

**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
(NORTHERN LEG)**

Red Moss (Site 314)

Palaeoenvironmental Assessment



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Date: 30 November 2012

Report Reference No.: AWPR-NL-009



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Red Moss (Site 314)

Palaeoenvironmental Assessment

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

SUMMARY

Palaeoenvironmental survey using a manual gouge auger was conducted across Red Moss (Site 314), an area identified as wetland and having the potential to contain sediments of palaeoenvironmental potential on the Northern Leg of the Aberdeen Western Peripheral Route 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), the depth and nature of these deposits and their likely chronology; together with establishing the potential of these deposits to inform on landscape change and offer 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 in only two areas of the site; at the western end and just to the west of the central area. At Red Moss a maximum peat thickness of 0.89m was recorded in the western central part of the site. Peat was observed as having formed over a shallow minerogenic soil of colluvial and till deposits at the west of the site, where wood fragments within the peat indicate the presence of woodland growing on the mire surface. Birch woodland is still present in this area today and it is likely this area has changed little. The presence of coppiced rowan trees within this woodland show some past management of elements of this woodland. In the area to the west of the central part of the site peats are recorded as having developed from an infilled small water body, which was colonised by herbaceous plants including sedges and grasses together with trees. A layer of grey silty medium sand within the peats indicates an erosional episode that may have been caused by the removal of woodland in the area. Above this event peats develop once more but indicate an open vegetation cover of herbaceous plants including grasses, sedges and rushes. The majority of the area is covered by a peaty podzol overlying glacial till and is today used as pastoral land for grazing livestock.

Despite the relatively shallow depth of the peats, other studies located near to these sites and from across Aberdeenshire, 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, such as at the nearby site of Red Moss (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. Archaeological monuments and finds in this area indicate it has been inhabited since prehistoric times. However, the shallow peats present at this site have limited potential for palaeoenvironmental study with the small sequences providing little opportunity to develop any refined pollen sequences for this area.

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1 Introduction

1.1 General

- 1.1.1 This document is submitted as the report on the palaeoenvironmental assessment of Red Moss, Site 314 (Area of archaeological potential) located on the proposed route of the Northern Leg of the Aberdeen Western Peripheral Route (AWPR). The palaeoenvironmental assessment is part of a programme of archaeological non-invasive investigations to facilitate the construction of the 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 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 In August and October 2012 Headland Archaeology undertook the palaeoenvironmental assessment of Site 314 (Red Moss) 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 – Area of Archaeological Potential (site 314) located on the proposed Northern Leg 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 An area of peatland, Red Moss (Site 314) was identified along the Northern Leg of the planned AWPR (Illus 1) 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 this area. 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 survey of this area is to determine the palaeoenvironmental and archaeological potential of these deposits in order to formulate recommendations for the mitigation of impact deemed necessary to alleviate the impact of the development.

1.3.3 The key aims to achieve this objective are:

- to establish the presence of any palaeoenvironmentally significant deposits within the target area;
- to establish the depth of any palaeoenvironmentally significant deposits within the target area;
- to establish the nature of the deposits and the depositional processes of the sediments within the target area;

- to establish the potential of these deposits to inform on landscape change in the local and wider regions of the target area.

1.3.4 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.

1.3.5 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 Location & Description

1.4.1 The site of Red Moss (Site 314) lies approximately 0.1km north of Corby Loch and c. 4.3km north-west of the city of Aberdeen (Illus 1). The site lies on the Skene coastal lowland formation, which was significantly affected 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 a linear area stretching some 3.0km in length and up to between 0.1km and 0.4km in width. The area along this part of the proposed road corridor is mainly fields of rough pasture used for grazing of livestock. At its western end the site is fringed by birch woodland with coppiced rowan trees on a mossy substrate. The main area of Red Moss is located some 0.5km to the north of the site and has previously been the subject of pollen study by McGregor (1984) (Illus 2).

