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

Project code: AWPR-002
Employer: AWPR Managing Agent
Consultant: Jacobs UK Ltd

A96(T) DYCE DRIVE PARK AND CHOOSE AND ASSOCIATED LINK ROAD (DYCE)

Geophysical Survey

Aberdeen Western Peripheral Route

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Report Reference No: AWPR-A96-019
Date: 28th January 2013

BON ACCORD
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A96(T) Dyce Drive Park and Choose and Associated Link Road (Dyce)

Geophysical Survey

Contract:	Non-Invasive Archaeological Investigations for the Aberdeen Western Peripheral Route (AWPR Package)
Employer	AWPR Managing Agent
Consultant	Jacobs UK Ltd
Curator	Dr Judith Stones, Lead Curator, Local History and Archaeology, Aberdeen City Council
Contractor	Headland Archaeology (UK) Ltd
Contract Manager	Russel Coleman
Project Manager	Sorina Spanou
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Illustrations	Alister Bartlett, Peter Cottrell, Anna Sztromwasser
Geophysical Survey	Fraser Prince, Catherine Peters
Data processing	Peter Cottrell, Alister Bartlett
Schedule	
Fieldwork	November 2012
Report	January 2013

Summary

Headland Archaeology undertook a geophysical survey at the site of the proposed A96(T) Dyce Drive Park and Choose and associated Link Road (Dyce). The work formed part of a programme of archaeological non-invasive investigations to facilitate the construction of the Aberdeen Western Peripheral Route and associated schemes (AWPR).

Fluxgate gradiometer survey was used to cover the footprint of the proposed scheme. The results of the survey do not suggest the presence of any dense concentrations of detectable archaeological features. The majority of the magnetic disturbances appear to be of non-archaeological origin.

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1 Introduction

1.1 General

1.1.1 This document is submitted as the report on the geophysical survey of the footprint of the proposed A96(T) Dyce Drive Park and Choose and associated link road (Dyce) section of the Aberdeen Western Peripheral Route (AWPR). The geophysical survey 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) and a Written Scheme of Investigations prepared by Headland Archaeology (2012a) and agreed with Dr Judith Stones, Lead Curator, Local History and Archaeology, Aberdeen City Council.

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. As part of the wider local transport strategy, Aberdeen Council envisages a 'ring' of circumferential Park and Choose sites to be established around the city which are connected by the AWPR. A park and choose facility is proposed on the A96 (T) as one of the main corridors to the north of the City. The proposals also include a dual carriageway that links the proposed AWPR, the A96 (T) and Dyce Drive.

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 On 12th – 13th November 2012 Headland Archaeology undertook a geophysical survey of the proposed A96 Park and Choose site. This project was managed by Russel Coleman (Contract Manager) and Sorina Spanou (Project Manager). Fieldwork for this survey was directed by Fraser Prince, assisted by Catherine Peters. Data processing was done by Peter Cottrell and Alister Bartlett. The survey was carried out by Bartlett Clark Consultancy, specialists in archaeogeophysics, for Headland Archaeology (UK) Ltd, who act as the archaeological contractor.

1.2 Background to the Project

1.2.1 Planning permission for the proposed A96(T) Dyce Drive Park and Choose and associated Link Road (Dyce) was granted subject to the following condition:

'No development shall take place within the area indicated (in this case the area of the whole development) until the applicant has secured the implementation of a programme of archaeological work in accordance with a written scheme of investigation which has been submitted by the applicant and approved by the Planning Authority. The programme of archaeological work will include all necessary post-excavation and publication work'.

1.2.2 In order to comply with the above condition archaeological investigation was required to establish the potential impact on any features affected by the scheme.

1.2.3 Based on requirements of the condition, the following non-invasive archaeological investigations were required:

- geophysical survey, and
- photographic survey.

1.2.4 The present report deals with the geophysical survey.

1.3 Archaeological and Historical Background

1.3.1 The area around the proposed development is characterised by sites related to the agricultural and economic improvements that began in the 17th century and continued through the 18th and 19th centuries. Improving leases were granted to selected tenants, which allowed tenants to dismantle the runrig system of cultivation and replace it with longer, more varied crop rotations in large, enclosed fields. Activities such as the enclosure of the land, the quarrying and burning of lime for use as a fertilizer and the planting of trees all resulted in lasting changes to the landscape. Walton Farm is situated immediately north of the proposed development and consists of a Category C Listed late 18th century farmhouse, with adjacent and later farm buildings arranged around a rectangular courtyard. The adjoining fields that make up the proposed development site are regularly sized and straight edged, characteristic of enclosed fields of this period (Headland Archaeology 2013).

1.4 Aims and Objectives

1.4.1 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:

- to identify, investigate and record any such archaeological remains to the extent possible by the methods put forward in the ITT Specification (ACC 2012); in this case, to attempt to identify any previously unknown sites that might be affected by the scheme;
- to disseminate the results 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.

1.4.2 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.

1.5 Scope of the work

1.5.1 Geophysical survey of the footprint of the proposed scheme was undertaken as specified in the ITT (Aberdeen City Council 2012, 37-40) as follows:

- the footprint of the proposed Park and Choose site and link road (NGR NJ 872 113). The total area is 7.28ha (Illus 1).

