

**Non-Invasive Archaeological Investigations for the Aberdeen Western Peripheral Route
(AWPR Package)**

Project code: AWPR-002

Employer: AWPR Managing Agent

Consultant: Jacobs UK Ltd



**ABERDEEN WESTERN PERIPHERAL ROUTE PACKAGE
(FASTLINK)**

Red Moss Wetland (Site 67) and Blackburn Moss Wetland (Site 119)

Palaeoenvironmental Assessment



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Red Moss Wetland (Site 67) and Backburn Moss Wetland (Site 119)

Palaeoenvironmental Assessment

Contract:	Non-Invasive Archaeological Investigations for the Aberdeen Western Peripheral Route (AWPR Package)
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Schedule	
Fieldwork	August 2012 and October 2012
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SUMMARY

Palaeoenvironmental surveys using a manual gouge auger were conducted across two areas of wetland identified as having the potential to contain sediments of palaeoenvironmental potential on the Fastlink route of the proposed Aberdeen Western Peripheral Route (AWPR) scheme prior to any construction work being undertaken. The aims of the survey were to establish the presence of any deposits of palaeoenvironmental interest (e.g. peats and organic muds); establish the depth and nature of these deposits and their likely chronology; and the potential of these deposits to inform on landscape change in order to provide recommendations for the mitigation of impact deemed necessary to alleviate the impact of the development.

The results of the survey showed that peats were present at both sites and that these peats existed as pockets of peatland rather than as a continuous peat cover across the whole of each area. At Red Moss Wetland (Site 67) a maximum peat depth of 1.2m was attained in the southern part of the site, while at Blackburn Moss Wetland (Site 119) a maximum depth for peat of 1.5m was achieved. Peats in both locations were observed as having accrued over infilled shallow water bodies, which formed within small hollows in the landscape. The peat sequences suggest the formation of sedge and grass swamp communities following the initial infilling and peat development and then later the colonisation of trees onto the peatland, likely to represent taxa such as birch, alder and willow. At Blackburn Moss Wetland (Site 119) a cover of alder carr-woodland is still present on the site suggesting it has changed little since this first colonisation of woodland. At Red Moss Wetland (Site 67) no trees are currently present on the peatland.

Despite the relatively shallow depth of the peats, other studies located near to these sites and from across Aberdeenshire (e.g. Durno, 1961, Tipping *et al*, unpublished), have shown that they have the potential to have begun accruing during the early Holocene. This has been shown from both radiocarbon dated sequences and from pollen assemblages of non-dated sequences (showing species typical of an early Holocene environment). Therefore both peat sequences have the potential to contain information relating to landscape and vegetational change from the early Holocene onwards.

At Blackburn Moss Wetland (Site 119) there are significant archaeological monuments and features in the immediate surrounding landscape, including a scheduled monument of roundhouses and agricultural systems (White Hill House), megalithic standing stones and cairn burials. These features located so close to the site indicate the pollen sequence here would have great potential to inform on associated anthropogenic activity in the landscape. At Red Moss Wetland (Site 67) there is similar potential, however, the archaeological record immediately around this site is restricted to the finding of a Late Bronze Age sword from the nearby site of Red Moss.

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1 Introduction

1.1 General

- 1.1.1 This document is submitted as the report on the palaeoenvironmental assessment of two sites (Red Moss Wetland, Site 67 and Blackburn Moss Wetland, Site 119) located on the proposed route of the Fastlink of the Aberdeen Western Peripheral Route. The palaeoenvironmental assessment is part of a programme of archaeological non-invasive investigations to facilitate the construction of the Aberdeen Western Peripheral Route (AWPR) and associated schemes. The work was undertaken in accordance with a specification prepared by Jacobs UK Ltd within the Invitation to Tender (ITT) (Aberdeen City Council 2012).
- 1.1.2 The AWPR is proposed as both a bypass and a distributor road around the City of Aberdeen. The route envisages the construction of a wholly new dual carriageway some 34.6km long around Aberdeen, together with a link to Stonehaven some 11.5 km long, and includes associated side roads and junctions. The AWPR is divided into three sections; the Northern Leg, Southern Leg and Fastlink (Illus 1).
- 1.1.3 The Employer is the AWPR Managing Agent, administrator of the Commission on behalf of Aberdeen City Council (ACC) and its funding partners. The Consultant is Adam Brossler of Jacobs UK Ltd. The Engineer for the A90 Balmedie to Tippetty Scheme is Grontimij who also facilitated access to the survey areas. The Contractor is Headland Archaeology (UK) Ltd, the archaeological organisation appointed by the AWPR Managing Agent to carry out the work reported here. Historic Scotland provides advice, supervision and oversight of the content, conduct and quality of archaeological aspects of the Contract, acting in support of Transport Scotland.
- 1.1.4 On the 22nd-23rd of August 2012 and 22nd of October 2012 Headland Archaeology undertook the palaeoenvironmental assessment of Sites 69 and 119 to the specification provided in the ITT (Aberdeen City Council 2012). This project was managed by Russel Coleman (Contract Manager) and Sorina Spanou (Project Manager). Fieldwork for this survey was undertaken by Dr Scott Timpany and Steve Roe. Reporting was undertaken by Dr Scott Timpany.

1.2 Background to the Project – AWPR

- 1.2.1 Desk-based assessment undertaken in support of the cultural heritage chapter of the Environmental Statement (ES) identified a total of 316 sites of cultural heritage significance along or close to the route (Jacobs UK Ltd 2007). Chapters 13 (Northern

Leg), 28 (Southern Leg) and 43 (Fastlink) (Cultural Heritage and Archaeology) of the ES for the scheme recommends measures to be undertaken to evaluate or mitigate potential impacts of the scheme on the cultural heritage resource. These recommendations include both invasive and non-invasive archaeological evaluation followed by archaeological mitigation.

1.2.2 Based on the requirements of the ES and the results of subsequent dialogue with Historic Scotland, the following non-invasive archaeological investigations are required across all sections of the scheme:

- topographic survey
- palaeoenvironmental assessment
- geophysical survey.
- field walking
- metal detector survey and
- building recording

1.2.3 The present report deals with the palaeoenvironmental assessment of Red Moss Wetland (Site 67) and Blackburn Moss Wetland (Site 119) located on the proposed Fastlink of the AWPR route.

1.3 Aims and Objectives

1.3.1 The general aim of the archaeological non-invasive investigations is to identify the extent and character of known and unknown archaeological remains in order to enable a programme of mitigation to be designed. More specific aims and objectives are as follows:

1.3.2 Two areas of peatlands were identified along the Fastlink route of the planned Aberdeen Bypass road scheme. These areas have been identified as having potential to contain deep sediment sequences of peats and silts, which are of palaeoenvironmental significance. The waterlogged, anaerobic nature of these sediments means that they preserve microfossils (e.g. pollen, diatoms) and macrofossils (e.g. seeds, wood) that can be used to reconstruct the landscape history of these areas. The presence of such deposits also means there is potential for the discovery of cultural materials within them, such as wooden objects and structures. The main objective for the palaeoenvironmental surveys of these areas is to determine the palaeoenvironmental and archaeological potential of these deposits.

1.3.3 The key aims to achieve this objective are:

- to establish the presence of any palaeoenvironmentally significant deposits within the target areas.
- to establish the depth of any palaeoenvironmentally significant deposits within the target areas.
- to establish the nature of the deposits and the depositional processes of the sediments within the target areas.
- to establish the potential of these deposits to inform on landscape change in the local and wider regions of the target areas.

