeologist in advance of fieldwork commencing.
- ii. **Form**
- 5.5.29 The Post Excavation Assessment will comprise:

- introduction:
 - scope of the Sizewell C Project;
 - circumstances and dates of fieldwork and previous work; and
 - comments on the organisation of the report.
- original research aims;
- summary of the documented history of the site(s);
- interim statement on the results of fieldwork;
- summary of the site archive and work carried out for assessment:
 - site records: quantity, work done on records during post-excavation assessment;
 - finds: factual summary of material and records, quantity, range, variety, preservation, work done during post-excavation assessment;
 - environmental material: factual summary of human and animal bone, shell and each type of sample (e.g. bulk organic, dendrochronological, monolith), quantity, range, variety, preservation, work done on the material during the Post Excavation Assessment; and
 - documentary records: list of relevant sources discovered, quantity, variety, intensity of study of sources during post-excavation assessment.
- potential of the Data:
 - an appraisal of the extent to which the site archive might enable the data to meet the research aims of the Sizewell C Project, sub-divided according to the research aims of the Sizewell C Project rather than the form of the data;
 - a statement of the potential of the data in developing new research aims, to contribute to other projects and to advance methodologies; and
 - summary statement of the significance of the data.
- additional information will normally include:
 - supporting illustrations at appropriate scales;

- sufficient supporting data, tabulated or in appendices, and/or details of the contents of the Sizewell C Project archive, to permit the interrogation of the stated conclusions; and
- index, references and disclaimers.

e) **Online Access to the Index of Archaeological Investigations**

- 5.5.30 The overall aim of the Online Access to the Index of Archaeological Investigations project is to provide an online index to the mass of archaeological grey literature that has been produced as a result of the advent of large-scale developer funded fieldwork.
- 5.5.31 The archaeological consultant or contractor must therefore complete the online Online Access to the Index of Archaeological Investigations form (available at <http://ads.ahds.ac.uk/project/oasis/>).in respect of the scope of works set out in each site-specific WSI.
- 5.5.32 Once a report has become a public document by submission to or incorporation into the Suffolk HER, Suffolk HER will validate the Online Access to the Index of Archaeological Investigations form thus placing the information into the public domain on the Online Access to the Index of Archaeological Investigations website. The archaeological contractor must indicate that they agree to this procedure within the method statement submitted to SCCAS.

f) **Publication**

- 5.5.33 Formal publication of the results of some or all of the fieldwork is likely to be required. The results of the works will be reviewed and decisions taken on the scope and level of any publication(s) following the submission of the Post Excavation Assessment reports and review. This will consider the most appropriate route for dissemination, and the scope of any dissemination, including consideration of whether thematically or chronologically related sites should be reported together.

6. **Health, Safety, Security and Environment**

- 6.1.1 Health and Safety will take priority over all other requirements. A conditional aspect of all archaeological work is both safe access to the area of work, and a safe working environment. All relevant health and safety legislation, regulations, and codes of practice should be respected and adhered to. Site-specific risk assessments will be carried out in respect of each element of the mitigation fieldwork prior to commencement of the fieldwork, and copies sent to the representatives of the client for approval.

- 6.1.2 The Sizewell C Project will be carried out in accordance with safe working practices and under the defined Health, Safety and Environmental Policy.
- 6.1.3 Copies of the successful contractor's insurance policies will be required in advance by the client or their nominated representative.
- 6.1.4 The appointed contractor/s will take responsibility for securing the excavation areas (e.g. by fencing), provision of welfare, backfilling and reinstatement of the excavation areas and the removal of materials brought onto the site during the excavation.
- 6.1.5 Service plans will be supplied by the appointed principal contractor. Any archaeological intervention must respect all requirements for safe stand-off distances, and working practices in regard of these features.
- 6.1.6 Any specific site security requirements will be set out within the individual site WSIs, and these will be discussed and agreed with the client and main works contractors.

7. Monitoring

- 7.1.1 The SCCAS archaeologist must be informed of the start date and timetable in advance of any work commencing.
- 7.1.2 Reasonable access to the site must be afforded to the SCCAS archaeologist, or their nominee at all times, for the purposes of monitoring the archaeological excavations.
- 7.1.3 Regular communication between the archaeological contractor, the SCCAS archaeologist, client and other interested parties must be maintained to ensure the Sizewell C Project aims and objectives are achieved.

References

- 1.1 Cotswold Archaeology. 2017. Main Development Site, Sizewell C, Suffolk: Archaeological Evaluation.
- 1.2 Cotswold Archaeology. 2016. Wickham Market, Sizewell C, Suffolk: Archaeological Evaluation.
- 1.3 EAA, 2004 (Blagg, Plouviez & Tester, 2004. 'Excavations at a large Romano-British Settlement at Hacheston, Suffolk, 1973-4', *East Anglian Archaeology 106*)
- 1.4 Maria Medlycott (ed.). (2011). Research and Archaeology Revisited: a revised framework for the East of England, East Anglian Archaeology Occasional Papers 24. http://eaareports.org.uk/publication/occ_pap24/. [Accessed March 2019]
- 1.5 Nigel Brown, Jenny Glazebrook (eds). (2000). Research and Archaeology: a Framework for the Eastern Counties 2. Research agenda and strategy. East Anglian Archaeology Occasional Papers 8. http://eaareports.org.uk/publication/occ_pap8/. [Accessed March 2019]
- 1.6 East Anglian Archaeology (2019). Regional Research Framework Review. <http://eaareports.org.uk/algao-east/regional-research-framework-review/> [Accessed March 2019]
- 1.7 Chartered Institute for Archaeologists 2014 Standard and Guidance for Archaeological Excavation;
- 1.8 Chartered Institute for Archaeologists 2014 Guidelines for the Collection, Documentation, Conservation and Research of Archaeological Materials
- 1.9 Chartered Institute for Archaeologists 2014 Code of Conduct
- 1.10 Schmidt et al. (2016). EAC Guidelines for the use of Geophysics in Archaeology http://old.european-archaeological-council.org/files/eac_guidelines_2_final.pdf. [Accessed July 2019].
- 1.11 Chartered Institute for Archaeologists (CIfA). (2014). Standard and guidance for archaeological geophysical survey. https://www.archaeologists.net/sites/default/files/CIfAS%26GGeophysics_2.pdf. [Accessed July 2019].
- 1.12 Historic England. 2016. Understanding Historic Buildings: A Guide to Good Recording Practice.
- 1.13 Historic England (2011) Environmental Archaeology (https://historicengland.org.uk/images-books/publications/environmental-archaeology-2nd/environmental_archaeology/). [Accessed July 2019].

- 1.14 Watkinson & Neal.1988. First Aid for Finds. RESCUE/United Kingdom Institute for Conservation.
- 1.15 Chartered Institute for Archaeologists .2014. Standard and Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials
- 1.16 English Heritage .1995. A Strategy for the Care and Investigation of Finds

ANNEXES

Standards for Field Archaeology in the East of England

by David Gurney

with contributions by
Stewart Bryant, Jenny Glazebrook,
Andy Hutcheson, Peter Murphy,
Ben Robinson and Jonathan Smith

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Cover picture:

The Ordnance Survey benchmark on the Union Workhouse, Gressenhall
Photo: David Gurney

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Acronyms

ALGAOEE	Association of Local Government Archaeological Officers for the East of England	LPA	Local Planning Authority
EIA	Environmental Impact Assessment	MAP2	English Heritage 1991, <i>Management of Archaeological Projects</i> , 2nd edition
HER	Historic Environment Record	PPG15	Planning Policy Guidance Note 15
IFA	Institute of Field Archaeologists	PPG16	Planning Policy Guidance Note 16
LGAO	Local Government Archaeological Officer	RPG	Regional Planning Guidance
		SMR	Sites and Monuments Record

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Preface

Following extensive consultation, this document was formally adopted by the Committee of the Association of Local Government Archaeological Officers for the East of England at Bury St Edmunds on 12 September 2002. It was also agreed that it would be fully reviewed after 2–3 years, and that the Committee would receive regular

reports on its implementation and comments received. These can be sent to the author at Norfolk Landscape Archaeology, Union House, Gressenhall, Dereham, Norfolk NR20 4DR or by email to david.gurney@norfolk.gov.uk.

A copy of this document is also available as a PDF file, on the web at www.eaareports.org.uk.

Foreword

by Stewart Bryant

The Committee of the Association of Local Government Archaeological Officers for the East of England has produced this document. It aims to fulfill the following key objectives:

- to provide a quick reference guide on standards applicable to archaeological fieldwork and subsequent activities, including development-led projects, research projects and amateur (non-vocational) activities. This has been organised thematically for ease of reference in the widest possible range of contexts, and with a bibliography of the main sources. The document is to be kept under review and revised and updated as necessary.
- to provide a statement of the philosophy of the Committee regarding field archaeology, especially the importance of standards and research frameworks.
- to implement Planning Policy Guidance in the region, with particular regard to securing the evaluation of archaeological sites prior to determination of planning applications in line with PPG16.
- to improve the standard of archaeological fieldwork and the quality of research in the East of England by stating the principles that underpin decisions made by archaeological advisors to Local Planning Authorities.

- to provide details of methodological fieldwork requirements in key areas, and a benchmark against which archaeological projects can be monitored and assessed.

However, the document is not intended as a comprehensive guide to standards or as the minimum requirement for standards and as such should not be used by itself as guidance for the preparation of Project Designs or Written Schemes of Investigation. These documents should always be based upon the specific and detailed requirements of Briefs produced for individual projects, supported by and with reference to (where appropriate) these generic regional standards and Institute of Field Archaeologists standards and guidance.

- to move towards a greater clarity and consistency of approach across the region in terms of fieldwork methodology, fieldwork standards and the decision-making process for development-related archaeological projects, at the same time recognising that the variable nature of the landscape, the development context and the archaeological record will necessarily always result in some differences of approach.

Introduction

The Development of Regional Standards for Field Archaeology in the East of England

Across the East of England region, archaeologists working within Local Government are responsible for providing archaeological advice to Local Planning Authorities (LPAs), developers (and their archaeological consultants) and a wide range of other bodies whose actions may have an impact on the historic environment.

The Association of Local Government Archaeological Officers for the East of England (ALGAE) seeks to safeguard the historic environment by providing advice to LPAs on the archaeological implications of development proposals, and by ensuring that archaeological work within the region is conducted to the highest possible standard during fieldwork, analysis and publication of results. Their committee has prepared a Regional Action Plan, one objective of which is to *develop consistent approaches in the region to the preservation and management of the historic environment within the planning framework* (Association of Local Government Officers East of England Regional Committee 2000, 22–23).

The national Association of Local Government Archaeological Officers has also published a *Strategy 2001–2006* (2001), and its aims with reference to Field Archaeology are:

- to support the development of good professional practice in the monitoring of archaeological fieldwork, ensuring that work is carried out to appropriate briefs and specifications;
- to promote the framing of all projects within the context of national and local research agendas;
- to work in partnership with the Institute of Field Archaeologists (IFA) to ensure that professional standards are maintained throughout the archaeological contracting sector.

Within these national and regional contexts, the primary aim of this document is *to promote best practice in archaeological work in the region, and to assist professional archaeologists, developers and their appointed professional archaeological consultants and contractors with the provision of high standards of data collection and report preparation*. Although principally targeted at, and of use with reference to, archaeological fieldwork generated by the planning/development control process, its contents are broadly applicable to all field archaeology projects undertaken by professional or amateur (non-vocational) archaeologists and for this reason it has been arranged thematically.

The standards and practices that are documented here are based upon well-established techniques and procedures developed in the region since the early 1970s, and the first county standards document produced within the region (Norfolk Landscape Archaeology 1998). Expressed as a set of statements provided separately from Project Briefs, these *Regional Standards* now define required policy for work within the East of England region

to which archaeological contractors and consultants (and others) are expected to adhere. They also provide a manual of procedures that should reflect common practice familiar to competent professional and amateur archaeologists.

It is certainly not the intention that the production of *Regional Standards* should stifle debate or discourage innovation, and it is hoped that archaeological contractors and consultants will continue to introduce new and alternative approaches and techniques in order to meet the wider objectives of Project Designs (also known as Method Statements or Written Schemes of Investigations) or Project Specifications.

It is expected that all Project Designs prepared by archaeological contractors or consultants will state that all works will be carried out in full accordance with the Brief provided by the LGAO and, where required by the Brief, these *Regional Standards*. Where alternative approaches or techniques are proposed, these should not be employed without the prior written approval of the relevant LGAO.

Archaeological contractors and consultants should note that these *Regional Standards* stipulate basic *methodological* standards. It is considered axiomatic that all will strive to achieve the highest possible *qualitative* standards and apply the most advanced and appropriate techniques possible within a context of continuous improvement. A primary aim will be to maximise the recovery of archaeological data and thereby contribute to the development of a greater understanding of the historic environment. Monitoring officers will therefore seek and expect clear evidence of commitment to the historic resource of the East of England, with Project Designs being drawn up within a context of added value.

Thus the *Regional Standards* are intended to complement the regional *Research Frameworks*, which are vitally important in setting the broad parameters for individual projects and ensuring their relevance to wider archaeological endeavour.

They also provide an explicit framework within which the quality of archaeological project work may be assessed. Obviously some aspects of the archaeological resource vary considerably across the region, and so local requirements as expressed in Briefs and Specifications will always take precedence. Nevertheless, developers, contractors and consultants working in the region have a right to expect some basic consistency in curatorial approaches across administrative boundaries.

Adherence to defined standards alone, of course, does not guarantee the success of archaeological projects. Archaeological work is concerned with discovery and demands that investigative approaches are examined critically, and modified if necessary, in response to circumstances that unfold in the field. Recognition of exceptional evidence, anomalous evidence, or comparative evidence and the adoption of correct techniques for its treatment, is dependent upon good national, regional, and local contextual knowledge. Agreed standards, however, at least provide a vital part of a common dialogue within

which consensus regarding approaches to particular archaeological tasks may be reached.

Archaeological advisors within local government seek to create a framework of knowledge and co-operation within which successful development-led and other archaeological projects can occur, and it is in this spirit that the *Regional Standards* have been adopted.

Professional Values in Development-Led Archaeological Work

by Ben Robinson

ALGEOEE considers that all development-led investigative archaeological work should make a contribution to archaeological research and to the understanding of the past.

ALGEOEE considers that all investigative archaeological work should be undertaken to achieve maximum value within project resources. The value of a project will be determined by the informational outcome — the comprehensiveness of the record created, contribution to the archaeological knowledge base, and contribution to public promotional/educational output.

ALGEOEE acknowledges the value of a thorough understanding (by archaeological contractors, consultants and curatorial staff) of the local and regional archaeological environment.

ALGEOEE welcomes new approaches to archaeological investigation and the generation of new research questions by all those with an interest in the region's archaeology, where these have been formulated through a thorough consideration of the region's archaeological resources.

ALGEOEE encourages the participation of all those with an interest in the region's archaeology in promotional effort, public events and exhibitions, research seminars, and educational initiatives.

ALGEOEE encourages the dissemination of information regarding the region's archaeology within local, regional and national publications.

ALGEOEE acknowledges the value of programmes for the professional development of staff within curatorial sections, contracting organisations and archaeological consultancies. The presence of such programmes and their demonstrable efficacy in regard to approaches to regional archaeology are an essential part of organisational development.

ALGEOEE welcomes beneficial initiatives and partnership between the region's voluntary and professional archaeological communities.

ALGEOEE expects all members of project teams to display an awareness of the local and regional archaeological context for their work. This awareness will be commensurate with their responsibilities within the project team.

ALGEOEE members recognise their responsibility to ensure that staff taking on development control advisory duties and a monitoring role for contractual work, are informed of the wider national, regional, and local archaeological context of their advice. It is their responsibility to ensure that advisory staff maintain awareness of national, regional and local research priorities.

ALGEOEE members have a responsibility to ensure the validity and integrity of development control advice and powers exercised within a monitoring role.

ALGEOEE members will encourage their staff with advisory and monitoring roles to participate fully in local and regional research effort or technical development.

ALGEOEE members will encourage the flow of archaeological information between LGAOs, Sites and Monuments Records, Historic Environment Records, Urban Archaeological Databases and archaeological consultants and contractors. They should ensure that archaeological knowledge and information is disseminated equitably to all organisations and individuals with a legitimate interest in the region's past.

Planning Guidance and the Historic Environment

Archaeology and Planning (PPG16)

In November 1990, the Department of the Environment published *Planning Policy Guidance 16 Archaeology and Planning* (PPG16), which sets out the Secretary of State's policy on archaeological remains on land and how they should be preserved or recorded. It describes how archaeological remains are a finite and non-renewable resource, highly vulnerable to damage and destruction, and gives advice on the handling of archaeological remains and discoveries under the development plan and control system, including the weight to be given to them in planning decisions and the use of planning conditions. Where nationally important remains and their settings are affected by proposed development, there should be a presumption in favour of their physical preservation.

