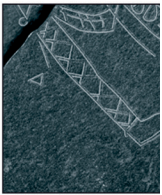
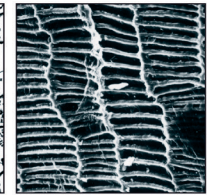
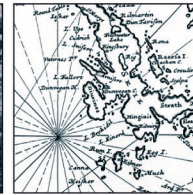
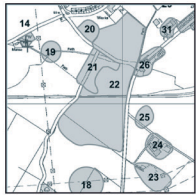


DSCM11/003



DALFAD SURFACE COAL MINE – ARCHAEOLOGICAL MITIGATION

Results of Archaeological Survey and Coring

for Scottish Resources Group

10/0842/PP

June 2011



HEADLAND
ARCHAEOLOGY (UK) Ltd



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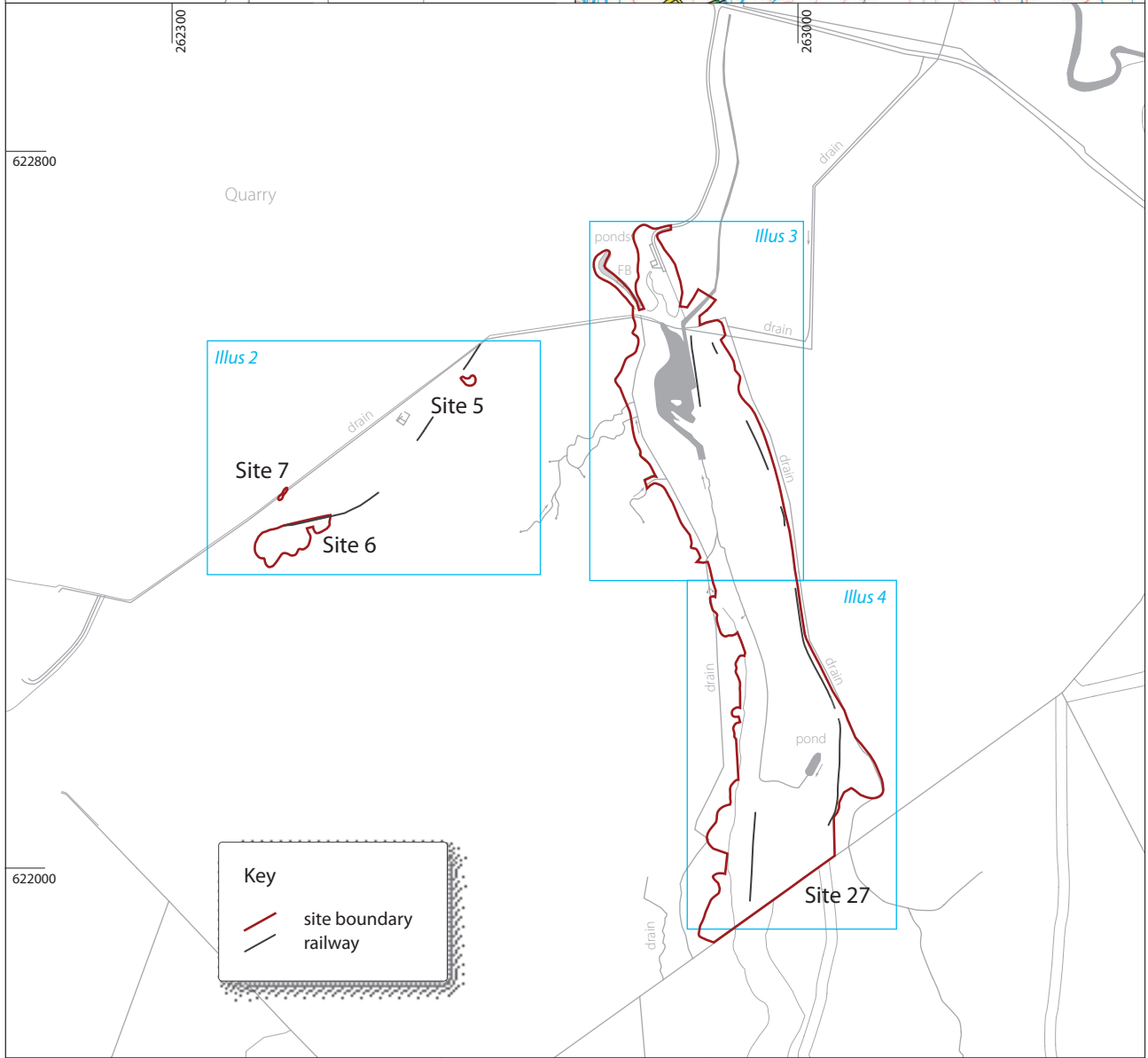
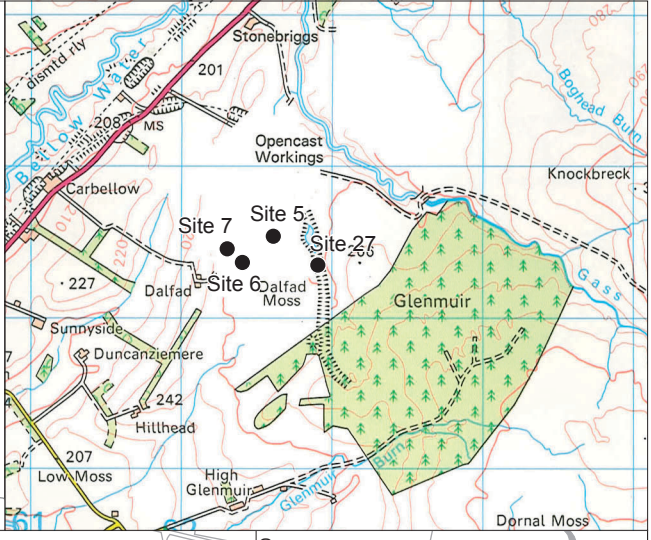
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Dalfad Quarry
Muirkirk
Ayrshire