1.3.3 The results will be disseminated through deposition of an ordered archive and a detailed report at the National Monument Records of Scotland (NMRS), and publication at a level of detail appropriate to the significance of the results.

1.3.4 The results of the non-invasive investigations will enable a more accurate assessment of the potential impact of the scheme on archaeological remains and the design of any further evaluation works and an appropriate programme of mitigation works (if necessary). Such works will form part of a separate contract.

1.4 Site Locations & Descriptions

1.4.1 The site of Red Moss Wetland (Site 67) is the more northern of the two peatland sites on the Fastlink part of the new road scheme (Illus 1). The site lies approximately 0.7km north east of the hamlet of Cookney and c. 15km south west of the city of Aberdeen. The site lies on the Skene coastal lowland formation, which was significantly effected by the Devensian ice-sheets, causing intense scouring of the landscape and subsequent burial of this eroded surface beneath till (sands and gravels) deposits as the ice-sheets retreated and melted (Murdoch, 1975; Tipping, 2007). The site itself is fairly small being approximately 0.25km in length and 0.1km in width. There is broadly a north/south distribution of sediments across Site 67, with peats restricted to the southern part of the site and peaty podzol in the northern part. These two areas are delineated by a sharp rise in the ground surface, marking out the slope with shallower soils and agricultural land to the north to the dip where wet ground dominates, seen by the colonisation of wetland plants such as soft rushes and sedges together with floating mats of vegetation.

1.4.2 The site of Blackburn Moss Wetland (Site 119) is located some 3km to the south of Red Moss Wetland (Illus 1). The site is situated approximately 2.5km north of Cowie Park, Stonehaven and c. 18km to the south west of the city of Aberdeen. As at Red Moss wetland the site lies on the Skene coastal lowland formation (see above). The site itself is around 1.8km in length and between approximately 0.3km and 0.05km in width. The area covered by the site is largely rough pasture land, with areas of wet alder-carr woodland in the central part of the site containing standing water.

2 Methods

2.1 Fieldwork

- 2.1.1 A manual gouge auger with a 1000 x 30mm chamber was used in the field to investigate the depth and nature of the deposits present. A total of 12 auger points (APs) were undertaken across Site 67, Red Moss Wetland, while a total of 45 APs were conducted at Site 119, Blackburn Moss Wetland. At each AP the type and depth of sediments encountered was recorded using the Troels-Smith (1955) guide to sediment characterization, together with the presence of any visible plant macrofossils such as wood fragments. Augering was conducted until contact with the pre-Holocene surface was established or until impenetrable strata (e.g. stone) was encountered. The position of all APs was surveyed in the field using a handheld GPS with a Wide Area Augmentation System (WAAS).
- 2.1.2 All field records and other products of the work shall be archived with the National Monuments Record of Scotland (NMRS) and the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS), following and adhering to its standards and guidance for project archiving (RCAHMS 1996a, b).

2.2 2D Contour Map Reconstruction

- 2.2.1 The auger and survey data collected in the field have been entered into a digital surface mapping and contouring program (SURFER10) to produce a 2D contour model of peat thickness across the targeted area (Illus 3, 4). The model uses the data collected in the field to interpolate the thickness and presence of peats across the area. Information has been taken from geotechnical logs of borehole and test pit data (Norwest Holst 2006a, b) together with the auger data from the field work results to construct the 2D maps.

3 Palaeoenvironmental Background of Peat Formation in the Study Area (Aberdeenshire)

- 3.1 In order to place the peat deposits of this study within the regional context for Aberdeenshire, the following section provides an overview of palaeoenvironmental work that has been done to date in this Area of Interest (AOI) in Aberdeenshire (defined as within 20km of the planned route of the new road). Reference is also made to some sites outside of this area; the location of all sites mentioned is presented in Illustration 2. This overview is primarily concerned with the depths of peat encountered and chronology of peat development within this part of Aberdeenshire.

- 3.2 There are two types of peatlands present across the AOI, blanket peats and raised mires. Raised or ombrotrophic mires differ from blanket peats as they receive all their water from precipitation, as such they hold key records of palaeoclimate change through reconstructing changing precipitation rates to show periods of wet and dry climate (e.g. Barber *et al*, 1994, 2000; Langdon and Barber, 2005). Raised mires get their name from the dome that forms, usually in the middle of the mire as peat accrues; the mires developing usually over infilled shallow lakes or basins. Conditions at the edge of the raised mire are usually much wetter and can often be found to support *Sphagnum* (usually *Sphagnum cuspidatum* and *Sphagnum fallax*) communities in pools or as lawns (e.g. Durno, 1957). Blanket mires develop where peat spreads out from initial foci, such as small upland basins. The spread of blanket mire can occur over a relatively rapid period (Tipping, 2008) and Tipping (2007) notes that it would undoubtedly have had a considerable impact upon any human populations living in effected areas.
- 3.3 Illustration 2 shows that there have been a reasonable number of palaeoenvironmental and peatland studies within the AOI. However, as noted by Tipping (2008) in a recent review of palaeoenvironmental work that has been undertaken across Aberdeenshire as a whole, a considerable number of these studies lack radiocarbon dates, which would allow their studied sequences to be placed in a chronological context. It is worth noting that of the ten studies located within the AOI only two have assigned radiocarbon dates (Vasari, 1977 and Tipping *et al* unpublished). This lack of dating evidence is largely ascribed to the age of the studies, when radiocarbon dating was relatively new and not done as standard.
- 3.4 This lack of dating evidence means that few definitive ages can be placed on the age of peat development across the AOI. However, Late Glacial peat development is thought to be unlikely, with Tipping (2007) observing that sites where such peats have been recorded as accruing during this period lie outside of this area. Where they occur, seems to be in scattered locations across Aberdeenshire (Illus 2), such as at Garral Hill where peat formation has been dated to 14,454-13,331 cal BP (Q-101; 11,350±300 BP) at a depth of 2.2m (Godwin and Willis, 1959). Another such site is Woodhead, Fyvie where peats have been dated to 12,851-12,556 cal BP (SRR-1723; 10,780±50 BP) (Connell and Hall, 1987). These peats are then capped by overlying solifluction deposits (of silts and/or clays) marking the Younger Dryas Stadial (Tipping, 2007).
- 3.5 Vasari (1977) has recorded organic muds (gyttja) deposits of Late Glacial date at Loch of Park, a lake site which lies within the AOI. These have been dated to 14,570-13,286 cal BP (HEL-417; 11,900±260 BP) from lake sediments at a depth of 3.4m. However, as no lake coring is within the remit of these works it is thought there is low potential for peats of such age to be encountered.
- 3.6 Early Holocene peat development has been recorded within the AOI at Moss-side, near Aberdeen, where peat formation has been dated as taking place at 9540-9470 cal BP (SUERC-17352; 8505±30 BP) at a depth of 0.75m overlying a previous pond of open water (Tipping *et al*, unpublished). While outside of the AOI at places such as St Fergus Moss, near Peterhead peat development has been recorded as starting at between 9650-9290 cal BP (SUERC-35407; 9950±35 BP) and 9470-9420 cal BP (SRR-6640;

8328±51 BP), at depths of 4.68m and 2.55m, respectively (Timpany *et al*, 2011; Clark and Edwards, 2004). Peats and organic mud sediments of Early Holocene date have also been recorded at sites in the Cairngorms (e.g. Pears, 1975a, 1975b; Rapson, 1985; Huntley, 1994) leading Tipping (2007) to postulate that peat initiation began in Aberdeenshire during the period 10,600-9800 cal BP.