2 Method

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 70 auger points (APs) were undertaken across Red Moss (Site 314) (Illus 3). At each AP the type and depth of sediments encountered was recorded using the Troels-Smith (1955) guide to sediment characterisation, 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) were 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 will 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). 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 2004a, 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 the 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). Tipping (2007) notes that it would undoubtedly have had a considerable impact upon any human populations living in affected 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, it 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 is also 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 The sediments encountered across much of Red Moss (Site 314) (between AP1 to AP50, with the exception of AP7 and AP63 to AP66) were shallow sequences between 0.10m (AP32) and 0.44m (AP44) in depth. Deeper sequences were present at the western part of the site within the area of birch woodland (AP51 to AP62), where depths extended to 0.71m (AP54). The deepest sequence present was located just to the west of the central part of the site at AP69 which extended to 0.98m (Illus 3). These shallow sequences across the majority of the site consist largely of a dark brown peaty podzol soil with an upper layer containing modern root material of c. 0.02-0.11m in thickness and below this coarse sand and sub-angular to angular gravel inclusions (Appendix 1). In most locations the dark brown peaty podzol is underlain by either stone or grey-brown to light brown silty, clayey coarse sand with angular gravels; this unit is considered to represent a glacial till layer (e.g. AP68). Occasionally a layer of red-brown silty medium sand is seen between the peaty podzol and sands with gravels and is again thought to be glacial to late glacial in origin. No peats were recorded in the borehole and test pit records for this area (Norwest Holst, 2004a, 2004b), which again demonstrates the limited peat development at the site.
- 4.2 Peats are only present in the extreme western part of the site and just to the west of the central area of the site (Illus 3). The peats at the western edge lie within an area of birch woodland, which has a field layer of mosses and sedges and this is shown in the upper part of the sediment sequence with the presence of either Mor Humus (formed from leaf litter) or black Sphagnum peat. Table 1 shows the deepest sequence from this area is present at AP54. The upper layer of this sequence is black Sphagnum peat of 0.35m thickness, which is underlain by a dark brown-black peat with occasional wood fragments of 0.21m thickness (Unit II). The peat appears to be well humified with the visible wood fragments indicating the presence of former trees in this area, suggesting it has changed little from this period to the present. Below the peats is a layer of light brown clayey silt with occasional wood fragments and sub-angular to angular gravels (Unit V). This deposit is likely to be of early Holocene age corresponding to initial minerogenic soil development following the late glacial period, with wood fragments indicating colonisation of trees. The organic staining observed within this deposit are suggested to represent the presence of former tree roots penetrating this layer, which have subsequently rooted away and may have been associated with tree growth in the overlying peat layer. This layer is underlain by the glacial till layer (Unit IV) that is present across the area (Appendix 1) and here is described as grey clayey, silty coarse sand with sub-angular to angular gravel inclusions. Stone is present at the base of the sequence.

Table 1 - Sedimentary sequence at AP54 (Illus 3)

Unit	Sediment	Depth (m)
II	Black Sphagnum peat.	0.0-0.35
II	Dark brown-black peat with occasional wood fragments.	0.35-0.56
V	Light brown clayey silt with organic staining (former roots), occasional wood fragments and occasional sub-angular to angular gravels.	0.56-0.67
IV	Grey clayey, silty coarse sand with sub-angular to angular gravel inclusions.	0.67-0.71
-	Stone.	0.71

4.3 The deepest sequence containing peat to the west of the central part of the site was found in AP69 and this sequence is presented in Table 2. The peat sequence here is of a different nature to that seen at AP54. Whereas the peats at AP54 and across the western fringe of the site are essentially wood peats overlain by Mor Humus or Sphagnum peats, the peats in and around AP69 represent monocotyledon peats formed in a wetter environment. The upper part of the sequence at AP69 is a dark brown-black peat of 0.57m thickness, with visible monocotyledon plant fragments (representing plants such as sedges and grasses) together with plant macrofossils including *Luzula* sp. (wood rush); a plant which grows in woods and hedge-banks and also on shaded stream sides and open peaty ground (Clapham *et al*, 1962; Stace, 1997). Below this peat is a layer of grey silty medium sand (Unit IV), which is likely to reflect an erosional episode depositing minerogenic materials onto the peats. The location of this part of the site in the bottom of the valley indicates it would be prone to inwash events from the surrounding hill sides and in particular those from the north, which are the steepest. Underlying this sand unit is a further peat layer of dark brown-black peat with visible monocotyledon plant fragments and occasional wood fragments of 0.29m thickness. The presence of wood fragments within this peat suggests that this part of the site had a former cover of trees, while the monocotyledon plant fragments suggest the presence of sedges and grasses amongst the field layer. This peat is underlain by a layer of grey silty clay with medium sand inclusions (Unit III) and is likely to represent the presence of a former waterbody across this part of the site. This in turn is underlain by glacial till consisting of grey clayey coarse sand with sub-angular to angular gravels, in turn overlying stone. A full results list of all the APs taken on site can be found in Appendix 1.