2 Survey Procedure and methodology

2.1 Fieldwork

2.1.1 The procedure used for the investigation was a recorded magnetometer survey carried out according to the methodology set out in the ITT Specification (ACC 2012).

2.1.2 The magnetometer readings were collected along transects 1m apart using Bartington 1m fluxgate gradiometers, and are plotted at 25cm intervals along each transect. The results of the survey are presented as a grey scale plot accompanied by an interpretation at 1:2000 scale (Illus. 3 and 6); and as graphical [x-y trace] plots (Illus. 4-5) at 1:1250 scale. Inclusion of these alternative presentations allows the detected magnetic anomalies to be examined in plan and profile respectively.

2.1.3 The survey grid was set out and tied to the OS grid using a Trimble ProXRT GPS system with Omnistar correction capable of providing an accuracy of ±0.01m. The plans

are therefore geo-referenced, and OS co-ordinates of map locations can be read from the AutoCAD version of the plans.

2.1.4 Data from the survey was downloaded from the data-logger into a separate computer at appropriate intervals, and at least daily, to ensure a security copy was made.

2.2 Data processing and presentation

2.2.1 The graphical (x-y) plots (Illus 4, 5) represent minimally pre-processed magnetometer readings, as recommended for initial presentation of survey data in the 2008 English Heritage geophysical guidelines document (English Heritage 2008). Adjustments are made for irregularities in line spacing caused by variations in the instrument zero setting (as is required for intelligibility in gradiometer data), but no further filtering or other process which could affect the anomaly profiles or influence the interpretation of the data has been applied. A weak additional 2D low pass filter has been applied to the grey scale plot to reduce background noise levels.

2.2.2 An interpretation of the findings is shown superimposed on Illustrations 4-5 (which permits the interpreted outlines to be compared with the underlying data), and is reproduced separately to provide a summary of the findings (Illustration 6). Colour coding has been used in the interpretation to distinguish different interpretations and anomaly types.

2.2.3 The following conventions have been used on the plots to provide a degree of interpretation of anomalies encountered in the survey:

Interpretation	**Colour coding**	Other
Features of possible archaeological interest	Red	Outlines or broken lines
Less well defined responses (of archaeological or geological origin)	Magenta	Outlines
Strong geological responses	Brown	Outlines
Geological background activity	Light brown	These markings are included to indicate variations in the intensity of geological magnetic activity in different parts of the survey.
Cultivation	Green	Dashed lines

The more recent responses have been divided into four categories depending on the nature of their response and what caused it:

Interpretation	**Colour coding**	Other
General disturbances	Dark blue/purple	Outlines
Pipes	Blue	Outlines and broken lines
Drains	Purple	Dashed
Individual ferrous items	Light blue	Outlines

2.3 Archive

2.3.1 All field records and other products of the work shall be archived with the NMRS at the Royal Commission on the Ancient and Historic Monuments of Scotland (RCAHMS), following and adhering to its standards and guidance for project archiving (RCAHMS 1996a and b).

3 Geology

3.1.1 Magnetometer survey findings throughout the AWPR investigations are liable to be influenced by the presence of metamorphic and igneous parent material with variable magnetic properties.

3.1.2 The A96 Park and Choose site is on a bedrock of Granite overlaid by Quaternary drift deposits. The bedrock is described (on BGS 1:50000 sheet 77) as foliated muscovite-biotite-granite. This is covered by Banchory Till, which is a poorly sorted (diamicton) collection of superficial deposits, measuring 2-5m in thickness. This is a gravelly sandy diamicton, principally decomposed Neoproterozoic metamorphic rocks and Caledonian igneous rocks. This could produce clusters of quite high magnetic responses.

3.1.3 There is also a deposit of Blairdaff Moraine Formation in the southern part of the survey area. This is also likely to contain metamorphic and igneous clasts, as is the case for the Banchory Till.

4 Results

4.1 Part of the southern field of the Park and Choose site lies within the boundaries of the Northern Leg evaluation area, and was previously surveyed as part of the AWPR Northern Leg survey (Headland Archaeology 2012b). Plots and results from this part of the field are included in the illustrations in the present report for completeness. The following features and findings are labelled on Illustrations 3 and 6:

4.2 **Linear and other anomalies A:** This group of magnetic anomalies includes a partly rectilinear negative feature (indicated on Illustration 6 by a broken red line). These features show a greater regularity of plan than is seen in the prevailing background geological magnetic activity (as indicated in brown). Negative linear anomalies may be caused by an extant trench or hollow in the topsoil, but may sometimes indicate the presence of buried stone wall footings.

4.3 **Pit-like features B, C, D:** A number of individual magnetic anomalies have dimensions and amplitudes which could represent silted pits, and also display characteristic rounded profiles in the graphical plots (Illus 4-5). Such anomalies could in an appropriate context be interpreted as potential archaeological findings, particularly if they form groups or clusters, or are associated with linear features or enclosures. Such features in the present survey are sparsely and randomly distributed, and so are more likely to indicate individual igneous rocks buried in the till. They are therefore outlined in magenta (rather than red, the latter being used to indicate features of more direct archaeological significance). Examples are labelled at B, C, D (this last one on the access road), but other similar features are present in the data.