- 3.7 The variation seen in the depths at St Fergus Moss, together with the early dates from the relatively shallow sequence at Moss-side highlights that depth of sediments alone cannot be used to determine the likely age of peats encountered. The difference in peat depths is seen across the AOI with peat depths of between 0.75m at Moss-side (Tipping *et al*, unpublished) and 6.59m at Netherley Moss (Durno, 1956, 1957, 1961) recorded. This variation in depth will also no doubt be controlled by factors, such as the geomorphic setting of the site and whether they have been affected by later anthropogenic alteration such as agricultural activity, which may remove the upper layers of some deposits.

4 Results

4.1 Red Moss Wetland, Site 67

- 4.1.1 There is broadly a north/south distribution of sediments across Site 67, with peats restricted to the southern part of the site and peaty podzol in the northern part (Illus 3). These two areas are delineated by a sharp rise in the ground surface, marking out the slope with shallower soils and agricultural land to the north to the dip where wet ground dominates, seen by the colonisation of wetland plants such as soft rushes and sedges together with floating mats of vegetation.
- 4.1.2 The northern half of the site consists of shallow sediment sequences of between 0.23m (AP5) to 0.53m (AP4) in depth. Here a top sediment unit of dark brown peaty podzol soil is present, which attains a maximum depth of 0.32cm (AP4). This sedimentary unit has a top layer of approximately 0.05-0.12m containing modern plant roots, which then grades into a peaty podzol containing coarse sand and sub-angular to angular gravel inclusions. It is likely these inclusions have derived from the underlying sand deposits (e.g. through ploughing) together with erosion episodes from the surrounding hill sides. In one location (AP5) the peaty podzol was seen to overlie reddy-brown clayey silt with fine sand inclusions. It is likely this silt extends from that seen in the southern area of the site (see below); with this location being near the southern edge. A very small band of peat (0.01cm thick) was recorded at AP4 within the reddy-brown clayey silt unit. This represents the only peat found in the northern half of the site. This general absence of peat is also shown from the borehole records from points in the north of the site and to the south east (Norwest Holst, 2006a, 2006b).
- 4.1.3 Dark brown peat with visible monocotyledon plant fragments (likely to represent sedge and grass remnants) is present in the southern area (see Illus 3). The peat deposit in this area had a maximum depth of 1.25m (AP10) and shallow to 0.17m (AP8) at the very

southern edge. Wood fragments are present sporadically within this peat unit (II) indicating the presence of former trees on this wetland area. This peat at Red Moss Wetland lies some km to the east of the main area of peatland at Red Moss. There are no dates available for peat formation at Red Moss, however, the finding of a Late Bronze Age leaf-shaped sword under the peats (Coles, 1959-60), not only provides evidence for the presence of people in this area during this period but also a potential date for peat inception. Underlying the peat was a unit of dark grey clay with monocotyledon plant fragments (Unit III), which is likely to represent a shallow water body present prior to peat formation. The occurrence of organic materials within the clays suggests it was slowly infilled by vegetation, which allowed peat to develop. At AP10 this clay layer was underlain by stone.

Table 1 - Sedimentary sequence of deepest peat at AP10, Site 67

Unit	Sediment	Depth (m)
II	Dark brown monocotyledon peat with occasional wood fragments	0-1.25
III	Dark grey peaty clay with monocotyledon plant fragments	1.25-1.30
-	Stone	1.30

4.2 Backburn Moss Wetland, Site 119

- 4.2.1 The sediments encountered across much of Backburn Moss Wetland were very shallow sequences between 0.14m (AP21) and 0.47m (AP16) in depth. These sequences are similar to those at Red Moss Wetland, consisting of a dark brown peaty podzol soil with an upper layer containing modern root material of c. 0.06-0.16m in thickness and below this containing coarse sand and sub-angular to angular gravel inclusions. This peaty podzol achieved a maximum depth of 0.41m at AP16. Underlying this unit was generally found to be a brown to grey silty, medium sand unit with sub-angular and angular gravels; this unit is considered to represent a glacial till layer. In some locations, such as at AP32 and AP36 dark brown to brown peaty silt with monocotyledon plant fragments has been recorded below the peaty podzol layer indicating the presence of relatively short-lived episodes of sedge, reed and grass wetlands. These silt layers tend to be thin and a maximum thickness of 0.11m was recorded at both AP32 and AP36 (see Appendix 1).
- 4.2.2 No peats were recorded in the borehole and test pit records for this area (Norwest Holst, 2006a, 2006b). However, augering has shown peats are present across Backburn Moss Wetland (Illus 4), which are seen to achieve maximum thickness of 1.5m at AP23 in the middle of the site. This part of the site is currently occupied by an area of alder-carr woodland and sedge tussocks. The sedimentary sequence from AP23 is provided in Table 2. The upper layers of the peats at AP23 were not recovered and were washed

out of the chamber due to the presence of standing water in this area. Below this level is dark brown peat with visible monocotyledon plant fragments and occasional wood fragments, indicating periodic tree presence, while sedges and grasses would have occurred throughout this phase of peat growth. A similar peat is present below this unit containing more frequent wood fragments suggesting tree growth took place on the mire throughout this period. The underlying monocotyledon peat unit contains no visible wood fragments, indicating a treeless, probable sedge swamp environment existed. A similar environment is envisaged from the underlying dark brown silty monocotyledon peat), which marks the beginning of peat formation overlying stone at the bottom of the sequence. At AP24 peat was found to be underlain by dark grey-brown silty, peaty clay in turn underlain by brown silty medium to coarse sand and provides further stratigraphic information for this central section of the site. The basal sedimentary sequence at AP24 indicates that peat formed as a shallow pool became infilled by vegetation (indicated by the peaty clay). The underlying sands are again assumed to represent glacial materials, which overlay stone at the base of the sequence (see Appendix 1).

Table 2 - Sedimentary sequence of deepest peat at AP23, Site 119

<i>Unit</i>	<i>Sediment</i>	<i>Depth (cm)</i>
II	No recovery – washed out of chamber	0-50
II	Dark brown peat with visible monocotyledon plant fragments and occasional wood fragments	50-128
II	Dark brown peat with visible monocotyledon plant fragments and wood fragments	128-140
II	Dark brown peat with visible monocotyledon plant fragments	140-149
II	Dark brown silty peat with visible monocotyledon plant fragments	149-150
-	Stone	150

4.2.3 Outside of this area peats are fairly shallow with a maximum thickness of 0.4m at AP4 in the southern part of the site and 0.16m at AP33 in the northern part of the site. Peat in the southern part of the site is dark brown peat with visible monocotyledon plant fragments, suggesting the presence of a former sedge swamp environment. At AP4 there are levels within the peat where inclusions of sub-angular and angular gravels together with coarse sand were recorded, indicating probable erosional episodes from the surrounding slopes (e.g. from ploughing activity) causing the inclusion of potentially older material. A 0.04m band of grey clay with coarse sand inclusions near the top of the sequence at AP4 may also indicate the deposition of colluvial material from such an erosional episode. In the northern part of the site, peat is recorded in one location (AP33) and contains similar evidence for erosional episodes with coarse sand and sub-angular to angular gravel inclusions within the upper levels of the peat (see Appendix 1).

Within this peat wood fragments were also visible indicating the presence of former trees standing within the mire. In both of these locations the peat is recorded as forming above grey, silty, clayey coarse sand with sub-angular to angular gravels again suggested to represent glacial till deposits.