Table 2 - Sedimentary sequence at AP69 (Illus 3)

Unit	Sediment	Depth (m)
II	Dark brown-black peat with monocotyledon plant fragments and visible macrofossils of <i>Luzula</i> sp.	0.0-0.57
IV	Grey silty medium sand.	0.57-0.60
II	Dark brown-black peat with visible monocotyledon plant fragments and occasional wood fragments.	0.60-0.89
III	Grey silty clay with medium sand inclusions.	0.89-0.94
IV	Grey clayey coarse sand with sub-angular to angular gravels.	0.94-0.98
-	Stone	0.98

4.4 Archaeological features have been recorded in the area surrounding Red Moss within a couple of kilometres of the present site (Site 314). Prehistoric finds such as barbed and tanged flint arrowheads have been found at Newton of Shielhill to the south of the site and at Loch-Hills to the south west of the site (information from RCAHMS, 2001a, 2001b). A carved stone ball has also been discovered at Lochgreens Farm, just outside the south-west end of the site which may be of prehistoric date (information from RCAHMS, 2003). More prominent features have also been recorded in this area include megalithic standing stones, such as that at Lochgreens (Shepherd, 1976a) just to the north of the central area of the site, which has since been removed from the field in which it stood. A further standing stone has been recorded at North Allans (Shepherd,

1976b) to the south of the site, this has again been removed and nothing was present during a field visit by RCHAMS in 1996. A possible ring ditch has also been recorded based on crop marks observed from aerial photography at Newtonhill (information from RCAHMS, 1996c), near the eastern end of the site. A possible crannog was also recorded by Shepherd (1978) on Corby Loch to the south of the site, but similar to the standing stones, no visible remains of this feature could be seen on a field visit by RCHAMS in 1996.

5 Discussion

- 5.1 The results of the auger survey have shown that peats are present in only two areas of the site at Red Moss, in the western and central western areas; with peats only recorded in 16 of the 70 auger points (Illus 3). Peats in the western part of the site, within a current area of birch woodland were seen to be very shallow with a maximum depth of 0.56m (AP54). The sedimentary sequence in this location indicate peats formed over an initial minerogenic soil of light brown clayey silt with occasional wood fragments and sub-angular to angular gravels, which is thought to represent a mixture of glacially till derived material and colluvial deposits. The presence of wood fragments within this layer suggests trees colonized this soil, which led to the development of a well humified dark brown-black peat as vegetation matter collected and decayed over the minerogenic silty clay layer. The presence of wood fragments within this peat layer again suggests local tree growth and it may be that the area has changed little in terms of arboreal taxa present from this period to the current day. This peat layer is overlain by a further Sphagnum peat or Mor Humus, (e.g. AP60) which is thought to reflect relatively recent peat development from the current field layer of mosses and leaf litter.
- 5.2 Peats in the western central area of the site were also recorded as being shallow, extending to a maximum depth of 0.98m (AP69), which includes a 0.03m band of grey silty medium sand (Table 2). The peats in this area are seen to have developed from a probable small hollow that would have formed a shallow water body (indicated by the presence of grey silty clay), which gradually infilled by colonizing vegetation allowing peats to develop. The peats and the visible plant remains they contain suggest that initial infilling of these water bodies led to colonisation by monocotyledon plants such as sedges and grasses. Wood fragments within this layer indicate trees or saplings also colonised these areas. A layer of grey medium silty sand is then seen to have been deposited over this peat, which may reflect an erosional event. The absence of wood fragments in the upper peat layer provides some tentative evidence that this erosional deposit may have been caused by the removal of trees in the immediate landscape leading to initial increases in slope wash deposits. The overlying dark brown-black peat contains visible monocotyledon plant fragments and seeds of *Luzula* sp. indicating an open wet environment of grasses, sedges and probably rushes (soft rush now present across this area).
- 5.3 Peats have previously been studied at Red Moss to the north of the present site within an area of raised bog, which is a different type of deposit to those found within this study. Here peats were recorded to much greater depths, being up to 4.5m deep

(McGregor, 1984). Although no radiocarbon dates are available for this study, pollen data indicate that they date from the Early Holocene period through comparison with other pollen diagrams in the area (e.g. Durno, 1956, 1970). The pollen sequence shows vegetational change over an estimated period of 9000 years (McGregor, 1984). Initial vegetation cover is recorded as being open vegetation of sedge swamp with aquatics and willow trees, this is then replaced by birch and pine woodland as the area becomes more terrestrialised allowing the colonization of trees. Alder carr-woodland is then seen to develop in the area with birch and pine still prominent in the landscape. There is then a phase of woodland clearance potentially taking place in the Late Bronze Age to Iron Age followed by the development of heathland vegetation with heather pollen dominant, marking the development of the raised mire (McGregor, 1984). This area of Red Moss is still present but has been affected by cutting for drainage since the study by McGregor and is now quite desiccated (Paterson pers comm).