PPG16 also firmly establishes that archaeology is a material consideration in the assessment by a Local Planning Authority (LPA) of a planning application, and that 'it is reasonable for the Planning Authority to request the prospective developer to arrange for an archaeological field evaluation to be carried out before any decision on the planning application is taken' (PPG 16, para 21). On this basis, the impact of the proposed development on the historic environment can be assessed and an informed and reasonable planning decision can then be taken.

On sites where the physical preservation *in situ* of archaeological remains is not justified, LPAs will satisfy themselves before granting planning permission that the developer has made appropriate and satisfactory provision for the excavation and recording of the remains. This is normally secured by the imposition of an appropriate planning condition (a negative or 'Grampian' condition) in line with *The Use of Conditions in Planning Permissions* (Department of the Environment/Welsh Office Circular 11/95, Appendix A, paras 53–55), or an agreement under Section 106 of the *Town and County Planning Act 1990*. In these cases, a mitigation strategy will be devised to safeguard the archaeological remains by means of engineering solutions, by redesign to preserve any remains *in situ*, or by the excavation of any remains and their replacement 'by record'.

Environmental Impact Assessment (EIA) Directives and Regulations are also highly relevant to management of the historic environment, as these require EIAs to be carried out, before development consent is granted, for certain types of projects which are judged likely to have significant environmental effects (see Directives 85/337/EEC and 97/11/EC, *Note on Environmental Impact Assessment Directive for Local Planning Authorities (1999 EIA Regulations)* (Office of the Deputy Prime Minister 2002) and *Environmental Impact Assessment* (DETR Circular 02/99)).

Terrestrial and marine archaeological remains provide a seamless physical and intellectual continuum. The management of archaeological remains under water (including inland waters, estuaries and ports, intertidal areas and the territorial sea) will generally require

specialist advice and non-standard procedures. Government advice on coastal planning for local authorities is given in *Planning Policy Guidance Note 20, Coastal Planning* (Department of the Environment/Welsh Office 1992), and English Heritage and the Royal Commission on the Historical Monuments of England have published a useful statement (1996).

There are also various codes of practice for particular forms of development, such as mineral sites (Confederation of British Industry 1991) or seabed developments (Joint Nautical Archaeology Policy Committee 1995).

Works affecting Scheduled Ancient Monuments or their settings will require Scheduled Monument Consent, and in these cases English Heritage must be contacted.

The Built Environment (PPG15)

In September 1994, The Department of the Environment and the Department of National Heritage also produced *Planning Policy Guidance Note 15, Planning and the Historic Environment* (PPG15). This provides a full statement of Government policies for the identification and protection of historic buildings, conservation area and other elements of the historic environment. It complements the guidance on archaeology given in PPG16 and makes provision for the appropriate assessment of the archaeological implications and for programmes of recording of historic buildings.

Some standing structures are Scheduled Ancient Monuments (SAMs) and/or Listed Buildings. The overwhelming majority of the built environment, however, is not covered by such designations. Despite this, many do retain an archaeological significance. It is important that this is identified at the earliest opportunity and that appropriate decisions are taken by the LPA on the advice of the LGAO and/or other specialist advisers when a standing structure is faced with a development proposal, demolition or, in the case of listed structures, repairs.

Standing structures are as much a part of the historic environment as 'traditional' below-ground archaeology. Hence the planning guidance and philosophies applied to subsurface deposits and features should be applied in the same manner. As a result, a similar process of appraisal, evaluation, and mitigation (where necessary) should be applied to 'above-ground archaeology' when faced with a development or demolition proposal. This will include buildings and other structures (see, for example, English Heritage 1998 on twentieth-century defences).

PPG15 is complementary to PPG16 in that it concurs with the presumption of preservation *in situ* and the philosophy of replacement 'by record' when preservation *in situ* is not feasible or deemed not to be reasonable. The PPG notes that early consultation with the LPA (and the LGAO) is desirable and that LPAs should expect developers to assess the likely impact of their proposals on the special interest (archaeological significance) of the site or structure in question. Developers should also provide

such information or drawings as may be required to understand the significance of a site or structure *before* an application is determined.

When an LGAO's appraisal of an application concludes that a development or demolition proposal has not yet been proved to have no impact on an archaeologically significant standing structure, further information should be requested in advance of determination to inform the decision-making process. This should take the form of a Standing Structure Impact Assessment (as part of an Historic Environment Impact Assessment, when appropriate). Once the relevant information has been presented, an informed decision can be made on the application, with the LGAO (and/or others) advising the LPA on this accordingly. Further mitigation if necessary can be secured through a Section 106 agreement or a negative condition on any planning permission in the usual manner.

Regional and Local Planning Policy

As well as the guidance on archaeology and the historic environment in the two PPGs, archaeological and built environment interests are also safeguarded through the development of relevant policies within Regional Planning Policy Guidance documents and, by LPAs, through Structure Plans and Local Plans.

Regional Planning Policy for the East of England is currently divided between two documents:

- *Regional Planning Guidance Note 6: Regional Planning Guidance for East Anglia to 2016 (RPG6)* (November 2000) covering Cambridgeshire, Peterborough, Norfolk and Suffolk
- *Regional Planning Guidance Note 9: Regional Planning Guidance for the South East (RPG9)* (March 2001) including Bedfordshire, Essex, Hertfordshire, Luton, Southend-on-Sea and Thurrock.

From April 2001, the boundaries for RPG have been brought into line with those for the Government Office for the East of England. In due course *Regional Planning Guidance (RPG14) for the East of England to 2021* will replace RPGs 6 and 9. This is due to be published mid-2004.

In the meantime, the two current RPGs for the region set out strategic aims and objectives for land use and

development within a sustainable framework, and provide the regional context for other strategies and programmes, complementing national planning policy guidance.

Objectives within the RPGs include the maintenance and enhancement of the quality of the built environment, including historic settlements, buildings, parks and gardens, open space, conservation areas and archaeological sites. Policies within the RPGs refer to the general management principles for conserving and enhancing the natural, built and historic environment, and the conservation of the region's built and historic environment respectively.

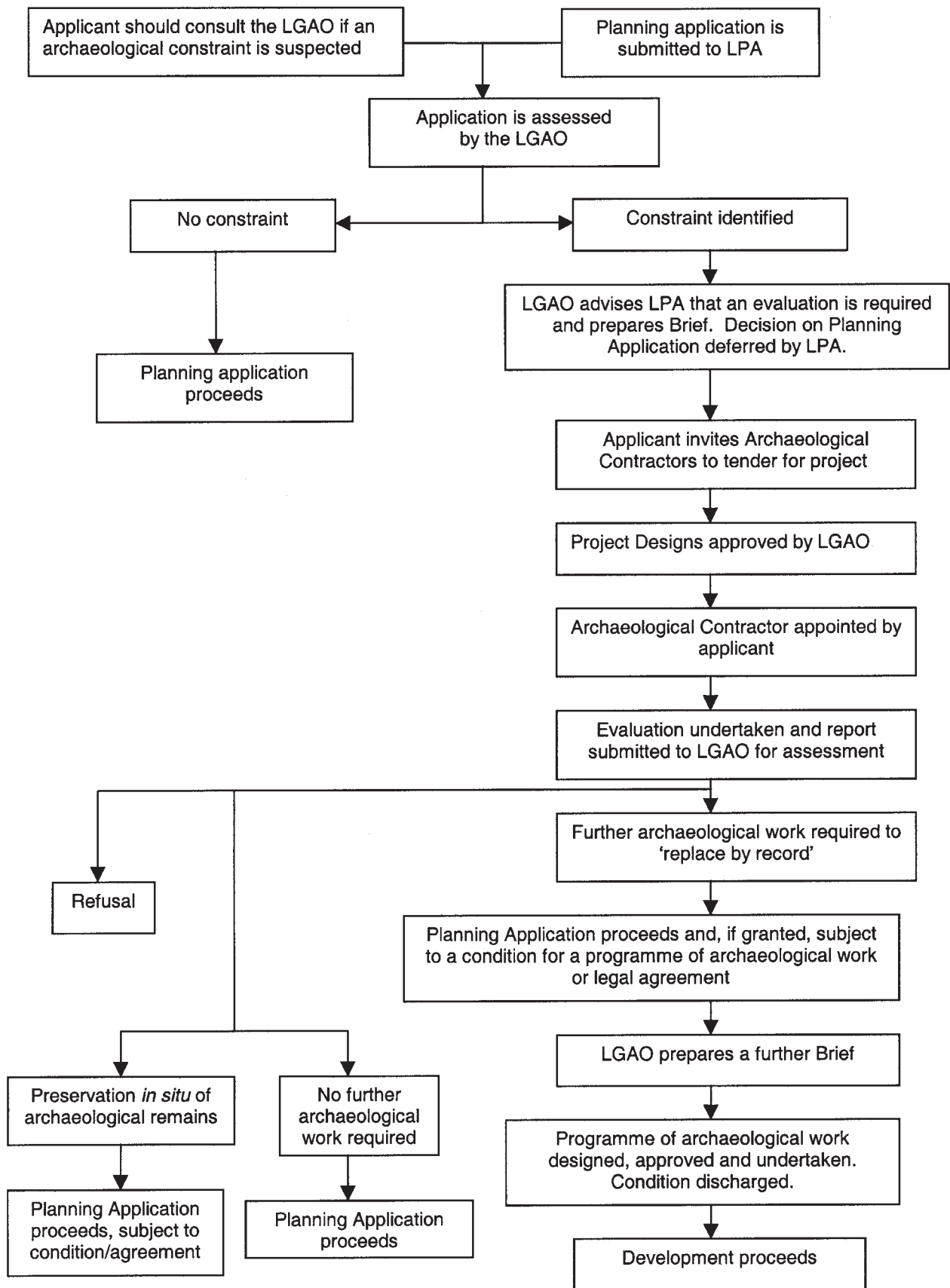
Further information and advice about archaeology and development within the East of England may be obtained from the ALGAOEE contacts listed in Appendix 1.

Future Developments: Planning Policy Statement 15

During 2003 it is anticipated that the Office of the Deputy Prime Minister will be issuing a consultation document on a review of PPGs 15 and 16, leading to the replacement of the PPGs by *Planning Policy Statement 15: Planning for the Historic Environment*.

Planning Policy Statements set out the Government's core policies and principles on different aspects of planning. They should be taken into account by regional planning bodies, strategic and local planning authorities in preparing regional planning guidance, structure plans, unitary plans and local development plans (and subsequently regional spatial strategies and local development frameworks) and will be material to decisions on individual planning applications. Where these policies are not reflected adequately in development plans, or taken into account in relevant development control decisions, the Secretary of State may use his powers of direction to seek changes to the plan and may intervene in planning applications.

PPS15 will in due course replace PPG15 *Planning and the Historic Environment* published in 1994 and PPG16 *Archaeology and Planning* published in 1990. It will be for use by local planning authorities, other public bodies, property owners, developers, amenity bodies and all members of the public with an interest in the conservation of the historic environment.



Flow chart illustrating a typical development-led scenario where a planning application is deferred for an archaeological evaluation (right column)

Planning Procedures

The principles of archaeological appraisal, pre-determination evaluation, and mitigation are well integrated into the local planning/development control process, and have been accepted by a wide variety of developers (such as the amenity companies, ecclesiastical authorities, transport and environmental agencies) who work outside the planning system. Developers are increasingly aware of their responsibilities towards the historic environment, and are happy to accommodate best archaeological practice in preserving or recording archaeological remains.

At each stage of the advice process, judgements are made about the value of the archaeological remains in question. The primary intention of this is to secure the preservation of archaeological remains and, where this is not possible, to achieve the creation of a meaningful record that will contribute to knowledge about the past.

Failure to meet the terms and conditions of planning obligations and agreements is a matter of formal enforcement within the Local Planning process. Outside this there are mechanisms for complaint and audit that seek to address shortcomings. These measures, however, cannot usually undo the effects of poor archaeological practice. Disputes occur at the cost of good working relationships between all interested parties, and seldom create a framework for efficient and productive archaeological work.

The LGAO's Appraisal of Planning Applications or Consultations

Archaeological development control advice is based upon a thorough knowledge of the historic environment within the various administrative areas (either Counties, Districts, or Unitary Authorities). The region's Sites and Monuments Records (SMRs), Historic Environment Records (HERs), Urban Archaeological Databases and the National Monuments Record are the principal indices and the primary tools for the initial appraisal of potential development impacts.

Developers and LPAs consult the LGAO on the archaeological implications of development proposals. Developers, their agents and consultants are encouraged to consult the LGAO as soon as possible so that any archaeological interest is identified at an early stage, rather than when a site has been acquired and a planning application submitted.

Consultation with the LGAO prior to the submission of a planning application is the most effective way of protecting the historic environment and managing risks.

The LGAO acts as a specialist adviser to the LPA, but the LPA is responsible for the imposition of conditions, for discharging conditions and, where necessary, for enforcement.

The LGAO's Recommendations to the LPA

The Appraisal by the LGAO will provide information on the archaeological implications of the development and a recommendation to the LPA. This will usually result in one of the following planning decisions:

- refusal of the application
- deferral pending an archaeological evaluation or the assessment of a building
- the imposition of a condition to secure the preservation of archaeological remains *in situ*
- the imposition of a condition to secure the implementation of a programme of archaeological work or building recording
- no archaeological recommendation

If a development site is known to or might possibly include archaeological remains, an Evaluation will be required before the LPA determines the application. This might involve an Archaeological Desk-Based Assessment, field survey, geophysical survey, trial trenching or any combination of these. If important remains are then found to be present and these cannot be preserved *in situ*, the application might be refused or granted subject to a condition for the excavation and recording of the remains.

On other sites of archaeological interest or potential, planning permissions may be granted subject to conditions for programmes of archaeological work. Development control advice provided by archaeologists often culminates in formal planning agreements or conditions, the fulfilment of which requires developing agents to employ archaeological consultants and contractors.

Any programme of work will naturally be informed by the results of any pre-determination evaluation, but if this has not been required the initial works will also be of an investigative nature and may therefore include desk-based work, surveys and/or trial trenching.

Following on from pre-determination evaluation, a further phase (or phases) of archaeological work may be required to complete a programme of archaeological work (and thus discharge the planning condition). This further work might involve, for example, the excavation and recording of defined areas, building recording, or archaeological monitoring and recording (a watching brief).

The fieldwork phase of any project is usually followed by what is generally referred to as Post-Excavation, involving assessment, analysis, report/publication and the preparation and deposition of the project archive. Although these activities take place off-site (and thus the development may have been initiated and possibly even completed while post-excavation work is in progress), they are an integral part of the Programme of Archaeological Work. Any archaeological condition on a planning permission will not be fully discharged until the *full* programme has been completed to the satisfaction of the LGAO and the LPA.

Briefs and Written Schemes of Investigation/ Specifications

When a development proposal raises archaeological issues that require investigation, the LGAO provides a Brief or Specification, an outline of what needs to be done or a more detailed schedule of works respectively. The LGAO should provide this within a reasonable period of time (this will vary according to the complexity of the case).

The LGAO will also be able to advise developers about the appointment of an appropriate Archaeological Consultant or Contractor (for ALGAO best practice in the compilation of lists of contractors, see Campling 1999).

An Archaeological Consultant or Contractor can prepare a Project Design in response to the Brief or Specification. It is advisable for this to be sent to the LGAO for approval before costed proposals are submitted to the client, considering the possible implications of its subsequent rejection by the LGAO. The LGAO should respond in writing to any documents submitted within a reasonable period of time, with comments or approval.

It is expected that all projects will adhere to the project management procedures of *Management of Archaeological Projects* (English Heritage 1991) and that this will be reflected in the structure and content of the Project Design.

The LGAO does not see project costings, nor does he/she give advice on the costs of archaeological projects. This is between a developer and their archaeological contractor(s). A developer may wish to obtain a number of quotations or to employ the services of an archaeological consultant to oversee this process.

The Tendering Process

If a developer (or an archaeological consultant acting on his/her behalf) intends to seek competitive tenders from a number of archaeological contractors then it is best practice for the following procedures to apply:

- the developer should inform all the contractors that they are in a competitive tendering situation and the deadline(s) for submission of Project Designs and costs should be specified;

- contractors should forward their Project Designs to the LGAO for approval as required;
- a developer should only appoint a contractor from those whose Project Designs have been approved by the LGAO;
- a developer should seek to appoint a contractor who will provide a high-quality service, not just the lowest price.