- 4.2.4 The area surrounding the Blackburn Moss Wetland has some interesting archaeological features located within a couple of kilometres of the site. To the west lies the scheduled monument of White Hill House and Field system consisting of the remains of two roundhouses and stony banks thought to demark prehistoric field systems (RCAHMS, 1984). Thus White Hill House and Filed system shows the presence of former prehistoric settlement and potential agricultural activity in this area. A finding of a Late Bronze Age sword within the peats within the site near Fishermyle (termed in the records as Moss of Cowie), again indicates the presence of prehistoric communities in this area (Coles, 1962). Further evidence for the presence of prehistoric communities is highlighted by the cairns at Hill of Allochie, lying to the west and the cairn at Cantlay Hills to the east, together with the megalithic stones and possible cist burial at Kempston Hill to the south (RCAHMS, 1984).

5 Discussion

- 5.1 The results of the augur survey have shown that peats are not present extensively across the two sites; at Red Moss Wetland peats are present only in the southern part of the site and at Blackburn Moss Wetland mainly in the southern and central sections. Maximum peat depths are relatively shallow at both sites with a maximum thickness of 1.2m at Red Moss Wetland and 1.5m at Blackburn Moss Wetland (Illus 3 and 4). The results show the presence of fragmented peats rather than continuous peat spread across the two areas. The sedimentary results suggest these peats formed initially from small hollows which contained water, that gradually infilled with vegetation allowing peats to develop. Both sites show a transition from initial monocotyledon peats, likely to represent sedge swamps, to a monocotyledon peat with wood fragments, showing the colonization of these areas by trees (e.g. alder, birch, willow). At Red Moss Wetland no trees currently exist on the site, showing that at some point it became treeless, possibly as conditions got too wet for tree growth or due to the effects of grazing animals; sheep are known to graze on the site. At Blackburn Moss Wetland, alder-carr woodland is still present on the peats and indicates this site has changed little since the initial establishment of this woodland highlighted by the wood fragments in the peats.
- 5.2 At maximum depths of 1.2m and 1.5m the peats are among some of the shallower peat sequences recorded within this part of the AOI. At nearby Netherley Moss (Illus 2) peats have been recorded of 6.59m in depth, which although undated are suggested from the pollen records to date from the early Holocene (Durno, 1956, 1957, 1961). Although relatively shallow the peat sequences at Red Moss Wetland and Blackburn Moss Wetland have the potential to have formed during the early Holocene. Radiocarbon

dated peats in the area, such as at Moss-side, near Aberdeen have shown that even shallow peats may have formed during the early Holocene (Tipping *et al*, unpublished), with the tops of the peats having been lost to later anthropogenic activity (e.g. ploughing and peat cutting).

- 5.3 The finding of a Late Bronze Age sword, reportedly from the base of the peats at Red Moss to the west of Red Moss Wetland (Balnagubs) (Coles 1962, 82) indicates peat formation in this area may be relatively late beginning in the Late Bronze Age. However, this late date for peat formation is not seen at any of the other radiocarbon dated sites in Aberdeenshire, with peat having formed prior to this date and lies outside of Tipping's (2007) estimate for initial peat formation in Aberdeenshire of 10,600-9800 cal BP. This may reflect the absence of dating evidence for many of the studied sites or an inaccuracy in the account of the depth of where the sword was recovered from at Red Moss.
- 5.4 Despite the lack of radiocarbon dates for many of the sites, the pollen records have confirmed the early Holocene date for peat initiation by containing assemblages typical of these initially treeless landscapes and subsequently recording the migration of trees back into this area (e.g. Fraser and Godwin, 1955, Durno, 1961, 1970). Where dates have confirmed the establishment of peats during this period, pollen records have also been able to show the presence of people in the landscape and their impact on the local environment from the Mesolithic (e.g. Edwards 1979, 1990; Edwards *et al*, 2000) through to relatively recent times (e.g. Edwards and Rowntree, 1980). Thus the two sequences from Red Moss Wetland and Blackburn Moss have similar potential. The presence of significant archaeological monuments and features in the landscape surrounding Blackburn Moss Wetland indicates there would be considerable potential for similar findings in the sequence at this location.

6 Conclusions

- 6.1 Augur survey work at Red Moss Wetland and Blackburn Moss Wetland on the Fastlink part of the New Aberdeen Bypass, revealed the presence of small pockets of peats at both sites.
- 6.2 Maximum peat thickness at Red Moss Wetland was 1.2m and 1.5m at Blackburn Moss Wetland.
- 6.3 The peats showed a sequence of initiation from infilled pools of water, through to sedge swamp and finally carr-woodland and sedge swamp environments.

- 6.4 Despite the relatively shallow depth of the deepest peats encountered on the sites, peat studies in Aberdeenshire have shown peat initiation may still have begun in the early Holocene.
- 6.5 The peats have the potential to contain pollen sequences that can inform on tree migration and vegetational change, together with anthropogenic activity. At Blackburn Moss Wetland the presence of significant archaeological features in the surrounding landscape suggests records of human activity would be present in the pollen sequence.

7 Statement on the Palaeoenvironmental potential and recommendations for mitigation

- 7.1 The presence of peats at both locations indicates there is good potential for the presence of waterlogged plant remains (e.g. pollen, seeds) which can provide information on the vegetational history of these sites. The observation of well preserved monocotyledon plant remains and wood fragments within the peats also indicates good potential for the preservation of plant remains. The dated peat sequences and pollen assemblages from undated peat sequences in this area of Aberdeenshire (e.g. Durno, 1956, 1961) indicates peats in this area developed largely during the early Holocene. The presence and activities of early human populations in the Mesolithic period has also been evidenced from pollen studies in this area (e.g. Edwards 1979, 1990; Edwards and Ralston, 1984). Thus the peat sequences within these areas have the potential to further knowledge of early Holocene landscape change and human interaction with the environment during this period.
- 7.2 The presence of significant archaeological monuments and features in the immediate surrounds of Blackburn Moss Wetland, including roundhouses, field systems, megalithic standing stones and cairn burials, shows the peat sequence from this location has great potential to provide further evidence of associated activities in the landscape (e.g. farming evidence and associated woodland clearances). Pollen analysis of these sediments provides an opportunity to investigate these sites without the need for full-scale excavation of the sites themselves. The differing ages of the sites also offers an opportunity to look at how the landscape changed between these different periods of activity.
- 7.3 Given the significance of the archaeology in the immediate vicinity of Blackburn Moss Wetland it is recommended that a core be taken from the location of the deepest peats encountered for radiocarbon dating and further analysis. The chronology of the sequence can be attained through the radiocarbon dating of the top and basal layers of the peats in order to see if the peat sequence contains those periods, where archaeological evidence has shown the presence of people in the surrounding landscape. If the dates are agreeable with the archaeology it is recommended that pollen analysis (local and regional vegetation), together with Loss on Ignition (erosion events) and plant macrofossil (local vegetation) analysis is undertaken from the core in

order to investigate the impact of people in the landscape during the periods the archaeological features were active.

- 7.4 The comparative lack of archaeological materials and features near to the site at Red Moss Wetland, together with its relatively shallow peat sequence indicates this site is not as important as Backburn Moss Wetland and therefore no further work is recommended.