- 5.4 Such early peat development in the area has been shown from relatively shallow peats, such as at Moss-side, near Aberdeen (Tipping *et al*, unpublished), with the tops of the peats having been lost to later anthropogenic activity (e.g. ploughing and peat cutting). At other sites where radiocarbon 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). The presence of archaeological monuments and finds in the landscape surrounding Red Moss also indicates there may be some potential for similar findings in the sequences at this location, however, given the shallow depths of the peats there is limited material available for these forms of study.

6 Conclusions

- 6.1 Auger survey work at Red Moss (Site 314) on the Northern Leg of the AWPR revealed the presence of small areas of shallow peats at the site.
- 6.2 Maximum peat thickness within these areas at Red Moss was found to be 0.56 and 0.89m.
- 6.3 The peats to the west of the site showed development of a wood peat from minerogenic soils.
- 6.4 The peats in the western central area of the site showed a sequence of initiation from infilled pools of water, through to sedge swamp and woodland, and then an erosional event possibly related to tree clearance before returning to open vegetation of sedge, grasses and rushes.
- 6.5 Despite the relatively shallow depth of the deepest peats encountered at Red Moss, other peat studies in Aberdeenshire have shown peat initiation may still have begun in the early Holocene.

- 6.6 The peats have limited potential to produce detailed pollen sequences that can inform on vegetational change and anthropogenic activity over long time spans for this area.

7 Statement on the Palaeoenvironmental Potential and Recommendations for Mitigation

- 7.1 The presence of peats indicates there is potential for the presence of waterlogged plant remains (e.g. pollen, seeds) which can provide information on the vegetational history of the site. The observation of well preserved monocotyledon plant remains, wood rush seeds and wood fragments within the peats also indicate 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) indicate peats in this area developed largely during the early Holocene. The presence and activities of early human populations in the Mesolithic period have also been evidenced from pollen studies in this area (e.g. Edwards, 1979, 1990; Edwards and Ralston, 1984).
- 7.2 However, the shallow depth of the peat sequences within this area with a maximum of 0.86m of peat available for study indicates there is limited potential to learn more from this site than has already been achieved at the nearby Red Moss raised bog, where 4.5m of peat was recorded and pollen studies already undertaken. Therefore no further work is recommended for this site.

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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 314

Auger Point	Depth (cm)	Sediment	Unit
1	0-05	Dark brown upper peaty podzol with modern roots	1
	05-24	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	24	Stone	-
2	0-03	Dark brown upper peaty podzol with modern roots	1
	03-13	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	13	Stone	-
3	0-05	Dark brown upper peaty podzol with modern roots	1
	05-20	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	20	Stone	-
4	0-06	Dark brown upper peaty podzol with modern roots	1
	06-26	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	26	Stone	-
5	0-05	Dark brown upper peaty podzol with modern roots	1
	05-26	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	26	Stone	-
6	0-05	Unrecovered - standing water	
	05-09	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	Stone	-

7	0-09	Dark brown upper peaty podzol with modern roots	1
	09-41	Dark brown peat with monocotyledon plant fragments	2
	41-56	Dark brown peat with monocotyledon plant fragments and wood fragments	2
	56-66	Dark brown, slightly clayey, peat with monocotyledon plant fragments and occasional charcoal fragments	2
	66-68 68	Light brown silty clay with small sub-angular to angular gravels Stone	3 -
8	0-05	Grey silty clay	3
	05-18 18	Grey silty clay with small sub-angular to angular gravels Stone	3
9	0-02	Dark brown upper peaty podzol with modern roots	1
	02-21 21	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand. Stone	1 -
10	0-05	Dark brown upper peaty podzol with modern roots	1
	05-29 29	Dark grey-brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand. Stone	1 -
11	0-02	Dark brown upper peaty podzol with modern roots	1
	02-20 20	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand. Stone	1 -
12	0-06	Dark brown upper peaty podzol with modern roots	1
	06-26 26	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand. Stone	1 -
13	0-10	Brown silty clay upper soil with sub-angular pebbles	3
	10-29	Brown clayey podzol with small sub-angular gravels	3
	29-34 34	Orange-brown coarse sandy clay with sub-angular to angular gravels Stone	3 -
14	0-10	Brown silty clay upper soil with sub-angular pebbles	3
	10-29	Brown silty, clayey podzol with small sub-angular gravels	3
	29-33 34	Orange-grey silty coarse sand with angular gravels Stone	4 -
15	0-07	Dark brown upper peaty podzol with modern roots	1
	07-27	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	27-28 28	Light brown silty, clayey coarse sand with angular gravels Stone	4 -