It is very important to note that the resources required for the post-excavation phase of any project cannot be predicted with certainty in advance, although indicative costs for assessment, analysis, report, publication and the deposition of the archive for an small evaluation project or watching brief may reasonably be estimated at the same time as the costs of fieldwork.

For excavation projects, archaeological contractors and consultants should advise their potential clients that the costs of post-excavation work can only be determined after the excavation has been completed and its results assessed.

The LGAO may be able to provide information (usually a list) about archaeological contractors and consultants working in the region.

The Institute of Field Archaeologists (IFA) publishes a directory of its members and Registered Archaeological Organisations (RAOs). Archaeological contractors and consultants may employ staff who are Members (MIFA), Associates (AIFA) or Practitioners (PIFA) of the IFA and who, as individuals, carry out archaeological work in accordance with the Institute's *Code of Conduct*. Work by RAOs is only carried out by, or under the responsibility of, a suitably experienced corporate member (MIFA) with appropriate Areas of Competence. The RAO scheme does not itself define detailed standards for best practice, but it seeks to provide a general control against which adherence to professional standards can be judged.

The Standing Conference of Archaeological Unit Managers has published guidance on competitive tendering in archaeology (1996).

The Institute of Field Archaeologists has published a code of practice for the regulation of contractual arrangements in field archaeology (1997b) and draft principles of conduct for archaeologists involved in commercial archaeological work (1998).

Regional Standards

The *Regional Standards* have been ordered thematically, primarily because many of the topics addressed are applicable to more than one form of archaeological fieldwork, including development-led projects, research projects and amateur (non-vocational) activities. Where appropriate, project documents (development-led or not) may usefully refer to the relevant sections of the *Standards*. For example, an archaeological evaluation in a rural context prior to the determination of a planning application might find some or all of the following sections especially relevant:

- General Requirements (1.1 to 1.16)
- Desk-Based Research (2.1 to 2.5)
- Fieldwalking (3.1 to 3.7)
- Metal-detecting (3.8 to 3.15)
- Geophysical surveys (3.20 to 3.21)
- Intrusive Methodologies (4.1 to 4.13)
- Evaluation (4.14 to 4.18)
- Finds and conservation (7.1 to 7.5)
- Archaeological Science (8)
- Reports (9.1 to 9.18, 9.25 to 9.32)
- Publication (10)
- Archives (11)
- Project Monitoring (12)

and reference to these sections of the *Standards* may be included, where appropriate, in the project Brief or Project Design.

1. General Requirements

1.1 It is advisable for Project Designs/Method Statements/Written Schemes prepared by archaeological contractors/consultants to be submitted to the LGAO (as adviser to the LPA) and approved in writing by the LGAO *before* proposals or estimates of costs or quotations are provided to the potential client. This is best practice in line with the Institute of Field Archaeologists' guidance (1997b), although it is recognised that practice across the region varies. The requirements of the LGAO's Brief regarding submission of documents must be adhered to.

1.2 Project Designs will be rejected if it is determined that they:

- are insufficiently documented
- do not meet the requirements specified in the Brief or Specification
- fail to demonstrate the Archaeological Contractor's competence and ability to undertake the project in accordance with this *Regional Standards* document.

In the event of a Project Design being rejected by the LGAO the archaeological contractor or consultant will be informed of the reason(s).

1.3 The LGAO may refer to appropriate research objectives in the Brief or Specification, or the archaeological contractor or consultant will be expected to consider what these might be. Either way, the Project Design must provide a clear statement of the project's aims and objectives within the context of national and regional research frameworks, especially Glazebrook 1997 and Brown and Glazebrook 2000.

1.4 All projects must be undertaken in accordance with relevant professional standards. IFA Membership and adherence to IFA's Codes of Conduct (IFA 1997a, 1997b) and formally adopted by-laws, guidelines and other relevant codes, standards and guidance documents are regarded as baseline standards and yardsticks of competence and good operating practice. Archaeologists working on a project should not attempt tasks outside their Areas of Competence.

1.5 Archaeological contractors/consultants are advised, as a matter of course during the preparation of Project Designs, to inspect the site in question and undertake sufficient background research to familiarise themselves with the archaeology of the site and its environs.

1.6 Where required by the LGAO in the Brief or Specification, archaeological projects will be managed following the guidance in English Heritage's *Management of Archaeological Projects* (1991) (often referred to as MAP2 and *cf* English Heritage n.d.).

1.7 Project Designs must provide details of:

- the qualifications and relevant experience of the Project Manager, project team, key personnel, subcontractors and specialists
- a timetable of work
- the arrangements to provide the LGAO with the required advance notice of the start of work and opportunities for monitoring. No fieldwork should be carried out with the required prior notification of the LGAO.

1.8 The Project Manager and any other supervisory staff will ensure that all members of the archaeological team are appropriately informed as to the projects' methodologies and objectives.

1.9 Professional archaeologists in the employ of the archaeological contractor must undertake all work being undertaken to meet the requirements of the Brief or Specification. Any *additional* work being undertaken by students or volunteer staff must be specified.

1.10 All archaeological work will pay due regard to Health and Safety considerations. Guidance on Health and Safety may be found in Standing Conference of Archaeological Unit Managers 1997. Contractors must carry out Risk

Assessments for all activities, including arrangements for Project Monitoring by the LGAO.

1.11 It is the responsibility of the archaeological contractor/consultant to ensure that adequate resources have been made available by the client to complete the programme of archaeological work set out in the Project Design and to fulfill the Brief or Specification.

1.12 Any subsequent variations by an archaeological contractor/consultant from an approved Project Design must be agreed with the LGAO prior to implementation.

1.13 Briefs or Specifications issued by an LGAO are usually valid for a specified period from the date of issue. After that time, they may need to be revised to take account of new discoveries, changes in policy or the introduction of new working practices or techniques.

1.14 Project Designs where required will include a provisional programme for the Assessment and Analysis phases of the project (where appropriate), following MAP2. The Analysis and Publication Programme will be reviewed at the Assessment stage.

1.15 For any project, all numbering and coding must be compatible with the relevant Sites and Monuments Record or Historic Environment Record. The relevant SMR/HER Officer upon request usually issues site numbers and, where appropriate, parish codes and starting context numbers. It is essential that archaeological contractors/consultants should obtain advice *before* numbers and codes are allocated on site.

1.16 All project records must be clearly marked with the relevant County Number, civil parish name or code, site name and date (following local requirements).

2. Desk-Based Research

Desk-based research is undertaken to determine, as far as is reasonably possible from existing records, the nature of the archaeological resource within a specified area.

2.1 Archaeological Desk-Based Assessments (ADBA) must be prepared following the *Standard and Guidance for Archaeological Desk-Based Assessments* (Institute of Field Archaeologists 1999a). It is advisable to consult the LGAO to define requirements and, if necessary, submit a Project Design.

2.2 An ADBA will also make full and effective use of existing information to establish the archaeological significance and potential of the defined area, drawing upon some or all of the following sources:

- a report of a site visit (compulsory)
- the Sites and Monuments Record or Historic Environment Record (compulsory)
- available historic maps (compulsory)
- geological maps
- Ordnance Survey maps of the site and its environs
- tithe apportionment, enclosure and parish maps
- estate maps
- documentary and cartographic collections held by the relevant record office



desk-based research

- Local Studies libraries
- historical documents held in other record offices, local museums, libraries or other archives
- enrolled deeds
- archaeological and historical books and journals
- unpublished research reports and archives held by relevant museums, local societies and archaeological contractors and consultants
- all sources of aerial photography, including the National Monuments Record and the Cambridge University Collection of Aerial Photographs (see below)
- borehole and trial pit data
- geophysical and/or geotechnical data.

2.3 Where an ADBA is required, staff with experience in the preparation of such reports will be used. This must identify and plot:

- all areas of known and potential archaeological significance within the defined area;
- all areas where activities may have destroyed or truncated archaeological remains;
- any areas of known or potential ground contamination;
- the scale and nature of the development proposal if known;
- relevant constraints (*e.g.* Scheduled Ancient Monuments, Conservation Areas and Listed Buildings). Where non-archaeological constraints are identified (*e.g.* Sites of Special Scientific Interest, sites of wildlife interest, protected species, Tree Preservation Orders, Countryside Stewardship Schemes, Environmentally Sensitive Areas), it is helpful if these are included;
- geology, soils, drainage, anticipated preservation conditions and variables affecting preservation of biological remains and organic artefacts;
- any previous investigations in Archaeological Science at the site or immediately adjacent to it (*cf* 8. below).

2.4 Where an accurate plot of cropmarks is required, this will usually be prepared at a scale of 1:2500, or 1:10,000 for larger relatively uncomplicated areas. In some parts of

the region, English Heritage's *National Mapping Programme* (NMP) has been completed and in other areas it is in progress. Where NMP data is available, this must be consulted.

2.5 All sources consulted must be listed.

3. Non-Intrusive Surveys

Field surveys of various kinds provide non-intrusive, non-destructive and cost-effective ways of collecting archaeological data. Fieldwalking and metal-detecting can recover information from artefacts on the surface of or within the ploughsoil or topsoil, whilst geophysical surveys can locate buried archaeological structures and features.

The first two sub-sections below (3.1 to 3.15) refer to extensive surveys undertaken in order to acquire a representative sample of artefact type and size classes present, to investigate locations and areas of occupation, to assess the effects of tillage on artefact distributions and to define areas for possible further archaeological investigation.

Where, for other reasons, intensive transects or gridded surface collection is required, this will be dealt with in the Project Brief or Specification.

On large or complex sites, a phased programme of evaluation or excavation may be adopted. Where field survey or geophysical survey needs to be followed by trial trenching or excavation, the trenching or excavation strategy will be determined once the survey results have been assessed.

Fieldwalking

3.1 Fieldwalking may only be carried out in suitable weather and light conditions, after appropriate cultivation, weathering and washing of the field surface. The surface conditions at the time of survey must be fully documented in the report, along with other variables (*e.g.* weather, light, obstructions, topography, collector *etc.*), and the impact of these variables on the recovery of data should be assessed.

3.2 Staff who fieldwalk must have experience of artefact recognition.

3.3 The survey grid will be established by measured survey technique. In all cases work must be related to fixed points, plotted and fully documented so that, if necessary, the precise locations of those surveys can be accurately re-established. It may be a requirement for fieldwork transects to be tied in to and aligned on the national grid. In other cases, grids may be aligned on appropriate landscape features.

3.4 Transects for fieldwalking should be at 20 metre intervals, unless otherwise specified. Search/collection units of specified length will be employed to locate concentrations of artefacts.

3.5 The fieldwalkers will generally observe a 2 metre wide strip along each transect, thereby examining a minimum 10% sample of the field surface.

3.6 Finds from each collection unit must be individually bagged, numbered, labelled and marked by context, and recorded on appropriate pro forma Fieldwalking Recording Sheets.

3.7 Where large amounts of *e.g.* post-medieval brick or tile fragments or burnt flints are not collected, the presence of this material must be recorded.

Metal-detecting

Systematic metal-detecting recovers a range of archaeological objects that is complementary to those classes of artefacts usually found by fieldwalking, *i.e.* flints, pottery and building materials. A metal-detector survey may retrieve metal artefacts from the Bronze Age onwards and coins from the Iron Age onwards. Some sites such as dispersed hoards of metalwork or coins and Anglo-Saxon inhumation cemeteries are more likely to be located by metal-detecting than by any other technique.

3.8 The recovery of archaeological objects located by metal-detector is an activity which, for the purposes of field survey, is to be restricted to the ploughsoil. In the event that an object or group of objects is located below ploughsoil depth, these must initially be left *in situ* while arrangements are made for their recovery under controlled excavation conditions.

3.9 Metal-detecting must be undertaken in appropriate conditions. Low stubble is often ideal.

3.10 Experienced and competent operators in the employ of the archaeological contractor, using reliable and well-maintained equipment, may only carry out metal-detecting as a separate activity from fieldwalking.

3.11 The strategy for metal-detecting (transects, collection units *etc.*) is broadly the same as that used for fieldwalking. The transects may be parallel to the fieldwalking transects if units are being searched by fieldwalkers and metal-detectorists simultaneously.

3.12 It is generally acceptable to discriminate against iron objects.

3.13 It is generally acceptable to discard items of no archaeological significance. However, when the date and function of an object is unknown or uncertain it must be retained for examination by finds staff and/or relevant specialists.

3.14 A pro forma recording sheet will include details of conditions, the equipment used, discriminator level, operator *etc.*, and a general comment about any discarded material.

3.15 All Treasure and finds of potential Treasure must be dealt with in accordance with the *Treasure Act* 1996 and its Code of Practice.

Earthwork surveys

For defined levels of recording for archaeological surveys, see Royal Commission on the Historical Monuments of England 1999.

3.16 Staff with appropriate survey and interpretative experience must be used in order to ensure uniformity of results.

3.17 Survey may be undertaken using instrumental and/or graphic methods, depending on the topography and the experience of staff. Whichever is employed, the survey methodology and the format of the interpretative drawings must be agreed with the LGAO before commencement.

3.18 The preferred method will be specified in the Brief, but it may include:

- digital data, where required, in a format to be agreed with the LGAO
- drawings on a film base at a scale of 1:1000, or 1:500 if greater detail is required
- at least two National Grid intersections
- earthwork features depicted by hachures
- sufficient detail of the adjacent topography so that the survey can be easily related to present-day landscape features
- profiles across any earthworks
- an analytical report presented as an integral part of the survey, with description and interpretation referenced by letters or numbers to the plan.

Aerial photographic surveys

Aerial photographic survey can be an important component of archaeological survey and may provide a level of detail that cannot be achieved by other means. Where ground conditions are favourable, aerial survey can record evidence of geological disturbances, the periglacial landscape, soil erosion and accumulation, and cut or embanked features.

3.19 All survey must be undertaken in accordance with the Institute of Field Archaeologists' Technical Paper 12, *Uses of Aerial Photography in Archaeological Evaluations* (Palmer and Cox 1993) and the Council for British Archaeology's *Aerial Archaeology Guidance Note* (1995).

Geophysical surveys

Non-intrusive geophysical surveys may provide a great deal of information about the extent and nature of below-ground structures and subsoil features. They are often therefore ideal (and cost-effective) techniques for site evaluation. The three main techniques are magnetometry (fluxgate gradiometer), magnetic susceptibility and resistivity. Careful consideration must be given to obtaining specialist advice, the appointment of an appropriate contractor, and the selection of the most suitable and effective technique taking into account the individual circumstances of each site. The results from test-pits or boreholes, if available, may assist with this. See also 8.3-8.6 below.

3.20 All survey must be undertaken in accordance with *The Use of Geophysical Techniques in Archaeological Evaluation* (Gaffney, Gater and Ovenden 2002) and *Geophysical survey in Archaeological Field Evaluation* (David 1995).

3.21 For best practice in the creation and use of digital geophysical data, see Schmidt 2001.

4. Intrusive Methodologies

General requirements

4.1 Project Designs must include details of:

- the proposed locations and extent of trial trenches or excavation areas (with scale plans)
- the excavation and recording strategy
- the arrangements for palaeoenvironmental assessment and analysis (*cf* 8.16-8.19 below)
- the arrangements to provide the LGAO with the required advance notice of the start of work and opportunities for monitoring
- the levels of intervention proposed in the excavation by hand of various types of contexts that may be encountered. In the case of Evaluations, where the objective is to define remains rather than totally remove them, investigation should not be at the expense of any structures, deposits, features or finds which might reasonably be considered to merit preservation *in situ*. It is important, however, that sufficient work is done to allow the resolution of the principal aims and objectives of the project
- provision for the identification of artefacts
- site security with particular reference to finds and records
- conservation facilities and expertise, both for on-site 'first aid' for finds and as part of the post-excavation process
- specialists who might be required to advise or report on archaeological science or other aspects of the investigation
- report strategy
- archive strategy.

4.2 A mechanical excavator working under close and constant archaeological supervision may usually remove all undifferentiated topsoil or overburden of recent origin in spits down to the first significant archaeological horizon. A mechanical excavator with a wide ditching bucket with teeth removed will usually be used for this. In some instances, topsoil layers may themselves require excavation, in which case this will be specified in the Brief. Any machine excavation of archaeological deposits (*e.g.* bulk deposits of little archaeological or environmental potential) may only be undertaken with the prior agreement of the LGAO.

4.3 Provision must be made for the cleaning by hand of the faces of trenches and, where appropriate, the machined surface.

4.4 Unless specified otherwise in the Brief, the areas indicated on the scale plans accompanying a Project Design will be excavated to natural, thereby recovering a complete sequence of ground plans of any archaeological deposits or features within those areas. However, investigation should not be at the expense of any structures, deposits, features or finds which might reasonably be considered to merit preservation *in situ* (*cf* 4.1).