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9 Appendices

9.1 Appendix 1 Survey results

Unit key:	1	Peaty Podzol	
	2	Peats	
	3	Clays	
	4	Sands	
	5	Silts	
	6	Mor Humus	

Site 67

Augur Point	Depth (cm)	Sediment	Unit
1	0-09	Dark brown upper peaty podzol with modern roots	1
	09-30	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	30-35	Light brown clayey, silty fine sand	4
	35	Stuck	-
2	0-08	Dark brown upper peaty podzol with modern roots	1
	08-27	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	27-31	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand with orange medium to coarse sandy clay intrusions.	3
	31-36	Brown-grey clay with sub-angular to angular gravel and coarse sand inclusions	3
	36-40	Light brown-grey clayey, silty fine sand	4
	40	Stuck	-
3	0-07	Dark brown upper peaty podzol with modern roots	1
	07-30	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand with orange fine sand toward the base.	1
	30	Stone	-
4	0-12	Dark brown upper peaty podzol with modern roots	1

	12-32	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	32-47	Reddy-brown clayey silt with fine sand inclusions	5
	47-48	black peat band	2
	48-52	Reddy-brown clayey silt with fine sand inclusions	5
	52-53	Light grey brown silty medium to coarse sand	4
	53	Stuck	-
5	0-05	Dark brown upper peaty podzol with modern roots	1
	05-21	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	21-23	Reddy-brown clayey silt with fine sand inclusions	5
	23	Stone	-
6	0-06	Dark brown upper peaty podzol with modern roots	1
	06-27	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	27-30	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand with grey-brown clay towards base.	1
	30-46	Light grey clayey fine sand with orange mottling.	4
	46-47	Light grey clayey fine sand with orange mottling and sub-angular to angular gravel inclusions.	4
	47	Stuck	-
7	0-13	No recovery	-
	13-22	Dark brown peat with monocotyledon plant fragments	2
	22-24	Dark grey silty coarse sand with sub-angular gravel inclusions	4
	24-29	Dark brown peat with monocotyledon plant fragments	2
	29-30	Dark brown peat with monocotyledon plant fragments with sub-angular gravel inclusions	2
	30-58	Dark brown peat with monocotyledon plant fragments	2
	58-60	Dark grey silty clay with monocotyledon plant fragments	3
	60-72	Light grey clayey medium to coarse sand with orange mottling and sub-angular to angular gravel inclusions towards the base.	4
	72	Stone	-
8	0-17	Dark brown peat with monocotyledon plant fragments	2

	17-22	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand and orange coarse sand inclusions.	1
	22-32	Grey clayey medium to coarse sand with orange mottling and sub-angular to angular gravel inclusions towards the base.	4
	32	Stuck	-
9	0-50	Dark brown peat with monocotyledon plant fragments	2
	50-62	Black peat with monocotyledon plant fragments	2
	62-66	Dark grey clay with monocotyledon plant fragments	3
	66-90	Grey clayey medium to coarse sand with orange mottling and sub-angular to angular gravel inclusions towards the base.	4
	90	Stuck	-
10	0-125	Dark brown peat with monocotyledon plant fragments and occasional wood fragments.	2
	125-130	Dark grey peaty clay with monocotyledon plant fragments	3
	130	Stone	-
11	0-79	Dark brown peat with monocotyledon plant fragments	2
	79-85	Black peat with monocotyledon plant fragments	2
	85-90	Dark grey peaty clay with monocotyledon plant fragments	3
	90	Stone	-
12	0-58	No recovery	-
	58-75	Black peat with monocotyledon plant fragments	2
	75-90	Black peaty clay with occasional wood fragments	3
	90-100	No recovery	-
	100	Stone	-

Site 119

Augur Point	Depth (cm)	Sediment	Unit
1	0-37	Dark brown peat with monocotyledon plant fragments	2
	37-44	Brown silty peat with bands of brown silt	2
	44-74	Grey clayey, coarse sand with orange medium to coarse sand inclusions	4
	74	Stone	-
2	0-17	Dark brown peat with monocotyledon plant fragments	2
	17-24	Grey-brown, clayey coarse sandy silt	5
	24	Stone	-

3	0-14	Dark brown peat with monocotyledon plant fragments	2
	14-22	Dark brown peat with monocotyledon plant fragments and wood fragments	2
	22-26	Grey silty clay with medium to coarse sand inclusions	4
	26-29	Grey silty, coarse sand and sub-angular to angular gravels	4
	29	Stuck	-
4	0-06	Black moss peat	2
	06-10	Grey clay with coarse sand inclusions	3
	10-26	Dark brown peat with monocotyledon plant fragments	2
	26-29	Dark brown peat with monocotyledon plant fragments with coarse sand and sub-angular gravel inclusions	2
	29-34	Dark brown peat with monocotyledon plant fragments	2
	34-40	Dark brown peat with monocotyledon plant fragments with coarse sand, sub-angular gravel and grey clayey silt inclusions	2
	40-50	Grey silty clayey coarse sand and sub-angular to angular gravels	4
	50	Stuck	-
5	0-20	Dark brown peat with monocotyledon plant fragments	2
	20-30	Grey silty, clayey coarse sand and sub-angular to angular gravels	4
	30	Stone	-
6	0-08	Dark brown upper peaty podzol with modern roots	1
	08-31	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	31-39	Light brown-grey silty coarse sand and sub-angular to angular gravels	4
	39	Stuck	-
7	0-22	Dark brown peat with monocotyledon plant fragments	2
	22-27	Grey silty clay with medium to coarse sand and sub-angular to angular gravel inclusions	4
	27-35	Not recovered (sands?)	-
	35	Stone	-
8	0-15	Dark brown peat with monocotyledon plant fragments	2
	15-24	Grey-brown silty medium to coarse sand with sub-angular to angular gravels	4
	24	Stuck	-
9	0-35	Dark brown peat with monocotyledon plant fragments	2
	35-40	Grey silty clay with coarse sand and sub-angular to angular gravel inclusions	3
	40-44	Grey clayey coarse sand and sub-angular to angular gravels	4

	44	Stone	-
10	0-07	Dark brown upper peaty podzol with modern roots	1
	07-15	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	15	Stone	-
11	0-07	Dark brown upper peaty podzol with modern roots	1
	07-25	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	25	Stone	-
12	0-06	Brown upper peaty podzol with modern roots	1
	06-16	Brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	16	Stone	-
13	0-16	Black upper peaty podzol with modern roots	1
	16-25	Black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	25-27	Brown-grey clay	3
	27-28	Brown-grey clayey coarse sand with sub-angular to angular gravel inclusions	4
	28	Stone	-
14	0-05	Black upper peaty podzol with modern roots	1
	05-12	Black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	12-13	Band of light brown fine to medium sand	4
	13-15	Dark brown peat with monocotyledon plant fragments	2
	15-19	Brown slightly silt coarse sand with sub-angular to angular gravels	4
	19	Stuck	-
15	0-07	Black upper peaty podzol with modern roots	1
	07-21	Black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	21-29	Red-brown silty peat with occasional monocotyledon plant fragments	2
	29-32	Light grey silt	5
	32	Stone	-
16	0-12	Black upper peaty podzol with modern roots	1
	12-41	Black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	41-47	Not recovered (sand?)	-
	47	Stone	-
17	0-06	Black upper peaty podzol with modern roots	1