16	0-05	Dark brown upper peaty podzol with modern roots	1
	05-53	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	23-24	Light brown silty, clayey coarse sand with angular gravels	4
	24	Stone	-
17	0-04	Dark brown upper peaty podzol with modern roots	1
	04-27	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	27	Stone	-
18	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
	27-29	Red-brown clayey, coarse sand with sub-angular to angular gravels	4
	29	Stone	-
19	0-04	Dark brown upper peaty podzol with modern roots	1
	04-14	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	14	Stone	-
20	0-07	Dark brown upper peaty podzol with modern roots	1
	07-28	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	28	Stone	-
21	0-04	Dark brown upper peaty podzol with modern roots	1
	04-22	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	22	Stone	-
22	0-05	Dark brown upper peaty podzol with modern roots	1
	05-38	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	38-39	Grey silty clay with inclusions of coarse sand and sub-angular to angular gravels	3
	39	Stone	-
23	0-05	Dark brown upper peaty podzol with modern roots	1
	05-25	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	25	Stone	-
24	0-04	Dark brown upper peaty podzol with modern roots	1
	04-31	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	31	Stone	-
25	0-05	Dark brown upper peaty podzol with modern roots	1

	05-30	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	30	Stone	-
26	0-03	Dark brown upper peaty podzol with modern roots	1
	03-18	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	18	Stone	-
27	0-06	Dark brown upper peaty podzol with modern roots	1
	06-32	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	32	Stone	-
28	0-06	Dark brown upper peaty podzol with modern roots	1
	06-18	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	18	Stone	-
29	0-06	Dark brown upper peaty podzol with modern roots	1
	06-24	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	24	Stone	-
30	0-03	Dark brown upper peaty podzol with modern roots	1
	03-23	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	23	Stone	-
31	0-05	Dark brown upper peaty podzol with modern roots	1
	05-12	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	12	Stone	-
32	0-07	Dark brown upper peaty podzol with modern roots	1
	07-10	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	10	Stone	-
33	0-08	Dark brown upper peaty podzol with modern roots	1
	08-30	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	30-31	Grey-brown silty coarse sand with sub-angular to angular gravels	4
	31	Stone	-
34	0-06	Dark brown upper peaty podzol with modern roots	1
	06-29	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	29-31	Grey-brown silty coarse sand with sub-angular to angular gravels	4
	31	Stone	-

35	0-07	Dark brown upper peaty podzol with modern roots	1
	07-21	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	21-23	Light brown silty coarse sand with sub-angular to angular gravels	4
	23	Stone	-
36	0-06	Dark brown upper peaty podzol with modern roots	1
	06-13	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	13	Stone	-
37	0-06	Dark brown upper peaty podzol with modern roots	1
	06-40	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	40	Stone	-
38	0-06	Dark brown upper peaty podzol with modern roots	1
	06-29	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	29	Stone	-
39	0-10	Dark brown upper peaty podzol with modern roots	1
	10-26	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	26-36	Red-brown silty medium sand	4
	36	Stone	-
40	0-05	Dark brown upper peaty podzol with modern roots	1
	05-30	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	30	Stone	-
41	0-11	Dark brown upper peaty podzol with modern roots	1
	11-27	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	27-31	Red-brown silty medium sand	4
	31-37	Light brown slightly silty, medium sand	4
	37	Stone	-
42	0-06	Dark brown upper peaty podzol with modern roots	1
	06-22	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	22	Stone	-
43	0-06	Dark brown upper peaty podzol with modern roots	1
	06-25	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	25	Stone	-