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Scale 1:7,500 @ A4



Illus 1
Site location

DALFAD SURFACE COAL MINE – ARCHAEOLOGICAL MITIGATION

Results of Archaeological Survey and Coring

1. INTRODUCTION

Headland Archaeology was commissioned by Scottish Resources Group to undertake a survey of five upstanding agricultural and industrial sites in advance of works at Dalfad surface mine, East Ayrshire (Illus 1). Previous work (Cressey & Finlayson, 1996) had confirmed the existence of a number of sites of archaeological interest, based on desk-based assessment and field survey. These were checked during a further walkover survey (van Wessel, 2011), which revealed that a number of sites had already been removed by landscaping works.

The purpose of the present work was to create a permanent record of the remaining sites that are to be affected by the proposed development (Illus 1). The WSI agreed with WoSAS specified a detailed topographic survey, complemented with photographs and a brief written record. This fieldwork was carried out between the 27th and 29th of April, 2011.

2. AIMS AND METHODS

It was intended to show to what extent the remains of the industrial landscape of the mid 19th century were still visible, and to create a ‘snapshot’ of their present condition. The survey was undertaken with a differential GPS, with reference to Ordnance Survey 1st edition mapping and recent aerial photographs. The topography was recorded to a scale of 1:1000, and has been drawn up as a series of hachured plans (Illus 2–4). Photographs (colour print and digital) were taken to show the condition of the sites.

3. RESULTS

3.1 Site 5 – ‘Old Coal Pit’ (Illus 2)

The coal pit exists as described by Cressey & Finlayson – as a crescent-shaped bank approximately 16x9 m, standing

now to a height of around 0.6m (Illus 5). The water-filled shaft was no longer visible. Two short stretches of railway embankment are visible to the N and SW, running towards Dalfad coal pit (Site 6).

3.2 Site 6 – ‘Dalfad Coal Pit’ (Illus 2)

The site exists more or less as described by Cressey & Finlayson. The railway branch that runs past Site 5 is partially visible as a line in the vegetation, becoming more easily discernible as it turns westwards in shallow cutting towards the pit head. It was not possible to make out either of the two flanking sidings. The shaft itself lies in a substantial hollow, measures 3.5x1.6m and is filled with large stones (Illus 6). The surrounding bings cover an area of 65x40m, standing to a maximum height of around 4m (Illus 7). It is likely that these have either collapsed or eroded somewhat since the 1996 survey, when they stood to a height of 10m, but covered a smaller area. A smaller bing to the E measures 20x12m and 1m high. There is no sign of any of the former pit buildings.