	06-16	Grey silty clay with orange-brown coarse sand and sub-angular to angular gravel inclusions	3
	16	Stuck	-
18	0-08	Black upper peat with modern roots	2
	08-21	Dark brown-black peat with monocotyledon plant fragments	2
	21-29	Brown medium sandy, clayey silt	5
	29-37	Dark brown-black peat with monocotyledon plant fragments with medium sand inclusions	2
	37-39	Brown medium sandy, silt with occasional sub-angular to angular gravels	5
	39	Stone	-
19	0-05	Black upper peaty podzol with modern roots	1
	05-10	Black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	10-28	Orange-brown silty medium sand with sub-angular to angular gravel inclusions	4
	28	Stone	-
20	0-13	Black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	13-15	Brown clayey silt with sub-angular to angular gravel inclusions	5
	15-17	Grey silty clay with coarse sand and sub-angular to angular gravel inclusions	3
	17-19	Grey clayey, silty coarse sand and sub-angular to angular gravels.	4
	19	Stone	-
21	0-5	Black upper peaty podzol with modern roots	1
	05-14	Black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	14	Stone	-
22	0-13	Dark brown peat with monocotyledon plant fragments	2
	13-21	Grey-brown clayey, silt with coarse sand and sub-angular to angular gravel inclusions	5
	21-22	Band of dark brown peat with monocotyledon plant fragments	2
	22-27	Grey clayey, silt with coarse sand and sub-angular to angular gravel inclusions	5
	27	Stuck	-
23	0-50	No recovery - peat	2
	50-128	Dark brown peat with monocotyledon plant fragments and occasional wood fragments	2

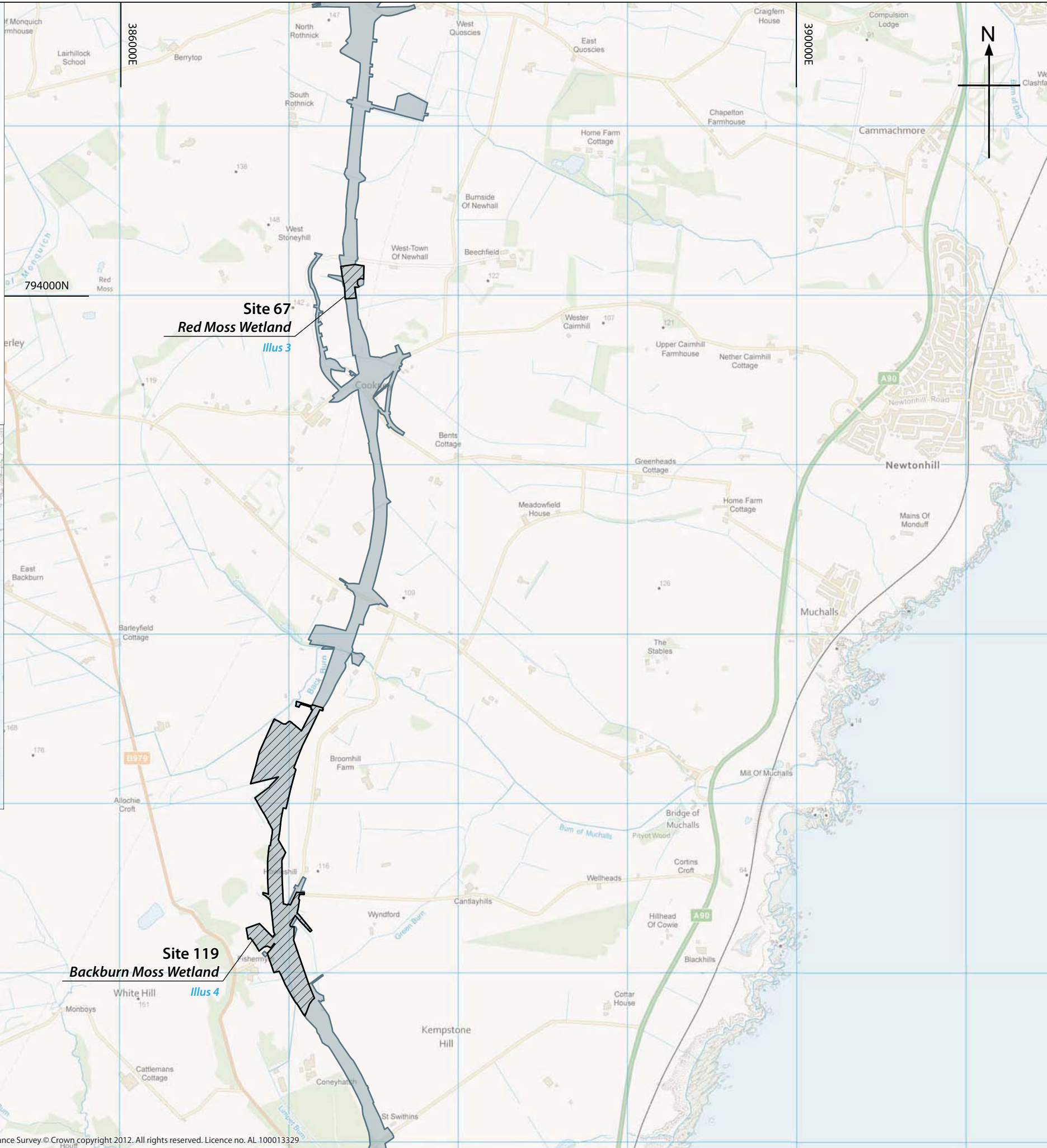
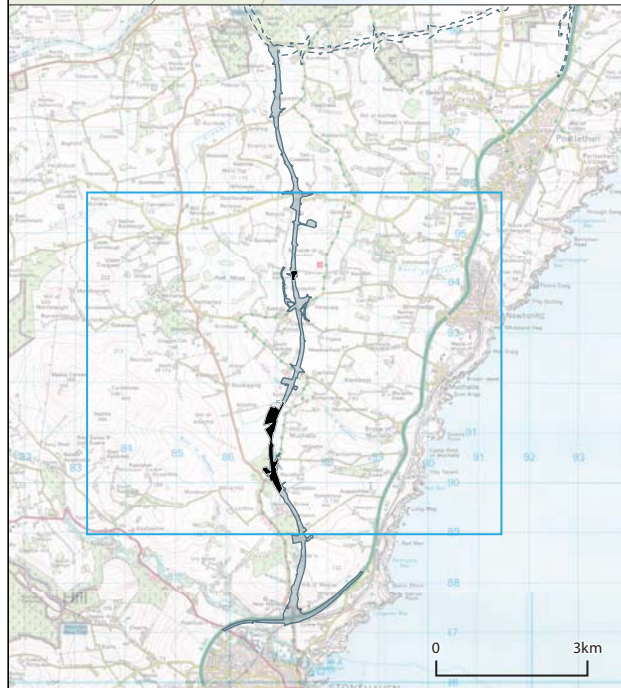
	128-140	Dark brown peat with monocotyledon plant fragments and wood fragments	2
	140-149	Dark brown peat with monocotyledon plant fragments	2
	149-150	Dark brown silty peat with monocotyledon plant fragments	2
	150	Stone	-
24	0-53	No recovery - peat	2
	53-76	Dark brown peat with monocotyledon plant fragments	2
	76-83	Dark grey-brown silty, peaty clay	3
	83-84	Brown silty medium to coarse sand	4
	84	Stone	-
25	0-55	No recovery - peat	2
	55-108	Dark brown peat with monocotyledon plant fragments	2
	108-120	No recovery - peat	2
	120	Stone	-
26	0-09	Black upper peat with modern roots	2
	09-26	Dark brown peat with monocotyledon plant fragments	2
	26-39	Brown clayey silt with medium to coarse sand and sub-angular to angular gravel inclusions	5
	39	Stone	-
27	0-38	Dark brown peat with monocotyledon plant fragments	2
	38-44	Dark brown peaty clay	3
	44-58	Dark brown silty, peaty clay with medium sand inclusions	3
	58-67	Grey brown silty clay with medium sand and sub-angular to angular gravel inclusions	3
	67-72	Grey silty, clay with medium to coarse sand and sub-angular to angular gravel inclusions	3
	72	Stone	-
28	0-04	Dark brown-black upper peaty podzol with modern roots	1
	04-20	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	20	Stone	-
29	0-07	Dark brown-black upper peaty podzol with modern roots	1
	07-25	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	25-31	Brown silty, medium sand with occasional sub-angular to angular gravels	4
	31-41	Grey silty, medium sand with sub-angular to angular gravels	4
	41	Stuck	-