4.5 Buried soils and/or specific contexts will be sampled and sieved or bulk-sieved in order to maximise the retrieval of artefacts and environmental evidence from significant deposits (*cf* 8.12 below).

4.6 Provision will be made, where appropriate, for scientific dating and analysis, including C14, dendrochronological and archaeomagnetic dating (*cf* 8.7-8.10 below).

4.7 Where deposits are encountered with the potential for providing scientific dating evidence, palaeoenvironmental evidence or other information related to archaeological science (see section 8 below), the advice of the LGAO and English Heritage's Regional Advisor for Archaeological Science must be obtained. An appropriate excavation and sampling strategy will be agreed and included in the Project Design.

4.8 Trenches or excavation areas must not be backfilled without the prior approval of the LGAO unless this is necessary for safety reasons.

4.9 Where obstructions are encountered unexpectedly, minor variations to trench/area layout may usually be made without consulting the LGAO. However, any substantive changes to the agreed strategy must be agreed with the LGAO before implementation.

4.10 Any human remains that are encountered unexpectedly must initially be left *in situ*, covered and protected (*cf* 8.20-8.25 below). If removal is necessary, this must comply with the relevant Home Office regulations, Section 25 of the Burial Act 1857, the Disused Burial Grounds (Amendment) Act 1981 (where appropriate) and the relevant environmental health regulations.

4.11 Archaeological contractors will employ standardised and documented recording methods, generally utilising pro forma recording sheets. Copies of these must be sent to the LGAO for approval.

4.12 All archaeological contexts and artefacts exposed or examined must be adequately surveyed, sampled, cleaned, planned, excavated and *replaced by record* on appropriate pro forma context, finds and sample sheets, by the production of plans, sections and elevations at appropriate scales and by black and white and colour photographic record.

4.13 An on-site index of plans and sections and other on-site records must be maintained, and eventually included in the project archive.

Evaluation

This is an intrusive methodology **which may be** required prior to the determination of a planning application, with the aim of informing the decision-making process on the best course of action for an archaeological deposit sequence to be affected by a proposed development programme.

4.14 Project Designs must confirm that the aim of the work is to create a full characterisation of the archaeological sequence and a model of the deposit history. The methodology to be used must be articulated and the sources to be consulted listed.

4.15 Evaluation trial-trenching will recover as much information as possible on the extent, date, phasing, character, function, status and significance of the site. The states of preservation of archaeological features or deposits within the area indicated must be determined.

4.16 Evaluation trial-trenching will normally examine an appropriate sample (often expressed as a % of the area of the proposed development site) as required by the Brief or Specification (*cf* Hey and Lacey 2001). The area of the *base* of a battered or stepped trench will usually be the figure used to determine if the sample has been achieved. In urban areas, smaller samples may sometimes be specified taking into account the particular circumstances on a site-by-site basis. Where the sample size is not stipulated in the Brief, a rationale for the sampling method must be provided based on knowledge and understanding of the surrounding archaeological resource.

4.17 Exceptionally, and only with the prior approval of the LGAO, the mechanical removal of archaeological deposits may be permitted.

4.18 An archive and client report must be produced. In some instances, publication of the evaluation results may be required if no further work is undertaken and if the results of the evaluation warrant dissemination of a synthesis of the results in an appropriate journal.

Excavation

An Excavation may be required where it has been decided that any archaeological remains do not warrant physical preservation *in situ*, and that an acceptable mitigation strategy is for these to be excavated archaeologically, replaced by record, assessed, analysed, archived and a synthesis of the results disseminated. For standards and guidance see also Institute of Field Archaeologists 1999d.

4.19 Excavation Projects will recover as much information as possible on the origins, date, development, phasing, spatial organisation, character, function, status, significance and the nature of social, economic and industrial activities on the site.

4.20 Excavation Projects will examine, excavate and replace by record all archaeological features, deposits and structures within the area indicated and to the agreed depth, assess their potential for analysis, undertake an agreed programme of analysis, produce a report (9 below), archive (11 below), and publication (10 below).

4.21 Archaeological contractors must provide sufficient, secure and separate accommodation for site records, and for finds processing and finds storage if these activities take place on site.

4.22 Provision of access is an important tenet of archaeological excavation, and a Brief may include encouragement to bring the circumstances, results, analysis and interpretation of archaeological work before the general public (open days, viewing platforms, site tours, on-site provision of information and publicity (where allowed) in the local and national media). Opportunities should also be provided, where practicable, for local amateur archaeological groups to participate. This, it must be stressed, should in no way replace any aspect of the formal costed works to meet the requirements of the Brief or Specification.

Archaeological Monitoring (or Watching Brief)

Archaeological Monitoring and Recording (or a Watching Brief) means that an archaeologist must be present throughout or during certain specified phases of the development to record any features exposed or any archaeological finds.

In the event of the discovery of unanticipated remains of national importance, discussions will take place (which might include the developer, the LGAO, the LPA and English Heritage) on how these might be preserved *in situ* or recorded.

For standards and guidance see also Institute of Field Archaeologists 1999c.

4.23 During Archaeological Monitoring and Recording, provision must be made for an archaeologist(s) to be present during specified times and/or activities including, where required:

- all areas of below-ground disturbance, including excavations, foundation trenches, service trenches, drains and soakaways
- above-ground remains when the development affects a building of historic importance
- pipelines and cable trenches.

4.24 Monitoring will be undertaken at the level or intensity indicated in the Brief or Specification. This may involve intensive monitoring (*i.e.* continuous presence during activities), regular monitoring visits or occasional monitoring (a programme of planned visits to coincide with relevant activities).

4.25 The archaeological contractor must be in full control of machining activity on the site.

4.26 Where required, all topsoil or spoil must be scanned carefully by eye and surveyed by metal-detector during its removal.

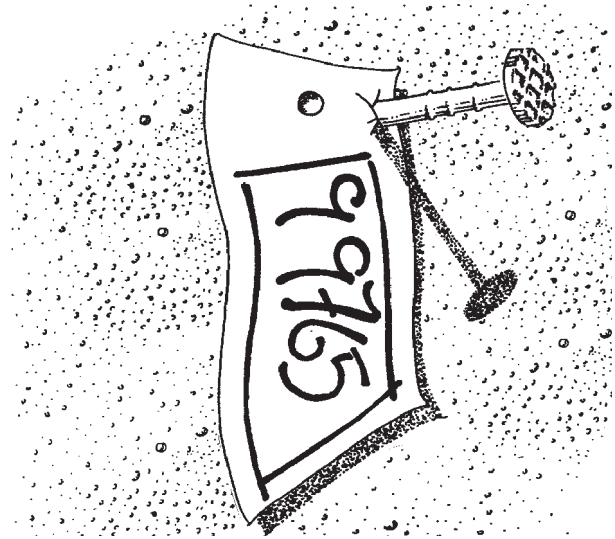
4.27 Monitoring and Recording of a standing structure is a particularly useful approach for small-scale, focussed developments and repair proposals involving minimal opening up of discrete areas of a structure. It will generally include, as a minimum:

- monitoring of fabric intervention to structure
- recording by photography and scale drawing of fabric revealed, altered or removed.

5. Urban Archaeology

by Andy Hutcheson

The defining difference between an urban and any other sort of archaeological site is, of course, the past intensity of use. A less interpretatively-loaded description of such a situation could be 'intensively stratified archaeological areas'. Regardless of the nuances of various definitions, the reality is that these stratified archaeological situations require a specific set of approaches and skills. A Project Design for a stratified site must therefore articulate a methodology appropriate to the nature of the archaeological deposits to be investigated and the environment in which the work will take place.



intensive stratification

There is a useful body of literature on methodological approaches to the archaeology of towns, notably Harris' work on understanding stratigraphy (1975, 1979, 1984 and 1993), Carver (1987; 1990), the Museum of London's archaeological site manuals (Spence 1990; 1994), the proceedings of the *Interpreting Stratigraphy* conferences (Steane 1992, Barber 1993, Shepherd 1995, Roskams 1998; 2000); Chadwick 1997, Thorpe 1998 and Roskams 2001.

Recording (evaluation and excavation)

Recording of the contextual situation and the relationships between deposits is of primary importance in any archaeological investigation. The major difference in an urban environment is that the deposit sequence will usually be more complex. There are a number of methodological tools that can be applied to the recording of this complexity. Most important of these is the record made of the relative position of a defined context in relation to the rest of the sequence through the use of a stratigraphic matrix. The construction and subsequent analysis of a matrix, both on site and in post-excavation, will greatly enhance the interpretative value of the investigation and will allow any future researcher to approach the primary site record more easily.

Also of great value to both understanding the sequence on site and creating an interpretable archive is a single context planning methodology. Linking of these two recording methods, along with the text record, results in a powerful interpretative tool for analysis of any archaeological deposit sequence. In many cases it may be appropriate to carry this further and utilise information technology to assist in the process of understanding.

Evaluation sampling

Given the nature of the urban environment and the potential necessity for deep trenches, evaluation will be a relatively more costly exercise in towns. The object of evaluation is to characterise the archaeological sequence and its present and future research value. In order to accomplish this the entire sequence present within a proposed development area will need to be modelled. This may require a significant sample of the site and a detailed synthesis of the results of evaluation with other information held on the location in archaeological databases, documents and maps.

Preservation *in situ*

The aim of much evaluation in the urban context is to decide on the best course of action for an archaeological deposit sequence affected by a proposed development programme. A range of possible solutions can be formulated to meet the challenge of reconciling the survival of a particular archaeological resource with the need for development. Very often the choice of solution will rest on whether the development scheme can be built on top of the archaeological remains. Piling and minimally intrusive foundation designs will be chosen for situations where it can be demonstrated that the remains can be effectively preserved through such an approach. In cases where there are anaerobic conditions resulting in organic preservation, evaluation must attempt to answer difficult questions such as:

- will the local environment be affected?
- how can the environment be monitored throughout the life of the building?
- what will be the affect of this development on the surrounding archaeological resource?

Approaches to evaluation that attempt to minimise on-site costs through stepping of the trenches can defeat the purpose of preservation. Destruction of part of the sequence without record is not an acceptable methodology, given the logic of the evaluation exercise. Shoring of deeply stratified evaluation trenches is usually the most effective way of characterising the resource whilst minimising its destruction.

There is presently a small but growing body of literature relating to the preservation of archaeological sites *in situ* (see Corfield *et al.* 1996).

5.1 All archaeological investigations of stratified deposit sequences will construct an ongoing matrix of the relationships between the contexts defined within the trench.

5.2 A single context planning methodology will normally be used to ensure both a greater understanding of the site sequence by the archaeologists carrying out the investigation but also so that sequential interpretations can be reproduced.

5.3 Project Designs must confirm that the aim of the work is to create a full characterisation of the archaeological sequence and a model of the deposit history. The methodology to be used must be articulated and the sources to be consulted discussed. Where the sample size is not stipulated in the Brief, a rationale for the sampling method must be provided based on knowledge and understanding of the surrounding archaeological resource.

5.4 Project Designs must confirm that where a sequence in excess of 1.2m in depth is expected, provision for the required methodology (normally trench shoring) has been made.

5.5 Project Designs must articulate the range of preservation considerations to be investigated and reported on during the evaluation. In cases where organic preservation in anaerobic conditions is likely, an appropriate range of scientific measurements and environmental tests should be built into the Project Design

and analysed for the report (*e.g.* pH and redox) as well as an assessment of organic preservation.

5.6 Excavation areas will generally be stipulated in the brief. The stipulated area does not include steps for edge protection and a methodology for providing safe excavation sides must be articulated in the Project Design.

6. Standing Structures

by Jonathan Smith

There is a variety of practice across the region with regard to the assessment and recording of standing structures. In some authorities, the LGAO may only advise on non-listed structures, while in others the LPA's Conservation Officers may deal with above-ground buildings archaeology.

6.1 Work must be undertaken in accordance with the guidance contained in the following documents:

- *Recording Historic Buildings; A Descriptive Specification* (3rd edition) (Royal Commission on the Historical Monuments of England 1996)
- *Analysis and recording for the conservation and control of works to historic buildings* (Association of County Archaeological Officers 1997)
- *Standard and Guidance for the Archaeological Investigation and Recording of Standing Buildings or Structures* (Institute of Field Archaeologists 1999e).

6.2 An archaeological contractor who is a suitably qualified buildings archaeologist, conservation architect, or art historian will carry out all assessments and fieldwork. The LGAO will be able to advise on the appointment of an appropriate contractor.

6.3 Where a Standing Structure Impact Assessment is required, this will usually include, as a minimum, an Archaeological Desk-Based Assessment, an outline photographic survey, measured plans, elevations, or other surveys representing the existing structure, drawings in plan and elevation indicating the proposed development, and a complete planning history of the site. This may be required before an application is determined, in cases where the information has not already been included with an application. In the case of demolition proposals, the LGAO may wish to request a fuller level of recording at this stage when the structure has potential for archaeological significance.

6.4 The aims and objectives of a programme of work involving building recording will generally be to:

- compile a comprehensive and high quality record of the structures subject to the development/demolition proposal
- provide a comprehensive review of the local and regional historical context of the structures recorded by the project in the resultant analytical report. This must be adequately detailed to place the findings of the recording in their context and to be able to inform conservation decisions and the subsequent management of the structures

- produce a high quality, fully integrated archive suitable for long-term deposition in order to replace by record the structures in their form prior to conversion, alteration, demolition or repair.

6.5 The contractor must complete the required surveys and submit the report *prior to the commencement of development or demolition* of the structures subject to the application. Further recording may be required of interventions into the fabric of the original structure in the case of alteration, conversion, and/or repair of the structure in question. This, if justified (particularly so with Listed Buildings and Scheduled Ancient Monuments), will complete the archive and facilitate its use as a future conservation and management tool for the structure.

7. Finds and Conservation

see also 8.26-8.35 below

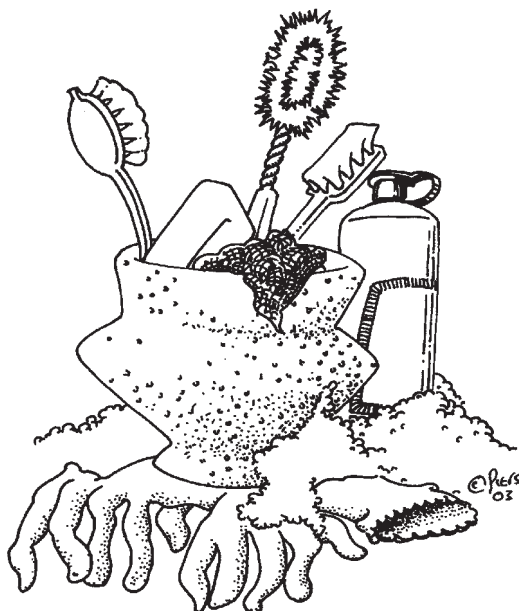
7.1 All finds work must be to accepted professional standards, and the *Standard and Guidance for the collection, documentation, conservation and research of archaeological materials* (Institute of Field Archaeologists 2001) adhered to.

7.2 Finds must be processed as soon as possible after recovery so that staff in the field can receive feedback and spot-dating of archaeological deposits being excavated.

7.3 During the assessment of metal finds, the advice of a professional conservator must be sought on conservation and x-ray requirements. All metal objects (except those of lead) must be x-rayed, and the x-rays included in the site archive as an integral component of the finds records (*cf* 8.29 below).

7.4 No sampling or disposal of cultural material from an evaluation or excavation may take place without prior approval by the LGAO and the intended place of deposition of the project archive.

7.5 All Treasure and finds of potential Treasure must be dealt with in accordance with the *Treasure Act* 1996 and its Code of Practice.



'have you washed those pots yet?'

8. Archaeological Science

by Peter Murphy

To separate 'Archaeological Science' from 'Field Archaeology' is of course artificial (for there are wide areas of overlap) but, for practical reasons and to avoid duplication, it is necessary in this document. Archaeological Science is here taken to include:

- geophysics
- scientific dating
- geoarchaeology and soil science
- analysis of botanical and faunal remains
- analysis of human remains
- artefact conservation and investigative analysis
- analysis of technological residues, ceramics, glass and stone.

This section applies equally to both evaluations and excavations, ranging from pre-determination evaluations through to evaluations and excavations secured by conditions. Evaluations differ widely in scope, scale and objectives. Small-scale initial pre-determination evaluations are usually intended to establish whether any archaeology is present at all and in this case Archaeological Science will often not be applicable. For all subsequent fieldwork it certainly is.

Procedures for desk-based studies, evaluation and excavation at coastal managed realignment schemes are to be found in Trow and Murphy (forthcoming). Most of these procedures are also applicable at other types of site where deep sediment sequences occur.