3.3 Site 7 – ‘Clearance Cairn or Dyke’ (Illus 2)

A linear spread of stones lies under the present fence line approximately 45m N of Dalfad pit. It runs for around 16m on a NE-SW alignment, with a maximum width of 5m (Illus 8). It is possible that it has been truncated on the NE end by a deep drain. The scant remains suggest that this feature is the result of small-scale field clearance rather than a collapsed dyke.

3.4 Site 8 – ‘Rig and Furrow’

Cressey & Finlayson recorded an area of rig and furrow cultivation immediately NW of Site 7. This is no longer visible on the ground or on current aerial photography. It is likely to have been removed with recent landscaping works on the adjacent hillside.



3.5 Site 27 – ‘Limekiln and mineral Railway’ (Illus 3 & 4)

As described by Cressey & Finlayson, the landscape immediately west of Dalfad Moss is dominated by a substantial linear quarry and associated spoil heaps. The former runs for approximately 750m (within the development area), on a slightly meandering N-S alignment (Illus 9). It is up to 7.5m deep and 35m wide, except for a ‘bulge’ toward the N end which is 60m wide and mostly flooded (Illus 10). A branch from the main railway spur can be traced down the slope to the N end and in parts along the length of the base of the quarry (Illus 11), though to the S end this appears to have taken a more easterly line at the time of the OS 1st edition. This corresponds with a slightly different alignment of the S end of the quarry at this time. The only upstanding structural remain is a thick wooden post at the base of the quarry, 300m from the S end (Illus 12).

The spoil heaps to the E are extensive, with a spread of between 45m and 125m, standing to a height of up to 11m from the upper edge of the quarry (Illus 13). The line of the railway spur can be followed for much of its length along the E edge, with stretches of cutting and embankment clearly visible (Illus 14).

2 To the W, the upcast is less substantial, with discrete mounds up to 31m wide and 1.5m high. A narrow, meandering water body runs parallel to the northern third of the quarry. It appears on the 1st edition OS map as part of a water course, though it may have been modified as part of the works.

The northern part of the quarry has been modified since the 1996 survey – a massive drainage cutting (Illus 15) has been excavated, linking the quarry to the Gass Water to the NE. A new access track, a hut and several smaller drains have also been constructed here (Illus 16). These have removed any trace of the limekilns and the junction between the two railway branches described above.

3.6 Map evidence

Illus 17 shows the major changes to the site between the 1850s and the 1920s (Thomson’s map of 1832 does not show any activity on the site). The 1st Edition (1864) shows the full operation of both the limestone quarry and Dalfad Coal Pit, with the associated railway branches (the ‘old coal pit’ does not appear at this scale). By 1896 it appears that both are out of use, with only the branch line running into the heart of the limestone quarry still extant. By 1904, even this had been cut short. It was later re-used as part of the line running to the Gass Water baryrite mine to the E, as shown in the 1926 map.