30	0-06	Dark brown-black upper peaty podzol with modern roots	1
	06-23	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	23-27	Grey-brown silty, medium sand with sub-angular to angular gravels	4
	27	Stuck	-
31	0-12	Dark brown-black upper peaty podzol with modern roots	1
	12-33	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	33-35	Grey-brown silty, medium sand with sub-angular to angular gravels	4
	35-40	No recovery (sands?)	-
	40	Stuck	-
32	0-29	Dark brown-black upper peaty podzol with modern roots	1
	29-40	Brown peaty silt with monocotyledon plant fragments	5
	40	Stone	-
33	0-08	Dark brown-black upper peaty podzol with modern roots	1
	08-14	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	14-22	Dark brown peat with monocotyledon plant fragments and wood fragments	2
	22-24	Brown silty peat with coarse sand and sub-angular to angular gravel inclusions	2
	24-28	Dark brown peat with monocotyledon plant fragments	2
	28-30	Dark brown peat with monocotyledon plant fragments and wood fragments	2
	30-32	Grey silty, coarse sand with sub-angular to angular gravels	4
	32	Stone	-
34	0-06	Dark brown-black upper peaty podzol with modern roots	1
	06-23	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	23	Stuck	-
35	0-06	Dark brown-black upper peaty podzol with modern roots	1
	06-23	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	23	Stuck	-



36	0-16	Dark brown-black upper peaty podzol with modern roots	1
	16-27	Brown peaty silt with monocotyledon plant fragments	5
	27	Stone	-
37	0-06	Dark brown-black upper peaty podzol with modern roots	1
	0-25	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	25	Stone	-
38	0-09	Dark brown-black upper peaty podzol with modern roots	1
	09-29	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	29	Stone	-
39	0-05	Dark brown-black upper peaty podzol with modern roots	1
	05-27	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	27-28	Light grey silty, coarse sand with sub-angular to angular gravels	4
	28	Stone	-
40	0-07	Dark brown-black upper peaty podzol with modern roots	1
	07-20	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	20	Stone	-
41	0-07	Dark brown-black upper peaty podzol with modern roots	1
	07-23	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	23-23.5	Brown silty, medium sand with sub-angular to angular gravels	4
	28	Stuck	-
42	0-04	Dark brown-black upper peaty podzol with modern roots	1
	04-16	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	16-18	Brown silty, medium sand with sub-angular to angular gravels	4
	18	Stuck	-
43	0-04	Dark brown-black upper peaty podzol with modern roots	1
	04-21	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1

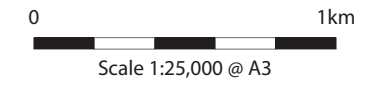
	21-23	Brown silty, medium sand with sub-angular to angular gravels	4
	23	Stuck	-
44	0-06	Dark brown-black upper peaty podzol with modern roots	1
	06-30	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	30	Stuck	-
45	0-07	Dark brown-black upper peaty podzol with modern roots	1
	07-26	Dark brown-black peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	26-29	Brown silty, medium sand with sub-angular to angular gravels	4
	29	Stuck	-

9.2 Appendix 2 Illustrations



LEGEND

-  Proposed road corridor
-  Site



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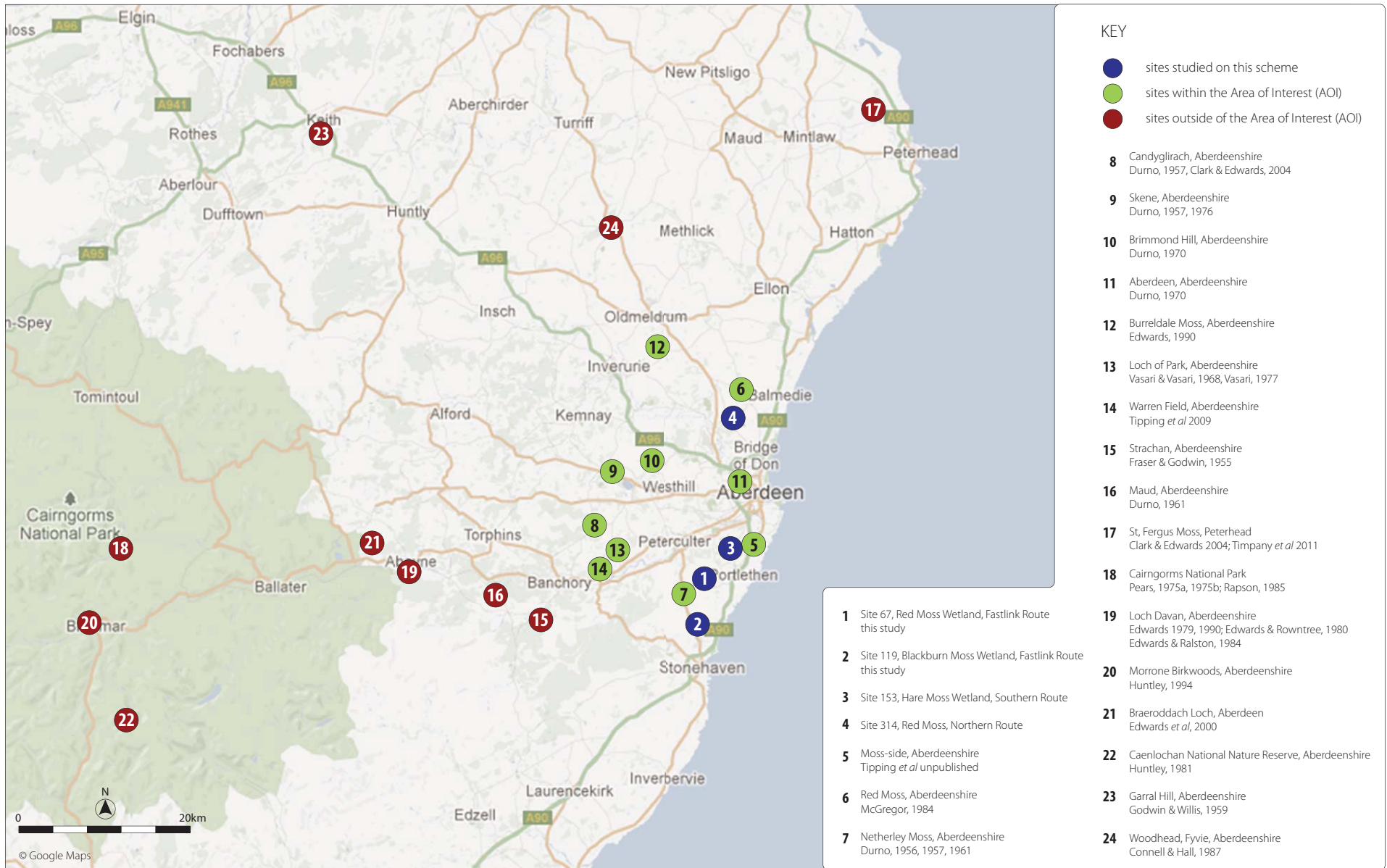