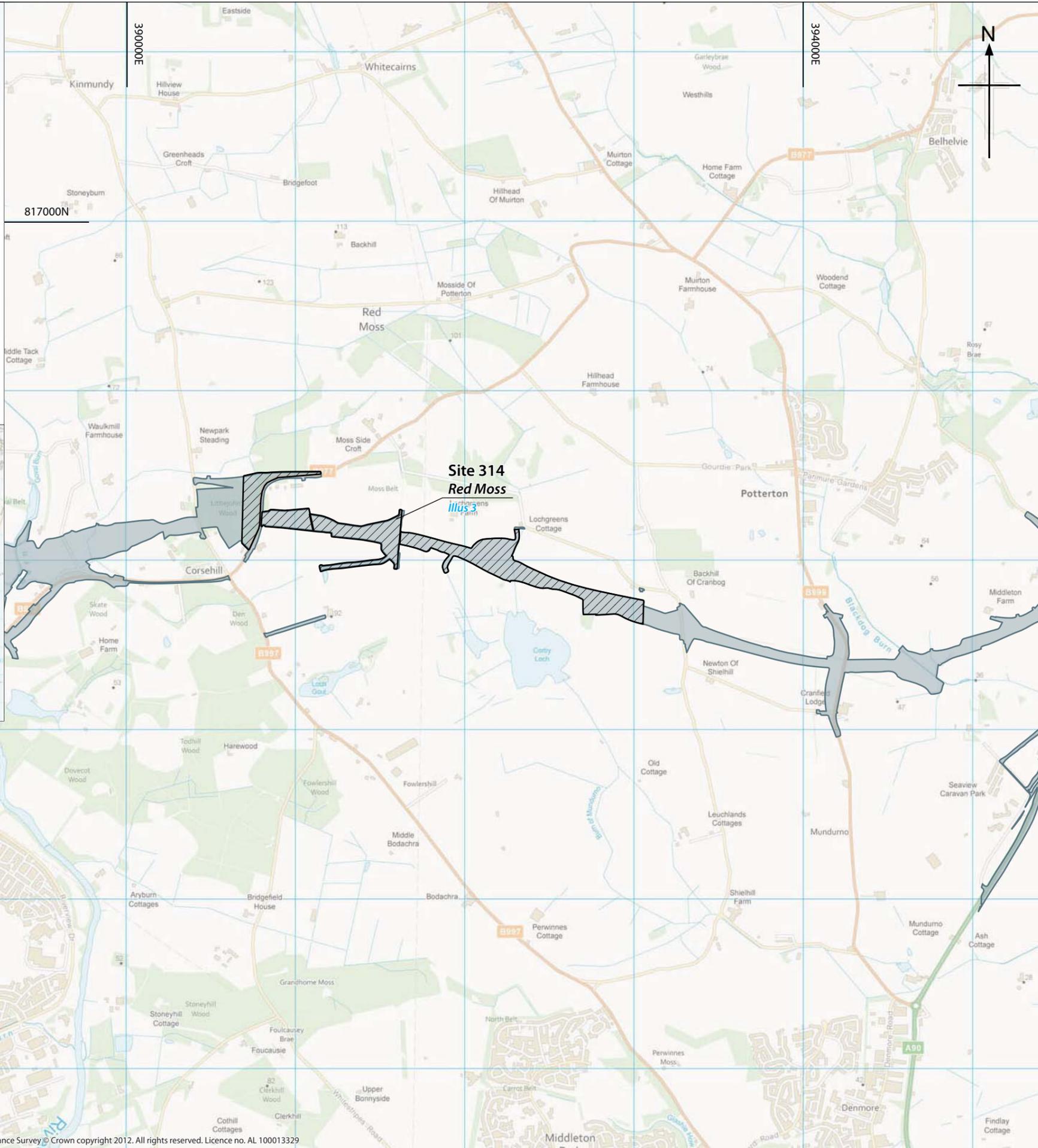
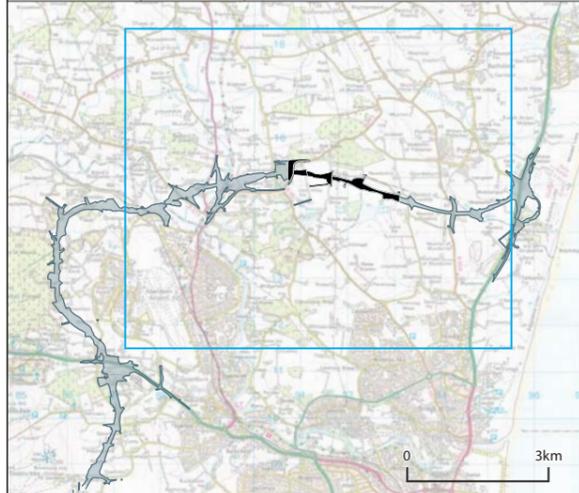
44	0-08	Dark brown upper peaty podzol with modern roots	1
	08-34	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	34-44 44	Red-brown silty medium sand Stone	4 -
45	0-06	Dark brown upper peaty podzol with modern roots	1
	06-22	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand. Includes large clasts.	1
	22	Stone	-
46	0-05	Dark brown upper peaty podzol with modern roots	1
	05-13	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	13	Stone	-
47	0-06	Dark brown upper peaty podzol with modern roots	1
	06-20	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	20	Stone	-
48	0-05	Dark brown upper peaty podzol with modern roots	1
	05-18	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	18-19	Red-brown silty medium sand	4
	19	Stone	-
49	0-05	Dark brown upper peaty podzol with modern roots	1
	05-27	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	27	Stone	-
50	0-05	Standing water	1
	0-17	Dark brown peaty podzol with inclusions of sub-angular to angular gravels, medium to coarse sand and organic matter (leaves and humic materials).	1
	17-26	Brown clayey, coarse sand with sub-angular to angular gavel	4
	26	Stone	-
51	0-10	Peaty humic layer with leaves and plant matter	2
	10-28	Dark brown-black peat with occasional wood fragments	2
	28	Stone	-
52	0-13	Black Sphagnum peat	2
	13-32	Dark brown-black peat with occasional wood fragments	2
	32	Stone	-
53	0-07	Black Sphagnum peat	2
	07-25	Dark brown-black peat with occasional wood fragments	2
	25	Stone	-