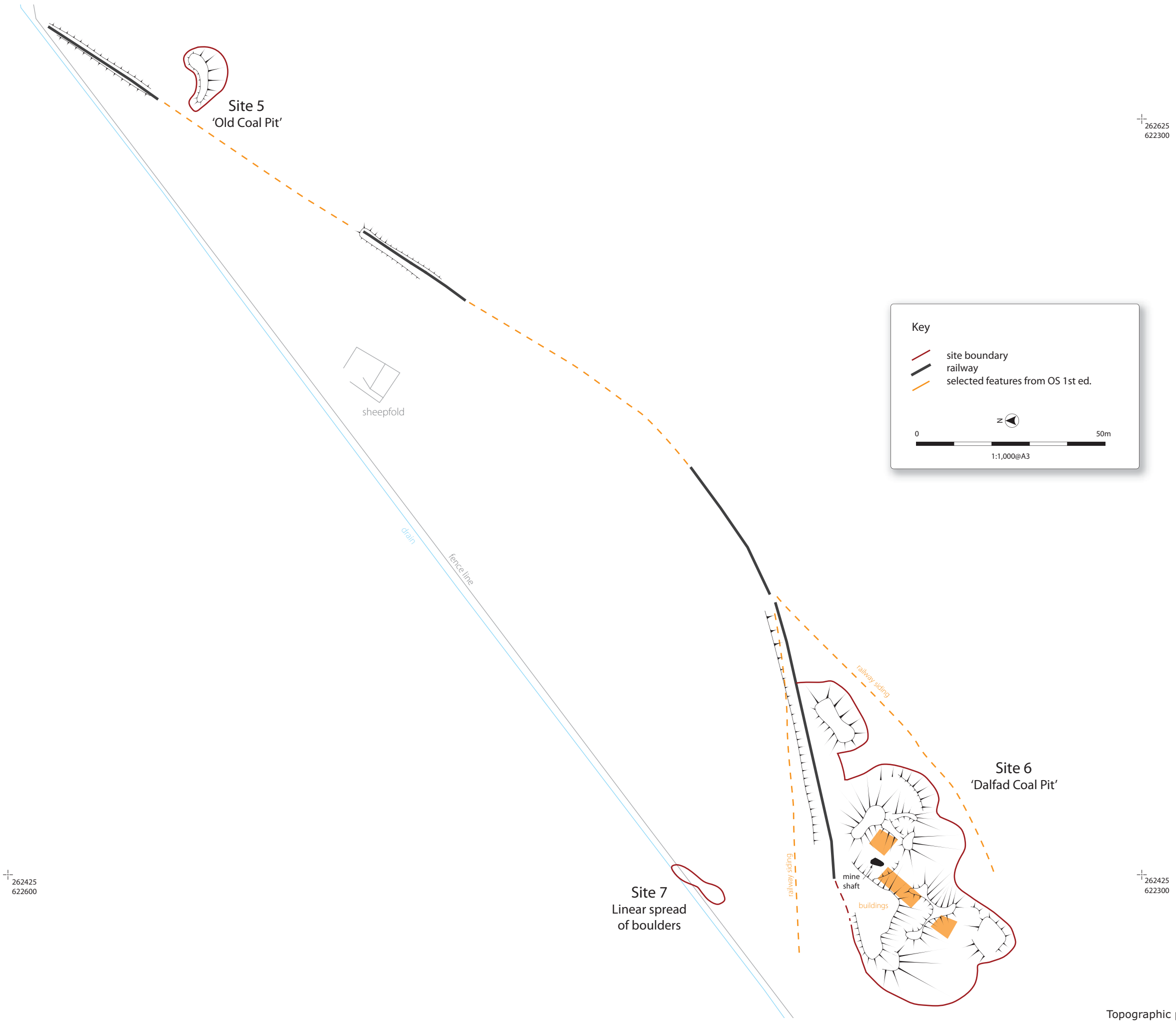
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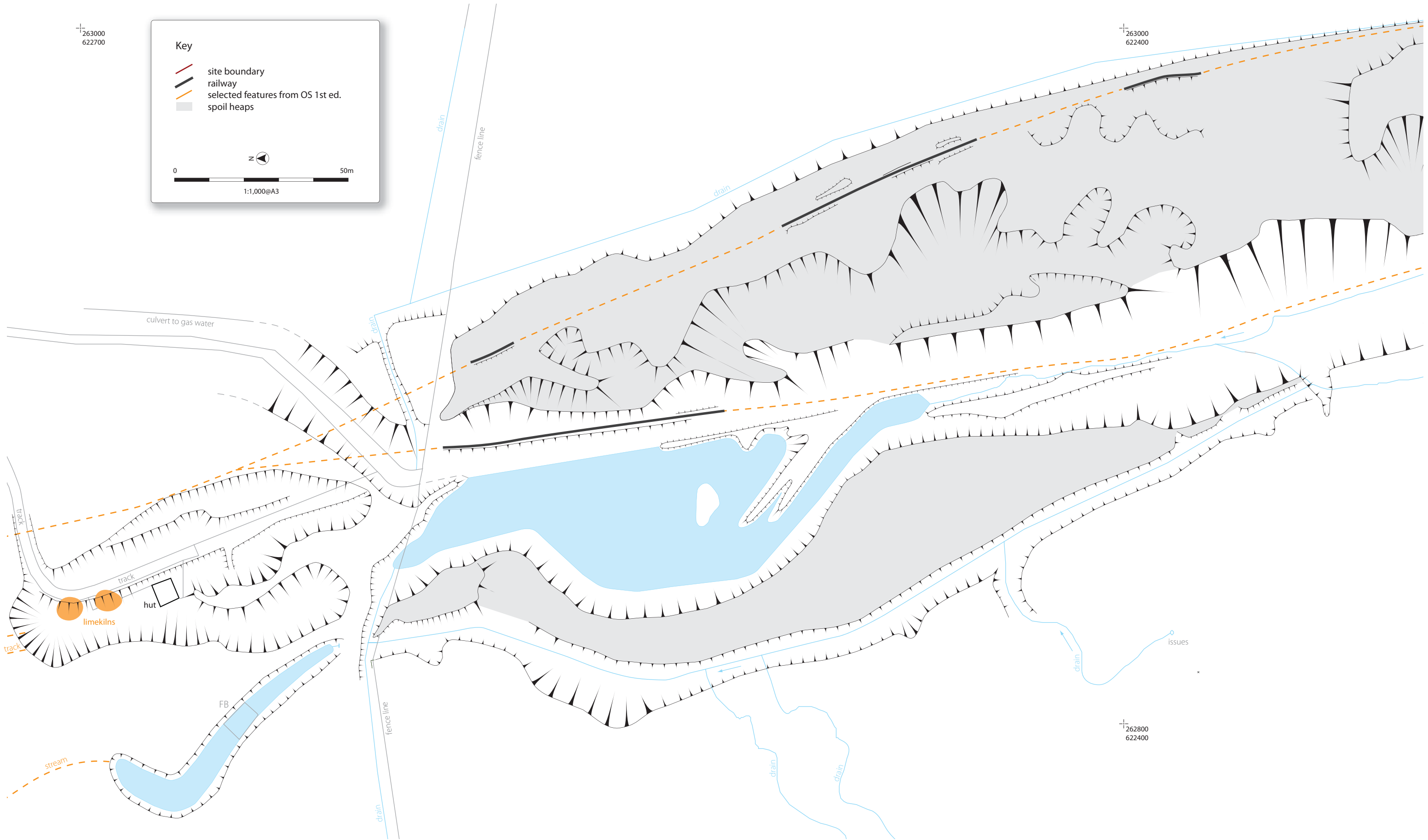
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4.2 Cartography