Specialists

Except in the field of artefact conservation, there are currently no professional accreditation schemes. Elsewhere, an objective criterion of competence is the ability of specialists to demonstrate that they have access to adequate laboratory facilities, including reference collections where needed. The phrase 'recognised specialist' is used below as a neutral, non-prescriptive term.

8.1 Specialists in archaeological science will be named in Project Designs and their competence to undertake investigations must be demonstrated. It is reasonable to expect a qualification, record of publication or training/mentoring by an experienced specialist.

8.2 There must be agreement in writing between the archaeological contractor/consultant and specialists on timetables and deadlines for all stages of work.

Geophysical prospection

8.3 The standards presented in *Geophysical Survey in Archaeological Field Evaluations* (David 1995) represent best practice.

8.4 Where a programme of geophysical survey is required, a recognised specialist in the techniques involved must be employed.

8.5 For most substrates, magnetometer survey is often the preferred technique in the first instance, using a fluxgate gradiometer with digital data storage and transfer facility.

8.6 If other techniques are to be employed, the geophysicist must provide a statement explaining the reasons for their use. The choice and deployment of techniques must be agreed with the LGAO in the light of this and after initial assessment of site conditions.

Scientific dating

As a guide to the potential usage of scientific dating, it has already been applied during evaluation in the East of England in the following circumstances:

- radiocarbon dating of wooden structures which were not dated artefactually or stratigraphically
- radiocarbon dating of organic sediment sequences believed to be contemporary with adjacent archaeological sites
- OSL (Optically Stimulated Luminescence) dating of colluvial sediments overlying cut archaeological features, undertaken to help define the appropriate depth of machining during subsequent excavation.

8.7 During field evaluation, samples will be taken for scientific dating in defined and specific circumstances, subject to time constraints. This applies where dating by artefacts is insecure or absent and where dating is necessary for development of the Project Design or Specification for subsequent work.

8.8 Samples for dating must be submitted to the laboratory promptly, following both evaluation and excavation. Prior agreement will be made with the laboratory on turn-around time and report production, so as to ensure that results are available to aid development of specifications for subsequent mitigation strategies, or for excavation report production.

8.9 During excavation projects, samples must be collected for radiocarbon, dendrochronology, luminescence, archaeomagnetism (and/or other techniques as appropriate) following the outline strategy presented in the Project Design/Specification. A detailed and cost-effective strategy for scientific dating will be prepared in consultation with appropriate specialists.

8.10 Sampling for dendrochronology must follow procedures presented in *Dendrochronology: guidelines on producing and interpreting dendrochronological dates* (Hillam 1998).

Geoarchaeology

8.11 Procedures and techniques presented in *Guidelines for carrying out Assessments in Geoarchaeology* (Canti 1996) should be followed.

8.12 Buried soils and sediment sequences must be inspected and recorded on site at both the evaluation and excavation stage by a recognised geoarchaeologist. Field inspection can provide sufficient data for understanding site formation processes, thereby avoiding the collection and processing of redundant samples.



bulk sieving

8.13 Samples for laboratory assessment and analysis will be collected where appropriate, following discussion with the LGAO.

8.14 Samples will be processed as deemed necessary by the specialist, particularly where storage of unprocessed samples is thought likely to result in deterioration. Appropriate assessment must be undertaken. Where preservation *in situ* is a viable option, consideration should be given to the possible effects of compression on the physical integrity of the site and to any hydrological impacts of development.

8.15 During excavation, samples will be collected for analysis of chemistry, magnetic susceptibility, particle size, micromorphology and/or other techniques as appropriate, following the outline strategy presented in the Project Design/Specification, and in consultation with the geoarchaeologist.

Botanical and faunal remains

8.16 During evaluation, deposits will be sampled for retrieval and assessment of the preservation conditions and potential for analysis of biological remains. The sampling strategy must include a reasoned justification for selection of deposits for sampling, and will be developed in collaboration with a recognised bioarchaeologist.

8.17 Sampling methods for macrofossils (e.g. shells, seeds) and microfossils (e.g. pollen, foraminiferans) must follow the document *Environmental Archaeology. A guide to the theory and practice of methods, from sampling and recovery to post-excavation* (English Heritage 2002).

8.18 Bulk samples and samples taken for coarse-mesh sieving from dry deposits must be processed at the time of the fieldwork wherever possible, partly to permit variation of sampling strategies if necessary, but also because processing a backlog of samples at a later stage can cause delays. Sampling strategies for wooden structures must follow the methodologies presented in Brunning 1996.

8.19 Biological samples from both evaluations and excavations must be assessed by recognised bioarchaeologists for evidence of site formation and taphonomy. Processing of all soil samples collected for biological assessment, or sub-samples of them, should be completed, except where deposits prove to be undatable. The preservation, state, density and significance of material retrieved must be assessed. Special consideration should be given to any evidence for recent changes in preservation conditions that may have been caused by alterations in the site environment. Unprocessed sub-samples must be stored in conditions specified by the appropriate specialists. Animal bone assemblages, or sub-samples of them, must be assessed by a recognised specialist. Following assessment, appropriate samples of biological materials must be analysed.

Human remains

8.20 At the evaluation stage, lifting of human skeletal remains must be kept to the minimum that is compatible with an adequate evaluation.

8.21 At sites known in advance to be cemeteries, provision must be made for site inspection by a recognised specialist.

8.22 Excavators must be aware of, and comply with, the relevant legislation and any Home Office and local environmental health concerns. Further guidance is provided in *Church Archaeology: its care and management* (Council for the Care of Churches 1999).

8.23 Assessment of human remains will be based partly on *in situ* observation, but where skeletal remains have been lifted, a recognised specialist must undertake assessment.

8.24 During excavation, burials must be recorded *in situ* and subsequently lifted, washed in water (without any additives), marked and packed to standards compatible with *Excavation and post-excavation treatment of cremated and inhumed human remains* (McKinley and Roberts 1993). Site inspection by a recognised specialist is desirable in the case of isolated non-complex burials, and necessary for cemeteries.

8.25 Proposals for the final placing of human remains following study and analysis will be required in the Project Design/Specification. Further guidance is provided in *Church Archaeology: its care and management* (Council for the Care of Churches 1999).

Artefact conservation and investigative analysis

8.26 All finds visible or located by other means (such as metal-detecting) during evaluation and excavation must be collected and processed, unless variations in this principle are agreed with the LGAO.

8.27 Provision must be made, where appropriate, for the regular transfer of finds from a site to the conservation laboratory.

8.28 Finds must be appropriately packaged and stored under optimum conditions, as detailed in *First Aid for Finds* (Watkinson and Neal 1998).

8.29 Assessment must include x-radiography of all metal objects (after initial screening to exclude obviously recent debris) except those of lead (*cf* 7.3 above). A rapid scan of

all excavated material must be undertaken by conservators and finds researchers in collaboration. Material considered vulnerable will be selected for stabilisation after specialist recording. Where intervention is necessary, consideration should be given to possible investigative procedures (*e.g.* glass composition studies, residues in or on pottery, ceramic thin sections, and mineral-preserved organic material).

8.30 Once assessed, all material must be packed and stored in optimum conditions, as described in *First Aid for Finds* (Watkinson and Neal 1998). Waterlogged organic materials must be dealt with following *Guidelines for the care of waterlogged archaeological leather* (English Heritage/Archaeological Leather Group 1995) and *Waterlogged wood: guidelines on the recording, sampling, conservation and curation of structural wood* (Brunning 1996).

8.31 Investigative conservation will be undertaken on those objects selected during the assessment phase, with the aim of maximising information whilst minimising intervention. Where necessary, active stabilisation/consolidation will be carried out, to ensure long-term survival of the material, but with due consideration to possible future investigations. Proposals for ultimate storage must follow *Guidelines for the Preparation of Excavation Archives for Long-Term Storage* (Walker 1990).

Analysis of technological residues, ceramics, glass and stone

8.32 Where there is evidence for industrial activity, macroscopic technological residues (or a sample of them) must be collected by hand.

8.33 Where appropriate, separate samples (*c.* 0.2 litres) must be collected for micro-slugs (hammer-scale and spherical droplets).

8.34 Reference should be made to *Archaeometallurgy* (English Heritage 2001) (*cf* English Heritage 1995) and *Hammerscale* (Starley 1995).

8.35 Assessment of any technological residues will include x-radiography of a sample of industrial debris relating to metallurgy.

9. Reports

Every archaeological project will produce a report that is submitted to the LGAO and made available through the SMR/HER. These are known as ‘client reports’ or ‘grey literature’ and must contain the basic information detailed below. Some archaeological work will justify publication and this should be in a format and at a level of detail *commensurate with the results*.

This section largely refers to unpublished reports — client reports and ‘grey literature’. For published reports, see 10 below.

9.1 Archaeological contractors will produce a report of every project undertaken for submission to the LGAO. All reports must include the results of the background research undertaken to place the evidence presented within its local and, where appropriate, its regional and/or national

context, by consulting relevant Sites and Monuments Record (or equivalent) data, documents, maps and aerial photographs. All sources examined must be listed.

9.2 Reports will be rejected if it is demonstrated that they do not provide sufficient information or if they have not been compiled in accordance with the relevant sections of the Brief or this document. The reasons for rejecting any report will be stated, and contractors will be expected to revise the report and to resubmit it.

9.3 Excavation and evaluation reports submitted to the LGAO and LPA (and deposited with the project archive to the agreed place of deposition) will include, where appropriate:

- a brief non-technical executive summary of the work undertaken and the results obtained
- acknowledgements
- site details, including location, SMR/HER number, grid reference, geology, place of deposition of the archive and any relevant details of the project's history
- archaeological background, including aims and objectives
- methodology
- site narrative, comprising the detailed description, analysis and interpretation of the site or structure;
- artefactual evidence, including results of specialist reports
- environmental evidence, including results of specialist reports
- archaeological science reports, including results specialist reports
- documentary and cartographic evidence
- discussion/conclusions
- recommendations as a separate section, if included (*nb* some LGAOs will not accept a report which includes recommendations for further work)(*cf*9.17)
- bibliography
- illustrative material including maps, plans, elevation drawings, sections, appropriate detail drawings and a key to any conventions used
- photographs, where appropriate
- lists of contexts and finds, as appendices
- specialist reports in full, as appendices
- copies of the Brief and Project Design, where required, as appendices.

9.4 Within the time specified by the LGAO a timetable for post-excavation work will be produced, following consultation, (including team meetings for larger-scale sites) with all specialists involved in the project. Timetables should be agreed in writing with external sub-contracted specialists.

9.5 Specialist reports should include details of methodology, results, interpretation and non-technical summaries.

9.6 The timetable should allow for adequate provision by the excavator of contextual information, provisional dating and stratigraphic relationships of contexts.

Project summaries

9.7 Many county journals in the region publish annual summaries of excavations and surveys, and the archaeological contractor must provide an appropriate summary/synthesis if asked to do so. The summary should contain an *irreducible minimum* of information, as defined in MAP2 Appendix 7.

Reports on Evaluations by survey and/or trial trenching

9.8 The archaeological contractor may determine the general style and format of evaluation reports.

9.9 However, the report must include an introduction with background information about the site, an outline of the development, the date of fieldwork, the personnel involved and the methodology employed. Copies of the Project Brief or Specification and Project Design must be appended, where required.

9.10 Plans at appropriate scales must be included, showing the site location, trench layout or excavation areas, finds distributions and features (by phase). Section and sample locations will be indicated. An overall site plan showing all features (hachured) must always be included.

9.11 An evaluation report must include comprehensive details of features and finds in each trench or area, their states of preservation and interpretation. Tables will summarise the recovery of finds from features within each trench or area.

9.12 An evaluation report must also include a quantification and assessment of the finds, and present an overview of the quality and potential of the finds assemblage. This should include illustrations and/or photographs of significant finds. Where appropriate, local reference collections, especially of ceramics, will be referred to for descriptive and analytical purposes in order to ensure that analysis and terminology is consistent. Relevant standards produced by national finds groups must be adhered to.

9.13 An evaluation report must include an assessment of the environmental potential of the site where this is appropriate.

9.14 Any results from assessment investigations involving archaeological science must be included in the evaluation report.

9.15 Archaeological science reports must include sufficient detail to permit the assessment of potential for analysis. They will include tabulations of data in relation to site phasing and contexts and non-technical summaries. The objective presentation of data must be clearly separated from interpretation. Any recommendations for further investigations involving archaeological science (both on samples already collected and further samples to be collected at future excavations) must be clearly separated from the results and interpretation (*cf*9.3).

9.16 An evaluation report must include an assessment of the preservation potential of the site so that appropriate decisions can be taken about mitigation strategies.

9.17 An evaluation report will comment on the perceived effectiveness of the fieldwork in relation to the project's stated aims and objectives. It will not express an opinion on preservation or further work.

9.18 Evaluation reports must be submitted by the time specified in the Brief. This is usually on the understanding that they will become public documents after an appropriate period of time.



Reports on Area Excavations

9.19 At the Assessment stage of an excavation project an Updated Project Design must be prepared with proposals for analysis, report and publication, and agreed with the LGAO.

9.20 An excavation report must be completed and the required number of copies supplied to the relevant Sites and Monuments Record (or equivalent) within the timetable agreed with the LGAO. Programmes may be negotiated for particular projects at the Assessment stage when the analysis, report and publication timetable will be agreed with the LGAO. Where a project is phased, interim reports will be prepared and submitted on each sub-phase to an agreed timetable.

9.21 An excavation report for publication will generally include as appropriate, the following:

- title page
- list of contents, plates, figures, tables, microfiche, contributors
- acknowledgements, preface, summary
- a description of the site
- excavation methodology
- summary of phasing
- excavated features
- finds
- specialist reports
- discussion and conclusions
- appendices
- bibliography
- index
- additional material (electronic release/microfiche)

9.21 If it is intended that an excavation report will be published, refer to section 10 below.

Reports on Archaeological Monitoring and Recording (Watching Briefs)

9.22 A report on an Archaeological Monitoring and Recording Project (or Watching Brief) should be commensurate with the results.

9.23 As a minimum, it must include a one-page summary of the archaeological project, with a description of the

... at a level of detail **commensurate** with the results

work and any field observations, and a location plan at an appropriate scale.

Report illustrations

9.24 Where conventions are used, as is normally the case, an explanatory figure or key must be included.

9.25 All report illustrations must be fully captioned and refer to the scale of the published drawing.

9.26 Plans must be based on and indicate the National Grid, showing at least two intersections.

9.27 North must be indicated on all plans.

9.28 A bar scale must be included on all plans and sections.

9.29 Sections must indicate the alignment of the section, and the height OD of the section datum.

9.30 Plan and section illustrations must include the context numbers of all cuts, fills, layers and structures represented. The locations of significant finds and/or of samples taken will also be shown, where appropriate.

9.31 The positions of all section lines must be indicated and annotated on the appropriate plan(s).

10. Publication

by Jenny Glazebrook

The principle of replacement by record

There is extensive literature dealing with archaeological project management, in which principles and standards for field archaeology have gradually been refined (Frere 1975; Cunliffe 1982; English Heritage 1991(MAP 2); Carver *et al.* 1992). Through these documents, a management framework has been developed which emphasises selectivity and archaeological value right through to publication, and is intended to work alongside academic priorities such as those embodied in the regional research framework.

Traditionally, archaeological publication was based on the idea of *preservation by record*, but this concept is now understood as *replacement by record*, implying a process of transformation into knowledge rather than one of passive data storage. The management framework accepts *replacement by record* as one of the basic principles of

archaeological excavation — the record being an *archive plus publication*. Because of this, the sponsor of an archaeological excavation must also pay for its replacement by record *satisfactory to the academic needs of the discipline* (Cunliffe 1990, 668).

In theory archives are publicly accessible, but in practice access — even to ‘grey literature’ — is often difficult or impossible and the published account forms the only easily obtainable record. It is important, therefore, that the account is published in a format likely to be acceptable to libraries and taken by as many libraries as possible.

Publication commensurate with results

Archaeological works will not always justify publication or publication at the same level of detail. Guidelines produced by the *East Anglian Archaeology* editorial committee indicate the range of outlets available and the criteria by which an appropriate level of dissemination can be judged (East Anglian Archaeology 2002).

In all cases a report is produced to guide the planning process and is made available through the SMR/HER (*cf* 9.1 above). Some work may endorse current knowledge rather than offer the potential to develop any new understanding, and this should be apparent to the archaeological contractor/consultant and LGAO at the Fieldwork phase or at latest the Assessment phase, following MAP2. An appropriate record will then comprise an archive deposited with the relevant body as defined below (section 11) and in MAP2 (5.4 and Appendix 3), plus a summary report in a local or period journal (*cf* 9.7 above).