54	0-35	Black Sphagnum peat	2
	35-56	Dark brown-black peat with occasional wood fragments	2
		Light brown clayey silt with organic staining (former roots), occasional wood fragments and occasional sub-angular to angular gravels	
	56-67		5
	67-71 71	Grey clayey, silty coarse sand with sub-angular to angular gravels Stone	4 -
55	0-08	Black Sphagnum peat	2
	08-27	Dark brown-black peat with occasional wood fragments	2
		Brown slightly clayey silt with coarse sand and sub-angular to angular gravel inclusions	
	27-30 30		5 -
56	0-18	Black Sphagnum peat	2
	18-35	Dark brown-black peat with occasional wood fragments	2
	35-46	Red-brown silt with organic staining (former roots)	5
	46-50	Light brown slightly clayey silt with medium sand inclusions	5
	50	Stone	-
57	0-10	Black Sphagnum peat	2
	10-44	Dark brown-black peat with occasional wood fragments	2
	44	Stone	-
58	0-08	Black Sphagnum peat	2
	08-42	Dark brown-black peat with occasional wood fragments	2
	42	Stone	-
59	0-10	Black Sphagnum peat	2
	10-14	Dark brown-black peat with occasional wood fragments	2
	14-27	Dark brown peaty silt with sub-angular gravels	5
	27-37	Light grey clayey silt with medium sand inclusions	5
	37-47	Not recovered - sands?	-
	47	Stone	-
60	0-07	Mor humus - woodland floor soil	6
	07-44	Dark brown-black peat with occasional wood fragments	2
	44-45	Grey silty coarse sand with sub-angular to angular gravels	4
	45	Stone	-
61	0-08	Mor humus - woodland floor soil	6
	08-23	Dark brown-black peat with occasional wood fragments	2
		Red-brown medium sandy silt with occasional sub-angular to angular gravels and organic staining (former roots)	
	23-36		5
	36-41 41	Light grey slightly clayey, medium sandy silt with sub-angular to angular gravels Stone	5 -
62	0-04	Mor humus - woodland floor soil	6

	04-20 20	Dark brown-black peat with occasional wood fragments Stone	2 -
63	0-02	Dark brown upper peaty podzol with modern roots	1
	02-21 21	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand. Stone	1 -
64	0-04	Dark brown upper peaty podzol with modern roots	1
	04-15	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	15-19 19	Red-brown medium sandy silt with occasional sub-angular to angular gravels and organic staining (former roots) Stone	5 -
65	0-04	Dark brown upper peaty podzol with modern roots	1
	04-12 12	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand. Stone	1 -
66	0-11	Standing water	
	11-20	Dark grey-brown, slightly clayey peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	20-30	Grey clayey, medium sand with sub-angular to angular gravels	4
	30-40 40	No recovery (as above?) Stone	- -
67	0-10	Standing water	-
	10-55 55	Black clayey peat with monocotyledon plant fragments and occasional wood fragments. Stone	2
68	0-09	Dark brown upper peaty podzol with modern roots	1
	09-24	Dark brown peaty podzol with inclusions of sub-angular to angular gravels and medium to coarse sand.	1
	24-26 26	Light grey, silty coarse sand with sub-angular to angular gravels Stone	4 -
69	0-57	Dark brown-black peat with monocotyledon plant fragments and visible macrofossils of <i>Luzula</i> sp.	2
	57-60	Grey silty medium sand	4
	60-89	Dark brown-black peat with monocotyledon plant fragments and occasional wood fragments	2
	89-94	Grey silty clay with medium sand inclusions	3
	94-98 98	Grey clayey coarse sand and sub-angular to angular gravels Stone	4 -
70	0-08	Dark brown upper peaty podzol with modern roots	1
	08-62	Dark brown-black peat with monocotyledon plant fragments	2

62-75	Black clayey peat with monocotyledon plant fragments and wood fragments.	2
75-79	Wood fragment	2
79-80	Black clayey peat with monocotyledon plant fragments and wood fragments.	2
80	Stone	-