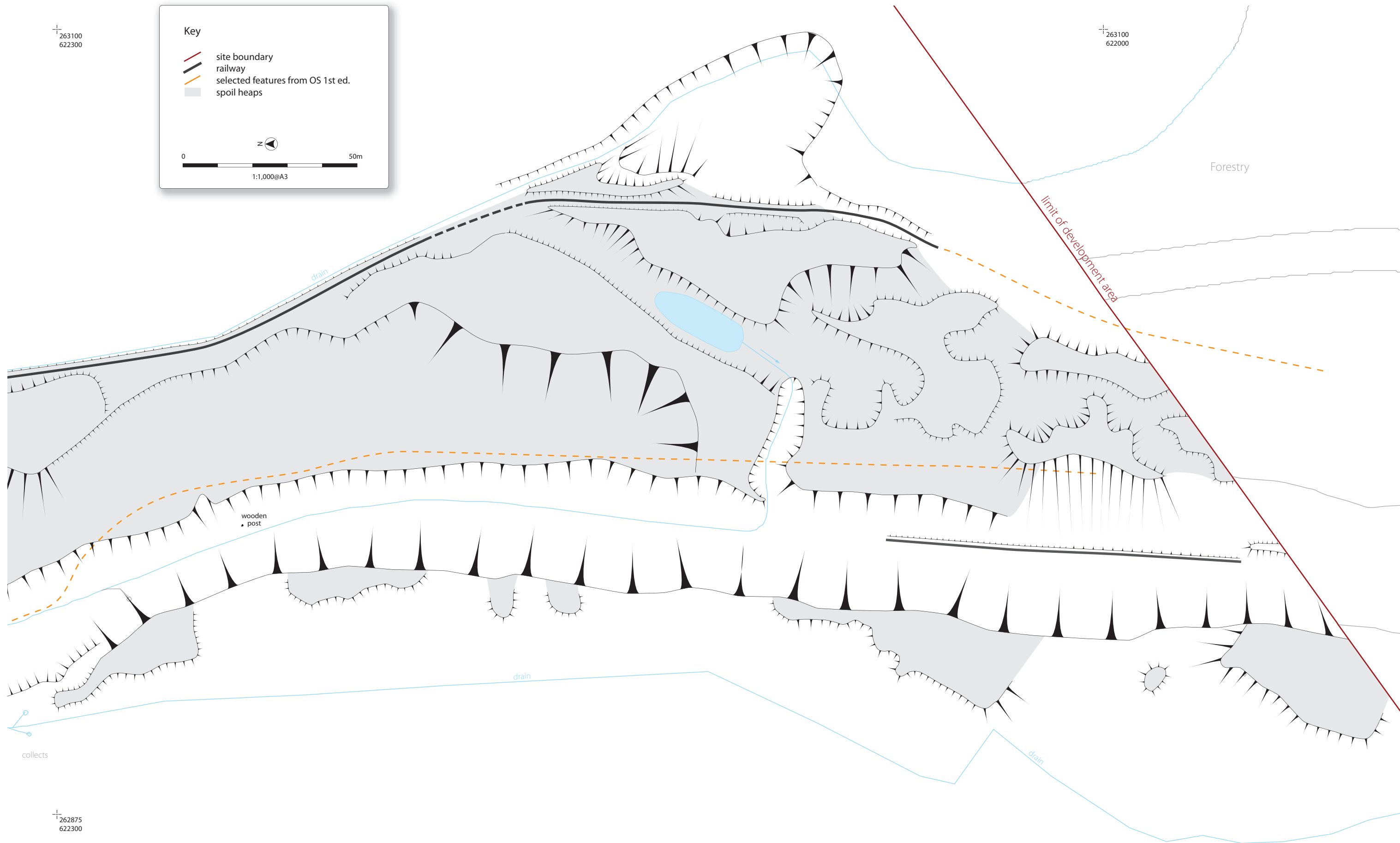
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Illus 2
Topographic plan of sites 5,6 and 7