Analysis takes place when material from the site *has the potential to contribute to the pursuit of local, regional or national research priorities* (MAP2, 6.16). Indeed, MAP2 (7.5) assumes that if a project proceeds to analysis it is with a planned publication in mind.

At this point the scope of the publication should be defined by the archaeological contractor/consultant, who should consider whether a full site report is intended, or a synthetic article on some aspect of the work, or detailed publication of material that is of *intrinsic archaeological value outside the context of the site report* — such as artefactual or environmental evidence (MAP2, 6.16).

10.1 The publication of archaeological work should reflect the significance of the data collected.

10.2 Some projects may involve more than one dissemination method, and this may not be known until the second assessment of results is carried out after analysis.

10.3 To ensure that relevant information is published in a clear, structured and user-friendly manner, site reports and articles must be subject to an *independent editorial process*. Suitable outlets provide academic vetting, copyediting, professional indexing and circulation to journals for review.

10.4 A *provisional publication synopsis* will be submitted by the archaeological contractor/consultant to an appropriate outlet(s) and to the LGAO at Updated Project Design stage (MAP2, Phase 4), when the resources needed for analysis, synthesising the research archive and publishing a report are also established.

10.5 Site reports must be compiled according to the report-writing criteria and the production standards laid out in MAP2. Suitable outlets will comply with these production standards, as their *Notes for Authors* will demonstrate, thus guaranteeing production quality.

10.6 Reports, including those for submission to county journals, must be drafted to conform to the requirements of the intended outlet. Contractors/consultants must establish contact with the journal or series editor at an early stage to obtain *Notes for Authors*, advice on the submission of synopses, and an estimate of the costs and timescale involved.

10.7 Until analysis has been completed, the exact content of the publication cannot be finalised. Any major alterations to report content should be subject to editorial approval, and a *final synopsis* should be sent to the outlet confirming the scope of the report and the intended delivery date of the draft text.

10.8 Publication costs can be more accurately established once the final text of the report has been agreed. Usually, these will include:

- copyediting
- typesetting
- origination of page layouts to camera-ready copy
- indexing
- printing
- distribution (including review copies)
- marketing.

10.9 Project Designs must confirm that the resources for editorial and reprographic work have been adequately built into the project.

Publication to an acceptable academic standard

As the amount of archaeological activity and the volume of available data rapidly increases, selectivity and a clear focus on defined issues are essential in publication, if uncritical reproduction of the archive is to be avoided.

10.10 When the report has been drafted, it should be subject to peer review by an independent academic referee.



the published report — always a cause for celebration!

The role of the independent referee, appointed by the editorial board of the outlet or the sponsor, is to ascertain:

- how far the publication reflects the stated aims of the project design
- whether the publication meets the general academic standards and priorities
- whether the proposed publication meets the requirements of the publishing body
- whether publication of the report is warranted and whether it meets professional standards.

By doing so, the referee addresses the needs of the archaeological community, the interests of the publisher and the sponsor.

The integration of published reports and project archives

As published reports become more selective and synthetic, the more they need to provide a gateway into the archive.

10.11 The published report will clearly state the location of the archive, its accession number, and details of the body responsible for its curation.

10.12 The published report will provide an index of the archive contents, method of reference between published report and archive information, and cite any material that is electronically accessible.

11. Archives

11.1 The place of deposition of the Project Archive may have an Archaeological Collecting Policy to which all material to be deposited will have to conform. The archaeological contractor/consultant should seek advice and guidance on this at an early stage, and arrangements made before on-site works commence.

11.2 Where finds records have been computerised, the archaeological contractor/consultant will be expected to provide an electronic database to accompany the archive. This may need to be compatible with MODES and include defined units of information for each item or significant group of items. Where records have been computerised the data must also be present as hard copy in the site archive.

11.3 Minimum standards for site archives should be followed, as defined in MAP2, para. 5.4 and Appendix 3.

11.4 The following should also be adhered to: *Guidelines for the Preparation of Excavation Archives for Long-Term Storage* (Walker 1990) and *Selection, Retention and Dispersal of Archaeological Collections* (Society of Museum Archaeologists 1993, *Archaeological documentary archives* (Ferguson and Murray 1997) and *Microfilming archaeological archives* (Handley 1999).

11.5 Account must also be taken of the requirements of the place of deposition regarding the conservation, ordering, organisation, labelling, marking and storage of excavated material and the archive.

11.6 Owners of finds and records should be encouraged to donate these to the appropriate place of deposition as a matter of best practice in the public interest.



the ultimate deposit

11.7 Where finds are retained by the owner and are not to be deposited with the project archive, a comprehensive record including detailed drawings, photographs and descriptions of individual finds must be included in the archive *in lieu* of the objects. The repository of any finds not included in the project archive must be indicated.

11.8 The finds and archive must be deposited within the specified time of the completion of the publication or, in certain circumstances, to an agreed timetable of a longer duration.

11.9 The integrity of the site archive must be maintained at all times.

11.10 For all projects, provision must be made for inclusion of the results in the relevant SMR/HER to meet local requirements. This will refer to the location of the archive and the relevant place of deposition accession number.

11.11 Digital archives must be prepared according to local requirements, and following the guidance in Bewley *et al.* 1998 and Richards and Robinson (eds) 2000.

11.12 It is normal practice for both the copyright and ownership of the paper and any digital archive resulting from an archaeological project to rest with the originating body (usually the archaeological contractor). The originating body will deposit the archive in a museum or other appropriate repository on the completion of the project, and normally transfers title and/or licences the use of the archive at this stage. It is advisable to document these arrangements in a written contract or agreement.

12. Project Monitoring

Archaeological advisors such as LGAOs undertake the important role of monitoring the quality of archaeological work. In this they are assisted by the broad frameworks provided by nationally agreed standards (for example, IFA Standard and Guidance for various types of archaeological work), by regional standards (this document) and by the detailed requirements within Briefs, Specifications and Project Designs for specific archaeological tasks.

12.1 The LGAO or his or her representative will be responsible for monitoring progress and standards throughout the project on behalf of the Local Planning Authority.

12.2 Regular monitoring by the LGAO of a project is seen as a necessary, constructive and desirable process, to ensure that satisfactory progress is being made and standards adhered to.

12.3 When the project is underway, the LGAO (acting on behalf of the relevant LPA) will review progress to ensure that:

- the development itself conforms to the submitted plans and drawings on which the archaeological Brief (and any requirement for archaeological investigation) was based
- the archaeological requirements of the Brief or Specification are being met
- the Project Design is being adhered to.

12.4 Monitoring intervals will vary according to the nature of the site and the scale of the project. The timing and frequency of monitoring points should be agreed with the LGAO. They may include the following stages:

- topsoil stripping
- during evaluation/excavation (frequency to be agreed)

- completion of evaluation/excavation
- completion of assessment
- during analysis
- completion of analysis
- submission of report and archive.

12.5 Archaeological contractors/consultants should give the LGAO not less than one week's written notice of the commencement of the work and its duration, so that arrangements for monitoring can be made. Failure to give due notice may result in trenches having to be left open until the LGAO is able to visit, and the archaeological contractor/consultant should advise any client hoping to accelerate the programme that this may be necessary.

12.6 Access to the site should be granted to the LGAO as the representative of the Local Planning Authority, to monitor the archaeological works at agreed points in the programme or at random, to ensure that these are being undertaken to professional standards and in accordance with any planning conditions or legal agreements.

12.7 The LGAO has responsibility for his/her own welfare, and will provide his/her own personal protective equipment for use during monitoring, and will inform themselves of the basic procedures for entering a site safely.

12.8 Once the fieldwork is completed, the LGAO should be closely involved with the assessment phase of the project and the preparation by the archaeological contractor/consultant of the Updated Project Design and, later still, the post-excavation stages of analysis, report and publication (if appropriate). The preparation and deposition of the project archive will also be subject to review by the LGAO and/or by the intended place of deposition.

Appendix 1. ALGAOEE Contacts

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Appendix 2. Definitions

Appraisal. A rapid examination of existing records to identify whether a development proposal has a potential archaeological dimension requiring further clarification. This is undertaken by the LGAO.

Archaeological Consultant. An archaeologist or archaeological organisation usually acting on behalf of the client (in the planning process), and who may themselves draw up a Project Design or Specification for approval by the LGAO, scrutinise and advise on the costs of an archaeological project, and monitor work for the client.

Archaeological Contractor. An archaeological organisation (unit, trust etc) usually able to provide a wide range of services, including desk-based assessments, surveys, evaluations, excavations, building recording, assessments of potential for analysis, analysis, conservation, report preparation, dissemination and the organisation and deposition of a project archive.

Archaeological Desk-Based Assessment. A programme of assessment of the known or potential archaeological resource within a specified area on land, inter-tidal zone, or underwater. It consists of a collation of existing written, graphic, photographic and electronic information in order to identify the likely character, extent, quality and worth of the known or potential archaeological resource in a local, regional, national or international context, as appropriate (IFA 1999a).

Archaeological Monitoring and Recording (sometimes referred to as an Archaeological Watching Brief) may be defined as a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in a report and ordered archive (IFA 1999c).

Brief. An outline or framework of the planning and archaeological situation that has to be addressed, together with an indication of the scope of works that will be required. This is provided by the LGAO and is the document required by archaeological contractors to prepare a Project Design. For model briefs, see Association of County Archaeological Officers 1993.

Evaluation. Evaluation techniques are employed prior to the determination of planning applications to clarify understanding of the character, extent, and importance of archaeological remains, usually comprising a programme of non-intrusive and/or intrusive fieldwork required prior to the determination of a planning application. It will be designed to supplement and improve existing information to a level of confidence at which the archaeological potential of a site can be assessed, and so that informed and reasonable planning recommendations and decisions can then be made.

An evaluation is intended to determine the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts, within a specified area on land, inter-tidal zone or underwater. If such archaeological

remains are present, field evaluation defines their character, extent, quality and state of preservation, and enables an assessment of their worth in a local, regional, national or international context, as appropriate (IFA 1999b).

Evaluation techniques may include fieldwalking, metal-detecting, geophysical survey, earthwork survey, trial trenching or environmental sampling.

Excavation. An Excavation may be required where it has been decided, usually following evaluation, that any archaeological remains do not warrant physical preservation *in situ*, and that an acceptable mitigation strategy is for these to be excavated archaeologically, replaced by record, assessed, analysed, archived and a synthesis of the results disseminated.

An excavation may be defined as a programme of controlled, intrusive fieldwork with defined research objectives which examines, records and interprets archaeological deposits, features and structures and, as appropriate, retrieves artefacts, ecofacts and other remains within a specified area or site on land, inter-tidal zone or underwater. The records made and objects gathered during fieldwork are studied, and the results of that study published in detail appropriate to the Project Design (IFA 1999d).

Historic Environment Record (HER). An Historic Environment Record provides access to a comprehensive and dynamic information resource about the historic environment of its local area for public benefit and use. The historic environment includes all aspects of our surroundings that have been built, formed or influenced by human activities from earliest to most recent times.

An Historic Environment Record makes information widely accessible to specialists and to the public, managing its services and data in accordance with agreed national and international standards and guidance on best practice.

The purpose of an Historic Environment Record is to:

- advance research and new understanding about the historic environment
- inform care of the historic environment through conservation and environmental enhancement programmes and projects, state of the environment reports, and by raising public awareness about conservation needs
- inform policies and decision-making in land-use planning, development control, statutory undertakings, agri-environment and forestry schemes
- contribute to educational programmes and projects about the historic environment
- encourage public and community participation in the appreciation and enjoyment of the historic environment.

Local Government Archaeological Officer (LGAO). The Local Government Officer at County, District or Unitary Authority level who is appropriately qualified and experienced (IFA Membership and adherence to IFA's Codes of Conduct (IFA 1997a, 1997b) and formally adopted by-laws, guidelines and other relevant codes, standards and guidance documents, are regarded as

baseline standards and yardsticks of competence and good operating practice).

The LGAO is responsible for the provision of archaeological services, usually including a Sites and Monuments Record or Historic Environment Record, planning policy, advice to developers, landowners, Local Planning Authorities and other agencies on the archaeological implications of planning applications and other development and land-use proposals, management of the archaeological resource, advice, education and promotion. Throughout these *Standards*, the term is taken to include other officers working under his or her authority.

The IFA is currently developing *Standards and Guidance for Curatorial Practice*, and it is naturally assumed that these will be regarded as further indicators of good operating practice that LGAOs and other curatorial archaeologists will adhere to.

Mitigation Strategy. Once the results of an evaluation are available and if a planning permission is granted, a mitigation strategy will seek to safeguard the archaeological remains. This might be achieved by the sympathetic design of foundations in order to preserve remains *in situ* or the exclusion of defined areas from further disturbance. Where this is not possible a further option is the implementation of a programme of archaeological work to excavate and ‘replace by record’.

Post-excavation. A term often used to refer to the office- or laboratory-based activities of an Archaeological Contractor (and others, *e.g.* specialists) that take place after the fieldwork phase of a project. Post-excavation will

usually include the assessment of potential for analysis, analysis, conservation, report preparation, dissemination and the organisation and deposition of a project archive.

Project Design (which may also be called a Method Statement or Written Scheme of Investigations). This is the document prepared by the Archaeological Contractor in response to the Brief or Specification prepared by the LGAO.

Sites and Monuments Record (SMR). An SMR is defined as: *a definitive permanent general record of the local historic environment in its national context, publicly and professionally maintained, whose data is accessible and retrievable for a wide range of purposes.* The SMR for a particular authority (county or district) is generally maintained by the LGAO or in some cases a local museum. The SMR will contain the data upon which the known archaeology (or the archaeological potential of an area) is assessed by the LGAO, and the SMR will also receive the results of archaeological fieldwork at the conclusion of a project. SMRs are increasingly collecting and holding a wider range of data on the historic environment, and developing into Historic Environment Records (HERs).

Specification. A schedule of works in sufficient detail to be quantifiable, implemented and monitored. Where a Specification is necessary or desirable this is provided by the LGAO and, like a Brief, is used by the Archaeological Contractor to prepare a Project Design.

For model specifications, see Association of County Archaeological Officers 1993.

References

- Association of County Archaeological Officers, 1993 *Model Briefs and Specifications for Archaeological Assessments and Field Evaluations* (Bedford)
- Association of County Archaeological Officers, 1997 *Analysis and recording for the conservation and control of works to historic buildings*
- Association of Local Government Archaeological Officers East of England Regional Committee, 2000 *Taking a Lead in Safeguarding the Historic Environment of the East of England*
- Association of Local Government Archaeological Officers, 2001 *Strategy 2001–2006*
- Barber, J., 1993 *Interpreting Stratigraphy. Proceedings of the Second Stratigraphy Conference, Edinburgh*, (AOC (Scotland) Ltd)
- Bewley, R., Donaghue, D., Gaffney, V., van Leusen, M. and Wise, A., 1998 *Archiving Aerial Photography and Remote Sensing Data: a Guide to Good Practice*, (Arts and Humanities Data Service)
- Brown, N. and Glazebrook, J. (eds), 2000 *Research and Archaeology: a Framework for the Eastern Counties 2. Research Agenda and Strategy*, E. Anglian Archaeol. Occ. Pap. 8
- Brunning, R., 1996 *Waterlogged wood. Guidelines on the recording, sampling, conservation and curation of waterlogged wood*, (London: English Heritage)
- Campling, N., 1999 *Which Archaeologist? Best Practice for Curatorial or Commissioning Archaeologists*, (Association of Local Government Archaeological Officers Briefing Note)
- Canti, M., 1996 *Guidelines for carrying out Assessments in Geoarchaeology*, English Heritage Ancient Monuments Laboratory Report 34/96 (London)
- Carver, M.O.H., 1987 *Underneath English Towns*, (London)
- Carver, M.O.H., 1990 'Digging for data: archaeological approaches to data definition, acquisition and analysis' in Francovich, R. and Manacorda, D. (acd) *Lo Scavo Archeologico: dalla diagnosi all'edizione*, 45–120 (Firenze: All'Insegna del Giglio)
- Carver, M.O.H., Chapman, H., Cunliffe, B., Hassall, T., Hebditch, M., Lawson, A., Longworth, I., Morris, R., Phillipson, D., Schofield, J. and Wainwright, G., 1992 *Archaeological publication, archives and collections: towards a national policy*, (Society of Antiquaries, unpublished)
- Chadwick, A.M., 1997 'Archaeology at the edge of chaos. Further towards reflexive excavation methodologies', *Assemblage* 3, Worldwide Web: <http://www.shef.ac.uk/~assem/3/3chad.htm>
- Confederation of British Industry, 1991 *Archaeological Investigations Code of Practice for Mineral Operators*
- Corfield, M., Hinton P., Nixon, T. and Pollard, M. (eds), 1996 *Preserving archaeological remains in situ: proceedings of the conference of 1st–3rd April 1996*, (London: Museum of London Archaeology Service)
- Council for British Archaeology, 1995 *Aerial Archaeology Guidance Note*
- Council for the Care of Churches, 1999 'Appendix 3. Draft guidelines for the treatment of human remains' and 'Appendix 4. The Vermilion Accord' in *Church archaeology: its care and management. A report to the council from the Archaeology Working Group*, (London)
- Cunliffe, B., 1982 *The Publication of Archaeological Excavations*, (Council for British Archaeology and the Department of the Environment)
- Cunliffe, B., 1990 'Publishing in the City', *Antiquity* 64, 667–71
- David, A., 1995 *Geophysical survey in archaeological field evaluation*, English Heritage Research and Professional Services Guideline No. 1
- Department of the Environment, 1990 *Planning Policy Guidance Note 16: Archaeology and Planning*, (HMSO)
- Department of the Environment and the Department of National Heritage, 1994 *Planning Policy Guidance Note 15: Planning and the Historic Environment*, (HMSO)
- Department of the Environment and the Welsh Office 1992 *Planning Policy Guidance Note 20: Coastal Planning*
- East Anglian Archaeology, 2002 *Notes for Authors*, 4th edition; *Submissions and About the Series*, <http://www.eaareports.org.uk/editorial/> (E. Anglian Archaeol. Editorial Committee)
- English Heritage, 1991 *Management of Archaeological Projects*, 2nd edition
- English Heritage, 1995 *Archaeometallurgy in archaeological projects*
- English Heritage, 1998 *Monuments of War. The evaluation, recording and management of twentieth-century military sites*
- English Heritage, 2001 *Archaeometallurgy* (Centre for Archaeology Guidelines)
- English Heritage, 2002 *Environmental Archaeology. A guide to the theory and practice of methods, from sampling and recovery to post-excavation* (Centre for Archaeology Guidelines)
- English Heritage, n.d. *Minimum Standards for MAP2 Project Designs and Assessments: supplementary guidance to MAP2*
- English Heritage/ Archaeological Leather Group, 1995 *Guidelines for the care of waterlogged archaeological leather*
- English Heritage/ Royal Commission on the Historical