9.2 Appendix 2 Illustrations



LEGEND

- Proposed road corridor
- Site

0 1km
Scale 1:25,000 @ A3

HEADLAND
ARCHAEOLOGY

Headland Archaeology (UK) Ltd
13 Jane Street, Edinburgh EH6 5HE
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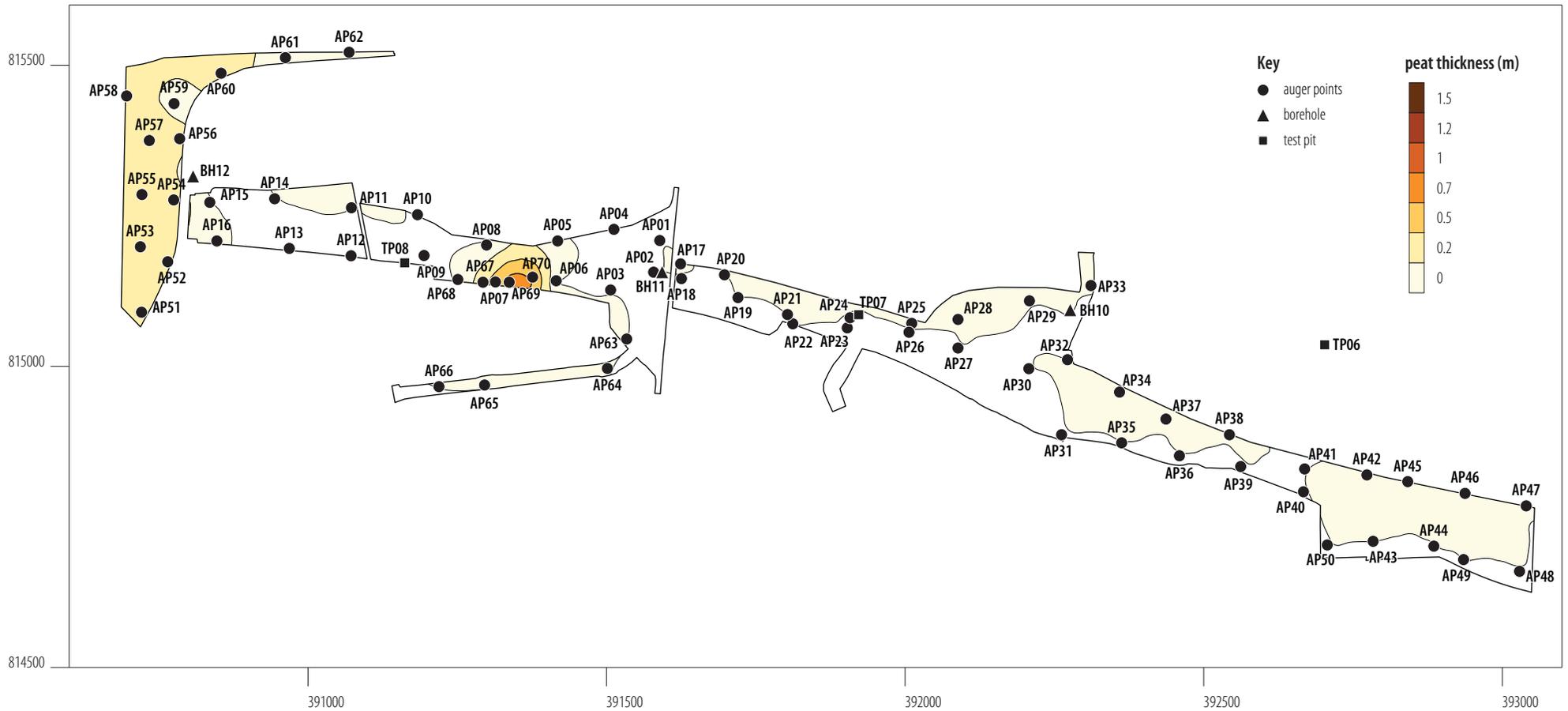
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Aberdeen Western Peripheral Route

Drawing title
Illus 1
Site location plan

Drawing status
Scale: 1:25000@A3 DO NOT SCALE
Headland Archaeology Drawing No.: Illustration 1
Based on Drawing No.: B1033200/CD/3000/CH/014-019 (ITT Appendix B) Rev

This drawing is not to be used in whole or part other than for the intended purpose and project as defined on this drawing. Refer to the contract for full terms and conditions.



Illus 3

2D contour map of peat thickness, Site 314, Red Moss. For location plan, see Illus 1