4.4 **Cultivation effects E, F:** Groups of parallel linear markings of a kind typically caused by past or present cultivation are visible in the grey scale plot (Illus 3). Some stronger examples are indicated in green at E and F (Illus 6). The linear pattern at E aligns with the existing boundaries, and so is unlikely to pre-date the enclosure of Walton Farm. The only extant historic boundary in the vicinity of the markings at F meanders to the south-east of these features and lies roughly perpendicular to their orientation.

4.5 **Geological responses G, H:** No large or extended magnetic anomalies of a kind which are likely to indicate igneous dykes in the bedrock have been detected here (in contrast to other sections of the AWPR surveys), but some responses may indicate igneous boulders which are particularly large or near to the surface. Some examples are outlined in a darker brown, as at G and H. Pit-like anomalies such as B, C, D (this last one on the access road) could also be of geological origin (Illus 3 and 6) (see 4.3).

4.6 **Pipe J**: This alignment of strong magnetic anomalies is likely to represent an iron water pipe.

4.7 **Drain (or former boundary) K**: The disturbed readings indicated by a broken line at K could represent a trench containing a land drain, or perhaps a line of disturbances along a former field boundary.

5 Discussion

5.1 Responses relating to geology

The Banchory Till which covers much of this site contains clasts of metamorphic and igneous rocks giving rise to detectable magnetic anomalies. These effects are not sufficiently dominant to preclude the identification of other features, but in general it is necessary in this terrain to identify archaeological findings against a more varied and active magnetic background than would be the case on a lowland site on sedimentary geology.

It is always necessary to take account of the plan, dimensions, distribution and regularity of detected features alongside the intrinsic properties of individual magnetic anomalies when interpreting a survey, and such factors are of particular relevance here. Some findings have been identified on the basis of a distinctive regularity or linearity of plan in contrast to the more randomly distributed natural background activity. These are discussed in more detail in sections 5.2 – 5.4 below.

5.2 Responses relating to modern services or disturbance

Recent features or disturbances as detected by the survey are limited to an iron pipe J, and various strong magnetic anomalies around the edges of the survey, as are often seen near to modern fences or structures.

5.3 Responses relating to drainage or cultivation

Land drains are sometimes represented by uneven sequences of small magnetic anomalies corresponding to sections of clay pipe. It is possible that the disturbances indicated at K could be of this kind, although they could also indicate debris in the filling of a ditch or on the line of a former boundary.

5.4 Possible archaeological responses

One feature of potential archaeological interest is the group of magnetic anomalies at A. This group is partly rectilinear in plan, as noted above. Other findings include possible pit-like magnetic anomalies, as at B-D. Features of this kind could in some cases be interpreted as silted pits of possible archaeological interest, but the examples seen here are widely dispersed across the site, and are more likely to be of geological origin.

6 Consideration of the methodology

The use of fluxgate gradiometry in areas of igneous or metamorphic rocks is potentially fraught with problems. There is a risk that responses from natural geology could dwarf those caused by archaeological features and even where they don't, the randomness of geological activity might mask patterns created by these rendering them unintelligible. In this instance the presence of Banchory Till would appear to have masked the effects of the underlying igneous bed rock. However, the difficulty still remains that isolated responses that in "normal circumstances" (i.e. on sedimentary landscapes) might be interpreted as archaeological in origin have a much greater chance of relating to buried magnetic boulders on this site.

7 Conclusions

The findings from the magnetometer survey of the A96 Park and Choose site do not suggest the presence of any dense concentrations of detectable archaeological features. Conditions at the site appear to be responsive to a survey of this kind, as is indicated by the visibility of cultivation effects, but most of the magnetic disturbances (including a drain or former boundary) appear to be of non-archaeological origin. One feature which cannot clearly be identified as recent or natural is the group of magnetic anomalies at A.

8 References

8.1 Bibliographic Sources

Aberdeen City Council 2012: *Invitation to Tender for the non-Invasive Archaeological Investigations for the Aberdeen Western Peripheral Route (AWPR Package)*

English Heritage 2008 *Geophysical Survey in Archaeological Field Evaluation*

RCAHMS 1996a *Publication and Archiving of Archaeological Projects*

RCAHMS 1996b *Guidelines for Archiving of Archaeological Projects*

Headland Archaeology 2012a *Written Scheme of Investigation – A96(T) Dyce Drive Park & Choose and Link Road (Dyce)*

Headland Archaeology 2012b *Aberdeen Western Peripheral Route Package (Northern Leg): Geophysical Survey*

Headland Archaeology 2013 *A96(T) Dyce Drive Park and Choose and Associated Link Road (Dyce); Photographic Survey: Walton Farmhouse (Site 128)*

8.2 Digital Sources

British Geological Survey Website 1:50,000 maps from the Geology of Britain Viewer

http://mapapps.bgs.ac.uk/geologyofbritain/home.html

9 Appendix 1: Illustrations