Monuments of England, 1996	<i>England's coastal heritage: a statement on the management of coastal archaeology</i>	Joint Nautical Archaeology Policy Committee, 1995	<i>Code of Practice for Seabed Developers</i>
Ferguson, L.M. and Murray, D.M., 1997	<i>Archaeological documentary archives</i> , Institute of Field Archaeologists Paper No. 1	McKinley, J. and Roberts, C., 1993	<i>Excavation and post-excavation treatment of cremated and inhumed human remains</i> , Institute of Field Archaeologists Technical Pap. 13
Frere, S., 1975	<i>Principles of Publication in Rescue Archaeology</i> , (Ancient Monuments Board for England Committee for Rescue Archaeology)	Norfolk Landscape Archaeology, 1998	<i>County Standards for Field Archaeology in Norfolk</i> (Norfolk Museums and Archaeology Service, unpublished)
Gaffney, C., Gater, J. and Ovenden, S., 2002	<i>The Use of Geophysical Techniques in Archaeological Evaluations</i> , Institute of Field Archaeologists Paper No. 6	Office of the Deputy Prime Minister, 2000	<i>Regional Planning Guidance for East Anglia to 2016 (RPG6)</i>
Glazebrook, J. (ed), 1997	<i>Research and Archaeology: a Framework for the Eastern Counties, 1. Resource assessment</i> , E. Anglian Archaeol. Occ. Pap. 3	Office of the Deputy Prime Minister, 2001	<i>Regional Planning Guidance for the South East (RPG9)</i>
Handley, M., 1999	<i>Microfilming archaeological archives</i> , Institute of Field Archaeologists Paper No. 2	Office of the Deputy Prime Minister, forthcoming	<i>Planning Policy Statement 15: Planning for the Historic Environment</i>
Harris, E.C., 1975	'The stratigraphic sequence: a question of time', <i>World Archaeology</i> 7, 109–121	Palmer, R. and Cox, C., 1993	<i>Uses of Aerial Photography in Archaeological Evaluations</i> , Institute of Field Archaeologists Technical Pap. 12
Harris, E.C., 1979	<i>Principles of Archaeological Stratigraphy</i> , 1st edition (London: Academic Press)	Richards, J. and Robinson, D. (eds), 2000	<i>Digital Archives from Excavation and Fieldwork: Guide to Good Practice</i> , 2nd edition, (Arts and Humanities Data Service)
Harris, E.C., 1984	'The analysis of multilinear stratigraphic sequences', <i>Scottish Archaeol. Rev.</i> 3, 127–33	Roskams, S. (ed), 1998	<i>Interpreting Stratigraphy 8: Papers Presented to the Eighth Stratigraphy Conference at York</i> , (York: York Archaeological Publications)
Harris, E.C., Brown III, M.R. and Brown, G.J. (eds), 1993	<i>Practices of Archaeological Stratigraphy</i> , (London: Academic Press)	Roskams, S. (ed), 2000	<i>Interpreting Stratigraphy: site evaluation, recording procedures and stratigraphic analysis</i> , Brit. Archaeol. Rep. S910
Hey, G. and Lacey, M., 2001	<i>Evaluation of Archaeological Decision-making Processes and Sampling Strategies</i> , (Planarch Project: Kent County Council)	Roskams, S., 2001	<i>Excavation</i> , (Cambridge University Press)
Hillam, J., 1998	<i>Dendrochronology: guidelines on producing and interpreting dendrochronological data</i> , (London: English Heritage)	Royal Commission on the Historical Monuments of England, 1996	<i>Recording Historic Buildings; A Descriptive Specification</i> , 3rd edition
Institute of Field Archaeologists, 1997a	<i>Code of Conduct</i> , (Revised edition)	Royal Commission on the Historical Monuments of England, 1999	<i>Recording Archaeological Field Monuments; A Descriptive Specification</i>
Institute of Field Archaeologists, 1997b	<i>Code of approved practice for the regulation of contractual arrangements in field archaeology</i> , (Revised edition)	Schmidt, A., 2001	<i>Geophysical Data in Archaeology: A Guide to Good Practice</i> , (Arts and Humanities Data Service)
Institute of Field Archaeologists, 1998	'Draft principles of conduct for archaeologists involved in commercial archaeological work', <i>The Archaeologist</i> 32 (Summer 1998), 13	Shepherd, L., 1995	<i>Interpreting Stratigraphy: Proceedings of the Fifth Stratigraphy Conference, Norwich</i> , (Interpreting Stratigraphy 5)
Institute of Field Archaeologists, 1999a	<i>Standard and Guidance for archaeological desk-based assessment</i> , (Revised)	Society of Museum Archaeologists, 1993	<i>Selection, retention and dispersal of archaeological collections. Guidelines for use in England, Northern Ireland, Scotland and Wales</i> , (London)
Institute of Field Archaeologists, 1999b	<i>Standard and Guidance for archaeological field evaluation</i> , (Revised)	Spence, C. (ed.), 1990	<i>Archaeological Site Manual</i> , 2nd edition, (Museum of London)
Institute of Field Archaeologists, 1999c	<i>Standard and Guidance for an archaeological watching brief</i> , (Revised)	Spence, C. (ed.), 1994	<i>Archaeological Site Manual</i> , 3rd edition, (Museum of London)
Institute of Field Archaeologists, 1999d	<i>Standard and Guidance for archaeological excavation</i> , (Revised)	Standing Conference of Archaeological Unit Managers, 1996	<i>Guidelines and notes on competitive tendering for archaeological services</i>
Institute of Field Archaeologists, 1999e	<i>Standard and Guidance for the archaeological investigation and recording of standing buildings or structures</i> , (Revised)	Standing Conference of	
Institute of Field Archaeologists, 2001	<i>Standard and Guidance for the collection, documentation, conservation and research of archaeological materials</i>		

- Archaeological Unit Managers, 1997 *Health and safety in field archaeology*, 3rd edition
Beirut', *Assemblage 2*, Worldwide Web:
<http://www.shef.ac.uk/assem/4/4rxt.html>
- Starley, D., 1995 *Hammerscale*, Historical Metallurgy Society: Archaeology Datasheet No. 10
Trow, S. and Murphy, P., forthcoming *Coastal Defence and the Historic Environment: a Policy Statement*, (London: English Heritage)
- Steane, K. (ed), 1992 *Interpretation of Stratigraphy: A Review of the Art. Proceedings of the First Stratigraphy Conference, Lincoln*, (City of Lincoln Archaeology Unit)
Walker, K., 1990 *Guidelines for the preparation of excavation archives for long-term storage*, (Archaeology Section of the United Kingdom Institute for Conservation)
- Study Group for Roman Pottery, 1994 *Guidelines Advisory Document 1. Guidelines for the Archiving of Roman Pottery*
Watkinson, D. and Neal, V., 1998 *First Aid for Finds*, 3rd edition, (RESCUE and Archaeology Section of the United Kingdom Institute for Conservation)
- Study Group for Roman Pottery, 1997 *Research Frameworks for the Study of Roman Pottery*
Williams, J. and Brown, N. (eds), 1999 *An Archaeological Research Framework for the Greater Thames Estuary*, (Essex County Council)
- Thorpe, R., 1998 'Which Way is up? Context formation and transformation: the life and deaths of a hot bath in

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Requirements for a Trenched Archaeological Evaluation (updated March 2017)

An outline specification, which defines certain minimum criteria, is set out below. These requirements accompany, and should be used in conjunction with, the project brief.

Fieldwork Requirements

- 1.1 If excavation is mechanised a toothless 'ditching bucket' 1.80m wide minimum must be used.
- 1.2 The topsoil may be mechanically removed using an appropriate machine with a backacting arm and fitted with a toothless bucket, down to the interface layer between topsoil and subsoil or other visible archaeological surface. All machine excavation is to be under the direct control and supervision of an archaeologist. The topsoil should be examined for archaeological material.
- 1.3 The top of the first archaeological deposit may be cleared by machine, but must then be cleaned off by hand. There is a presumption that excavation of all archaeological deposits will be done by hand unless it can be shown there will not be a loss of evidence by using a machine. The decision as to the proper method of excavation will be made by the senior project archaeologist with regard to the nature of the deposit.
- 1.4 In all evaluation excavation there is a presumption of the need to cause the minimum disturbance to the site consistent with adequate evaluation; that significant archaeological features, e.g. solid or bonded structural remains, building slots or postholes, should be preserved intact even if fills are sampled. For guidance:

For linear features, 1.00m wide slots (min.) should be excavated across their width;

For discrete features, such as pits, 50% of their fills should be sampled (in some instances 100% may be requested).
- 1.5 There must be sufficient excavation to give clear evidence for the period, depth and nature of any archaeological deposit. The depth and nature of colluvial or other masking deposits must be established across the site.
- 1.6 Archaeological contexts should, where possible, be sampled for palaeoenvironmental remains. The archaeological contractor shall show what provision has been made for environmental assessment of the site and must provide details in the WSI of the sampling strategies for retrieving artefacts, biological remains (for palaeoenvironmental and palaeoeconomic investigations), and samples of sediments and/or soils (for micromorphological and other pedological/sedimentological analyses. Advice

on the appropriateness of the proposed strategies should be sought from the Historic England Regional Advisor for Archaeological Science (East of England). The English Heritage guide (2011), *Environmental Archaeology, A guide to the Theory and Practice of Methods, from Sampling and Recovery to Postexcavation*, provides further guidance to sampling archaeological deposits.

- 1.7 Any natural subsoil surface revealed should be hand cleaned and examined for archaeological deposits and artefacts. Sample excavation of any archaeological features revealed may be necessary in order to gauge their date and character.
- 1.8 Metal detector searches must take place at all stages of the evaluation by an experienced metal detector user. Metal detecting of trench locations should be carried out before trenches are cut, with trench bases and spoil scanned once trenches have been opened.
- 1.9 All finds will be collected and processed (unless variations in this principle are agreed SCCAS during the course of the evaluation).
- 1.10 Human remains must be left *in situ* except in those cases where damage or desecration are to be expected, or in the event that analysis of the remains is shown to be a requirement of satisfactory evaluation of the site. However, the excavator should be aware of, and comply with, the provisions of Section 25 of the Burial Act 1857.
- 1.11 Plans of any archaeological features on the site are to be drawn at 1:20 or 1:50, depending on the complexity of the data to be recorded. Sections should be drawn at 1:10 or 1:20 again depending on the complexity to be recorded. All levels should relate to Ordnance Datum. Any variations from this must be agreed with SCCAS.
- 1.12 A photographic record of the work is to be made, consisting of high resolution digital images.
- 1.13 Topsoil, subsoil and archaeological deposit to be kept separate during excavation to allow sequential backfilling of excavations.
- 1.14 Trenches should not be backfilled without the approval of SCCAS. Suitable arrangements should be made with the client to ensure trenches are appropriately backfilled, compacted and consolidated in order to prevent subsequent subsidence.

Reporting and Archival Requirements

- 2.1 The project manager must consult the Suffolk HER Officer to obtain a parish code for the work before commencement. These numbers will be unique for each project or site and must be clearly marked on all documentation relating to the work.
- 2.2 An archive of all records and finds is to be prepared, consistent with the principles of *Management of Research Projects in the Historic Environment (MoRPHE)* (English Heritage 2006). It must be adequate to perform the function of a final archive for deposition in the Archaeological Service's Store

or in a suitable museum in Suffolk (see Archaeological Archives Forum: a guide to best practice 2007).

- 2.3 Finds must be appropriately conserved and stored in accordance with guidelines from *The Institute of Conservation* (ICON).
- 2.4 Every effort must be made to get the agreement of the landowner to the deposition of the full site archive, and transfer of title, with the Archaeological Service or designated Suffolk museum. The intended depository should be stated in the WSI, for approval. If this is not achievable for all or parts of the finds archive then provision must be made for additional recording (e.g. photography, illustration, scientific analysis) as appropriate.
- 2.5 The project manager should consult the intended archive depository before the archive is prepared regarding the specific requirements for the archive deposition and curation, and regarding any specific cost implications of deposition. The intended depository must be prepared to accept the entire archive resulting from the project (both finds and written archive) in order to create a complete record of the project. A clear statement of the form, intended content, and standards of the archive is to be submitted for approval as an essential requirement of the WSI.
- 2.6 For deposition on the County Archaeological Store, the archive should comply with SCCAS Archive Guidelines. If the Archaeological Service's Store is not the intended depository, the project manager should ensure that a duplicate copy of the written archive is deposited with the Suffolk HER.
- 2.7 The WSI should state proposals for the deposition of the digital archive relating to this project with the Archaeology Data Service (ADS), or similar digital archive repository, and allowance should be made for costs incurred to ensure proper deposition (<http://ads.ahds.ac.uk/project/policy.html>).
- 2.8 A report on the fieldwork and archive, consistent with the principles of *MoRPHE*, must be provided. Its conclusions must include a clear statement of the archaeological value of the results, and their significance in the context of the Regional Research Framework (*East Anglian Archaeology*, Occasional Papers 3, 8 and 24, 1997, 2000 and 2011).
- 2.9 The results should be related to the relevant known archaeological information held in the SHER. It should include examination of all readily available cartographic sources (e.g. those in the County Records Office) to record evidence for historic or archaeological sites and history of previous landuses. Where permitted, photographs, photocopies or traced copies should be presented in the report. It should also incorporate an assessment of the potential for documentary research that would contribute to the archaeological investigation of the site.
- 2.10 A copy of the WSI should be included as an appendix to the report.
- 2.11 An unbound hardcopy of the report, clearly marked DRAFT, must be presented to SCCAS for approval within six months of the completion of fieldwork unless other arrangements are negotiated. Following acceptance, a single copy of the report should be presented to the Suffolk HER as well as a digital copy of the approved report.

- 2.12 Where appropriate, a digital vector trench plan should be included with the report, which must be compatible with MapInfo GIS software, for integration in the Suffolk HER.
- 2.13 SCCAS supports the OASIS project, to provide an online index to archaeological reports. At the start of work (immediately before fieldwork commences) an OASIS online record <http://ads.ahds.ac.uk/project/oasis/> must be initiated and key fields completed on Details, Location and Creators forms. When the project is completed, all parts of the OASIS online form must be completed and a copy must be included in the final report and also with the site archive. A .pdf version of the entire report should be uploaded to the OASIS website.
- 2.14 Where positive results are drawn from a project, a summary report must be prepared, in the established format, suitable for inclusion in the annual 'Archaeology in Suffolk' section of the *Proceedings of the Suffolk Institute of Archaeology and History*. It should be included in the project report, or submitted to SCCAS, by the end of the calendar year in which the work takes place, whichever is the sooner.
- 2.15 Where appropriate, a copy of the approved report should be sent to the local archaeological museum.