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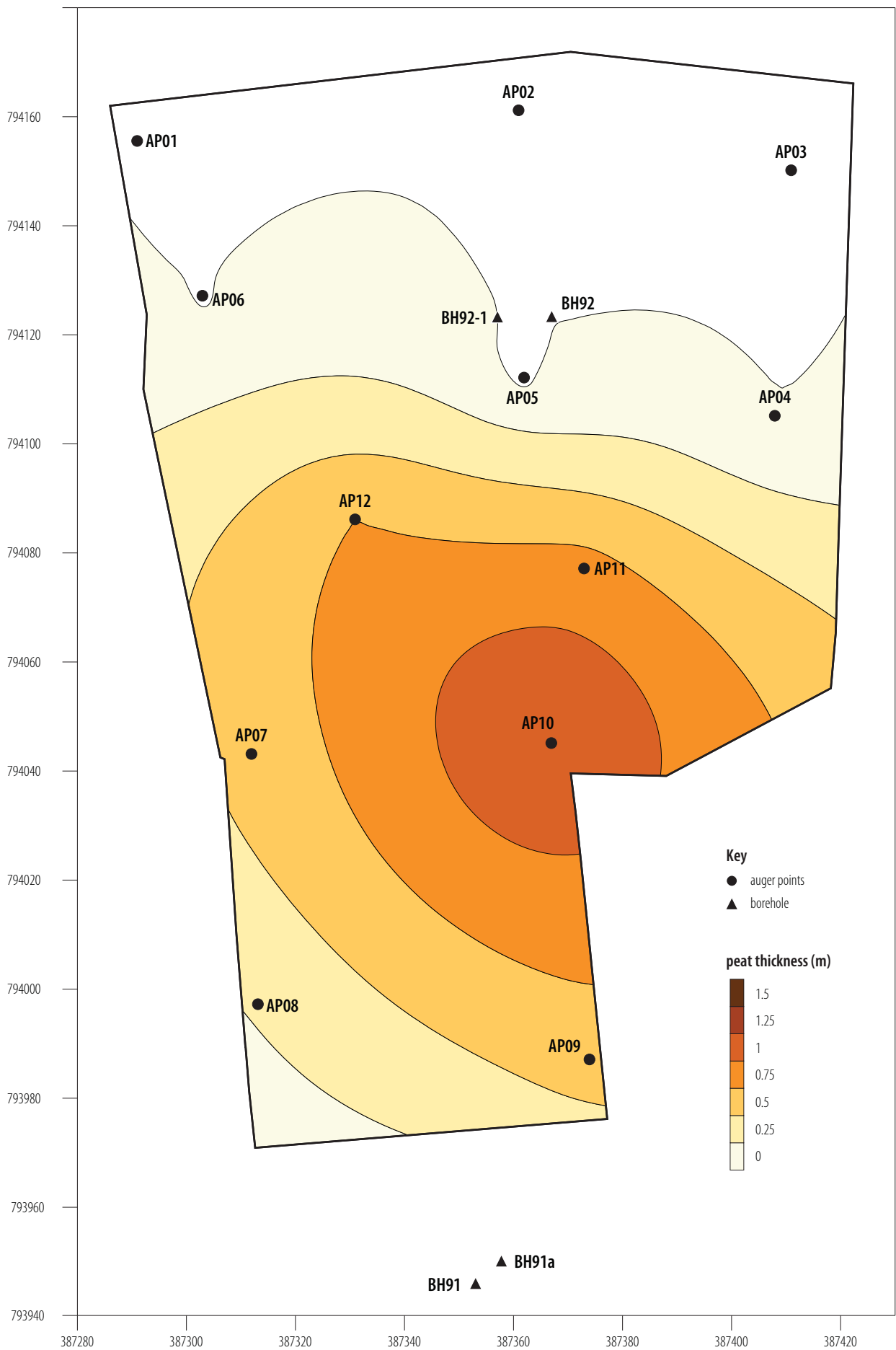
Headland Archaeology Drawing No.: Illustration 1
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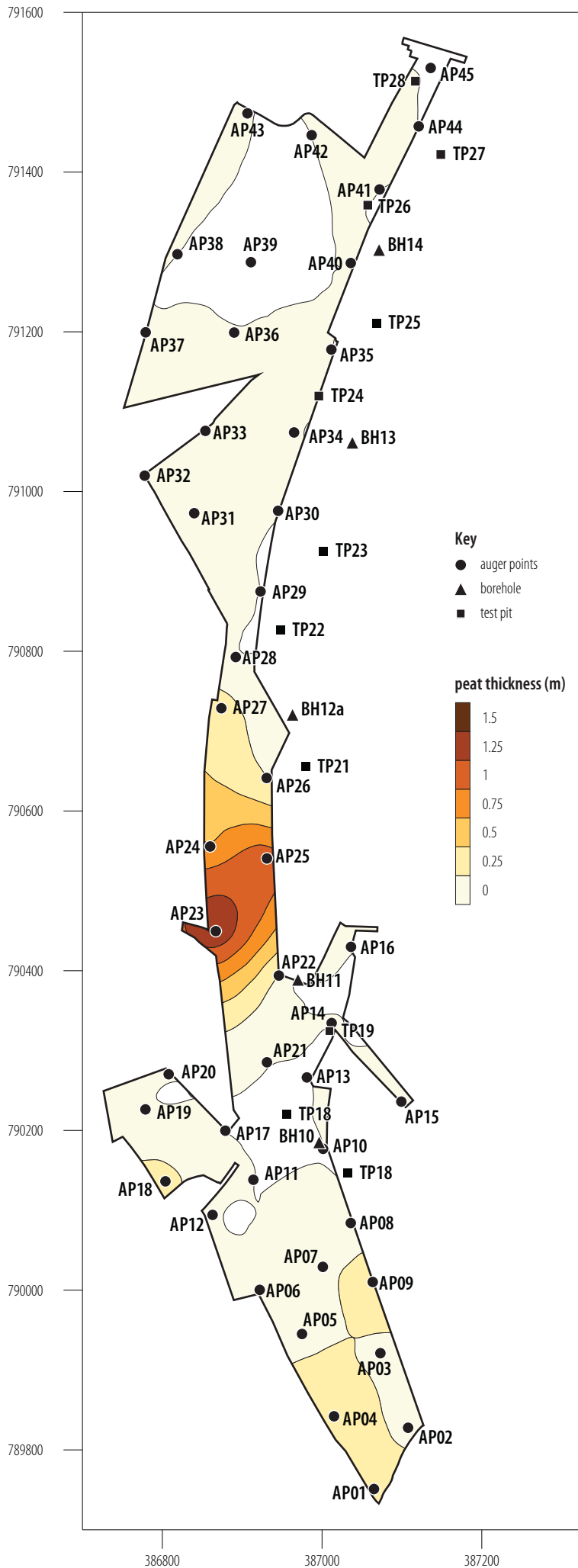


Illus 2

Map showing palaeoenvironmental studies in Aberdeenshire



Illus 3
2D contour map of peat thickness for Site 67



Illus 4
2D contour map of peat thickness for Site 119



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