Requirements for Archaeological Excavation (updated March 2017)

An outline specification, which defines certain minimum criteria, is set out below. These requirements accompany, and should be used in conjunction with the project brief. If in doubt, clarification should be sought from SCCAS.

Fieldwork Requirements

- 1.1 If excavation is mechanised a toothless 'ditching bucket' 1.80m wide minimum must be used.
- 1.2 The topsoil may be mechanically removed (unless otherwise agreed) using an appropriate machine with a backacting arm and fitted with a toothless bucket, down to the interface layer between topsoil and subsoil or other visible archaeological surface. All machine excavation is to be under the direct control and supervision of an archaeologist. The topsoil should be examined for archaeological material.
- 1.3 Topsoil, subsoil and archaeological deposits should be kept separate during removal to allow sequential backfilling of excavations, unless otherwise agreed with the developer.
- 1.4 If the machine stripping is to be undertaken by the main contractor, all machinery must be kept off the stripped areas until they have been fully excavated and recorded, in accordance with this specification.
- 1.5 There is a presumption that excavation of all archaeological deposits will be undertaken by hand (including stratified layers; see below) unless it can be shown there will not be a loss of evidence by using a machine. The decision as to the proper method of excavation will be made by the senior project archaeologist with regard to the nature of the deposit.
- 1.6 Provision should be made for hand excavation of any stratified layers (e.g. dark earth) in 2.50m or 1.00m systematic and gridded squares, to be agreed on the basis of the complexity/extent of such layers with SCCAS. This should be accompanied by an appropriate finds recovery strategy which must include metal detector survey and on-site sieving to recover smaller artefacts/ecofacts.
- 1.7 All features which are, or could be interpreted as, structural must be fully excavated. Post-holes and pits must be examined in section and then fully excavated. Fabricated surfaces within the excavation area (e.g. yards and floors) must be fully exposed and cleaned. Any variation from this process can only be made by agreement with SCCAS, and must be confirmed in writing.

1.8 All other features must be sufficiently examined to establish, where possible, their date and function. For guidance:

a) A minimum of 50% of the fills of the general features is to be excavated. In some instances 100% may be requested, depending on the nature of the feature/deposit.

b) 10% of the fills of substantial linear features (ditches, etc) are to be excavated (min.). The samples must be representative of the available length of the feature and must take into account any variations in the shape or fill of the feature and any concentrations of artefacts. For linear features, 1.00m wide slots (min.) should be excavated across their width.

Any variation from this process can only be made by agreement [if necessary on site] with a member of SCCAS, and must be confirmed in writing.

1.9 Any natural subsoil surface revealed should be hand cleaned and examined for archaeological deposits and artefacts. Sample excavation of any archaeological features revealed may be necessary in order to gauge their date and character.

1.10 Metal detector searches must take place at all stages of the excavation, including the scanning of excavation areas before they are stripped, by an experienced metal detector user.

1.11 All finds will be collected and processed, unless variations in this principle are agreed SCCAS during the course of the excavation. The finds recovery policy should be addressed in the WSI. Sieving of occupation levels and building fills will be expected. All ceramic finds should be processed concurrently with the excavation to allow immediate assessment and input into decision making.

1.12 The WSI must provide details of a comprehensive sampling strategy for flotation, assessment and analysis of biological remains by an appropriate environmental specialist (for palaeoenvironmental and palaeoeconomic investigations and also for absolute dating), and samples of sediments and/or soils (for micromorphological and other pedological/sedimentological analyses. All samples should be retained until their potential has been assessed and until a retention strategy has been agreed. Where necessary, advice on the appropriateness of the proposed strategies should be sought from the Historic England Regional Advisor for Archaeological Science (East of England).

1.13 Human remains are to be treated at all stages with care and respect, and are to be dealt with in accordance with the law. They must be recorded *in situ* and subsequently lifted, packed and marked to standards compatible with those described in the Institute of Field Archaeologists' *Technical Paper 13: Excavation and post-excavation treatment of Cremated and Inhumed Human Remains*, by McKinley & Roberts. Proposals for the final disposition of remains following study and analysis will be required in the WSI.

1.14 Excavation record keeping is to be consistent with the requirements the Suffolk Historic Environment Record (HER) and compatible with its archive. Methods must be specified in the WSI and agreed with SCCAS.

- 1.15 Plans of any archaeological features on the site are to be drawn at 1:20 or 1:50, depending on the complexity of the data to be recorded. Sections should be drawn at 1:10 or 1:20 again depending on the complexity to be recorded. All levels should relate to Ordnance Datum. Any variations from this must be agreed with SCCAS.
- 1.16 A photographic record of the work is to be made, consisting of high resolution digital images (the image format and resolution should be specified in the WSI), and documented in a photographic archive.

General Management Requirements

- 2.1 The project manager must consult the Suffolk HER Officer to obtain a parish code for the work before commencement. These numbers will be unique for each project or site and must be clearly marked on all documentation relating to the work.
- 2.2 A timetable for fieldwork and assessment stages of the project must be presented in the WSI and agreed with SCCAS before the fieldwork commences.
- 2.3 A detailed risk assessment and management strategy must be presented for this project in the WSI.
- 2.4 The WSI must state the security measures to protect the site from vandalism and theft, and to secure deep any holes.
- 2.5 The composition of the project staff must be detailed and agreed (this is to include any subcontractors). For the site director and other staff likely to have a major responsibility for the fieldwork and post-excavation processing of this excavation there must also be a statement of their responsibilities or a CV for post-excavation work on other archaeological sites and publication record. Ceramic specialists, in particular, must have relevant experience from this region, including knowledge of local ceramic sequences.
- 2.6 Provision should be included in the WSI for public benefit in the form of outreach activities, for example (and where appropriate), open days/guided tours for the general public, local schools, local councillors, local archaeological and historical societies and for local public lectures and/or activities within local schools. Provision should be included for local press releases (newspapers/radio/TV). Where appropriate, information boards should be also provided during the fieldwork stage of investigation. The archaeological contractor should ascertain whether their client will seek to impose restrictions on public access to the site and for what reasons and these should be detailed in the WSI.
- 2.7 Every effort must be made to get the agreement of the landowner to the deposition of the full site archive, and transfer of title, with SCCAS or designated Suffolk museum. The intended depository should be stated in the WSI, for approval. If this is not achievable for all or parts of the finds archive then provision must be made for additional recording (e.g. photography, illustration, scientific analysis) as appropriate.
- 2.8 Monitoring of the archaeological work will be undertaken by SCCAS. A decision on the level of monitoring required for the fieldwork will be made by

SCCAS, in consultation with the project manager and once the fieldwork has commenced. Any unexpected discoveries, or on-site complications, should be communicated to, and discussed with, SCCAS.

- 2.9 The WSI should be approved before costs are agreed with the commissioning client, in line with Institute for Archaeologists' guidance. Failure to do so could result in additional and unanticipated costs. It is the archaeological contractor's responsibility to ensure that adequate resources are available to fulfill the Brief.
- 2.10 Suitable arrangements should be made with the client, and stated in the WSI, to ensure the site is appropriately closed after the completion of the excavation (and provision for infilling of dangerous holes during fieldwork) to comply with health and safety regulations. The site, and any deep and dangerous holes, should be only backfilled with the prior approval of SCCAS.
- 2.11 Following satisfactory completion of the fieldwork, SCCAS will advise the LPA that the fieldwork has been completed and that no further on-site work is required. Full construction work must not begin until archaeological excavation has been completed and formally confirmed in writing by the LPA.

Post-Excavation Assessment and Archival Requirements

- 3.1 Within four weeks of the end of fieldwork a written timetable for post-excavation assessment, updated project design and/or reporting must be produced, which must be approved by SCCAS. Following this, a written statement of progress on post-excavation work – whether assessment, analysis, report writing and publication or archiving – will be required at six monthly intervals.
- 3.2 A post-excavation assessment report (PXA) on the fieldwork should be prepared in accordance with the principles of *Management of Research Projects in the Historic Environment (MoRPHE)* (English Heritage 2006). The PXA will act as a critically assessed audit of the archaeological evidence from the site; see East Anglian Archaeology *Draft Post Excavation Assessments: Notes on a New Guidance Document* (2012).
- 3.3 In certain instances a full PXA might be unnecessary. The need for a full PXA or otherwise should be discussed and formally agreed with SCCAS within four weeks of the end of fieldwork.
- 3.4 The PXA must present a clear and concise assessment of the archaeological value and significance of the results, and identifies the research potential, in the context of the Regional Research Framework (*East Anglian Archaeology*, Occasional Papers 3, 8 and 24, 1997, 2000 and 2011). It must present an Updated Project Design, with a timetable, for analysis, dissemination and archive deposition. The PXA will *provide the basis for measurable standards* for SCCAS to monitor this work.
- 3.5 An archive of all records and finds is to be prepared, consistent with the principles of *MoRPHE*. It must be adequate to perform the function of a final archive for deposition in the Archaeological Store of SCCAS or in a suitable museum in Suffolk (see Archaeological Archives Forum: a guide to best practice 2007).

- 3.6 Finds must be appropriately conserved and stored in accordance with guidelines from *The Institute of Conservation* (ICON).
- 3.7 The project manager should consult the intended archive depository before the archive is prepared regarding the specific requirements for the archive deposition and curation, and regarding any specific cost implications of deposition. The intended depository must be prepared to accept the entire archive resulting from the project (both finds and written archive) in order to create a complete record of the project. A clear statement of the form, intended content, and standards of the archive is to be submitted for approval as an essential requirement of the WSI.
- 3.8 The PXA should offer a statement of significance for retention, based on specialist advice, and - where it is justified – the UPD should propose a discard strategy. This should be agreed with the intended archive depository.
- 3.9 For deposition in the SCCAS's Archaeological Store, the archive should comply with SCCAS Archive Guidelines. If this is not the intended depository, the project manager should ensure that a duplicate copy of the written archive is deposited with the Suffolk HER.
- 3.10 The UPD should state proposals for the deposition of the digital archive relating to this project with the Archaeology Data Service (ADS), or similar digital archive repository, and allowance should be made for costs incurred to ensure proper deposition (<http://ads.ahds.ac.uk/project/policy.html>).
- 3.11 An unbound hardcopy of the PXA and UPD, clearly marked DRAFT, must be presented to SCCAS for approval within six months of the completion of fieldwork unless other arrangements are negotiated. Following acceptance, a single hard copy of the report should be presented to the Suffolk HER as well as a digital copy of the approved report.
- 3.12 On approval of an adequate PXA and UPD, SCCAS will advise the LPA that the scheme of investigation for post-excavation analysis, dissemination and archive deposition has been agreed, and that can be discharged.
- 3.13 Where appropriate, a copy of the approved PXA should be sent to the local archaeological museum, whether or not it is the intended archive depository. A list of local museum can be obtained from SCCAS.
- 3.14 SCCAS supports the OASIS project, to provide an online index to archaeological reports. At the start of work (immediately before fieldwork commences) an OASIS online record <http://ads.ahds.ac.uk/project/oasis/> must be initiated and key fields completed on Details, Location and Creators forms. When the project is completed, all parts of the OASIS online form must be completed and a copy must be included in the final report and also with the site archive. A .pdf version of the entire report should be uploaded to the OASIS website.
- 3.15 Where positive results are drawn from a project, a summary report must be prepared, in the established format, suitable for inclusion in the annual 'Archaeology in Suffolk' section of the *Proceedings of the Suffolk Institute of Archaeology and History*. It should be included in the project report, or

submitted to SCCAS, by the end of the calendar year in which the work takes place, whichever is the sooner.

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Requirements for a Geophysical Survey (updated March 2017)

An outline specification, which defines certain minimum criteria, is set out below. These requirements accompany, and should be used in conjunction with, the project brief.

General Requirements

- 1.1 Geophysical surveys must be undertaken in compliance with the standards and guidelines set out by Historic England (2008) and ClfA (2014).

Additional Requirements for Reporting and Archiving

- 1.1 The project manager must consult the Suffolk HER Officer to obtain a parish code for the work before commencement. These numbers will be unique for each project or site and must be clearly marked on all documentation relating to the work.
- 1.2 The survey methodology should be set out carefully, and explained as appropriate. It must include a non-technical summary to make the report intelligible to both specialists and non-specialists.
- 1.3 The report must include details of how the survey was geolocated, the instrument used for the survey, its configuration and the sampling intervals used.
- 1.4 The report must list the types of process which have been applied to the geophysical survey data and for each operation state relevant parameters (e.g. the cut-off threshold for despiking).
- 1.5 The report must include images of both unprocessed (without smoothing or filtering) and also processed data, as well as interpretative plans (accompanied by a full key).
- 1.6 Greyscale plots should use an appropriate data range and a scale must be included on plans.
- 1.7 Digital, geo-referenced copies of the geophysical survey plans should be supplied with the report for inclusion in the Suffolk HER.
- 1.8 The results of the geophysical survey should be easily related to present-day landscape features and the National Grid.
- 1.9 The objective account of the evidence must be clearly distinguished from its archaeological interpretation.
- 1.10 SCCAS supports the OASIS project, to provide an online index to archaeological reports. At the start of work (immediately before fieldwork commences) an OASIS online record <http://ads.ahds.ac.uk/project/oasis/> must be initiated and key fields

completed on Details, Location and Creators forms. When the project is completed, all parts of the OASIS online form must be completed and a copy must be included in the final report and also with the site archive. A .pdf version of the entire report should be uploaded to the OASIS website.

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Additional Requirements for a Palaeoenvironmental Assessment (updated March 2017)

An outline specification, which defines certain minimum criteria, is set out below. These requirements accompany, and should be used in conjunction with, the project brief.

- 1.1 The assessment will establish the potential for the survival and significance of geoarchaeological and palaeoenvironmental evidence with reference to adjacent and regional sequences, and to national frameworks. The project will need to consider the following objectives:
 - 1.1.1 The characterisation of the sequence, and patterns of the accumulation of palaeoenvironmental/ geoarchaeological deposits across the development area, including the depth and lateral extent of major stratigraphic units, and the character of any potential land surfaces/buried soils within or pre-dating these sediments.
 - 1.1.2 Identify significant variations in the deposition sequences indicative of localised features, particularly in relation topographic variation and the presence of features such as palaeochannels.
 - 1.1.3 Identify the location and extent of any waterlogged organic deposits and where appropriate and practical, to retrieve suitable samples in order to assess the potential for the preservation of environmental remains and material for scientific dating.
 - 1.1.4 Clarify the relationship between sediment sequences and other deposit types, including periods of 'soil', peat growth, and archaeological remains.
 - 1.1.5 To provide for the absolute dating of critical contacts.
 - 1.1.6 To focus academically upon the high potential for this site to produce palaeoenvironmental evidence, with the potential to inform on our understanding of past environments, palaeoclimates, sea-level changes and human interaction.
 - 1.1.7 To make the results of the investigation available through suitable reportage.
- 1.2 Archaeological contexts should be sampled for palaeoenvironmental remains and if suitable deposits are identified a number of cores/column samples should be taken and retained to assess the potential of the site. Best practice should allow for sampling of interpretable and datable archaeological deposits and provision should be made for this. The contractor shall show what provision has been made for specialist environmental assessment of the site and must provide details of the sampling strategies for retrieving artefacts, biological remains (for

palaeoenvironmental and palaeoeconomic investigations), and samples of sediments and/or soils (for micromorphological and other pedological/sedimentological analyses. This will follow the English Heritage guidance Environmental Archaeology, *A guide to the Theory and Practice of Methods, from Sampling and Recovery to Post excavation* (2011). If required, advice on the appropriateness of the proposed strategies should be sought from the Historic England Regional Advisor for Archaeological Science (East of England). It may be necessary to discuss the sampling strategy on site, depending on the deposits.

- 1.3 The cores/sections should be assessed for pollen and plant macrofossils. In addition, the samples may be assessed for diatoms, foraminifera, insect, and molluscs. Provision should be made for the dating of suitable deposits and requirements for any AMS and OSL dating and samples may be submitted to the contractor's preferred dating laboratory.
- 1.4 The palaeoenvironmental assessment must be undertaken by an environmental archaeologist of recognised competence, fully experienced in work of this character and formally acknowledged by the SCCAS. Details, including the name, qualifications and experience, of the site director and all other key project personnel (including specialist staff) will be communicated to SCCAS as part of a specification of works that conforms to the guidelines contained in English Heritage's MoRPHE publication.