Illus 3
Topographic plan of site 27 (N end)



Illus 4
Topographic plan of site 27 (S end)

Illus 5

The spoil heap at Site 5 ('Old Coal Pit'),
facing NE



Illus 6

The infilled mine shaft at Site 6
('Dalfad Coal Pit'), facing SW

Illus 7

The spoil heaps at Site 6 ('Dalfad Coal Pit'),
facing N





Illus 8

Linear spread of stones (Site 7), facing N



10



Illus 9

The limestone quarry at Site 27, facing N



Illus 10

Flooded area to N of limestone quarry at Site 27, facing S



Illus 11

Railway embankment descending into the limestone quarry,
facing S



Illus 12

Wooden post in limestone quarry, facing N

11



Illus 13

Spoil heaps on E side of Site 27, facing S



Illus 14
Line of railway branch on E side of site
27, facing S

12

Illus 15
Modern drainage cut at Site 27, facing E

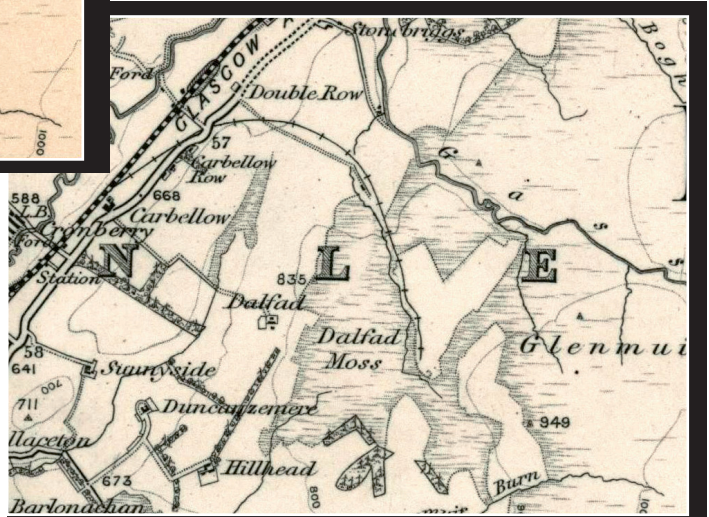


Illus 16
Modern shed and track at Site 27, facing
NW



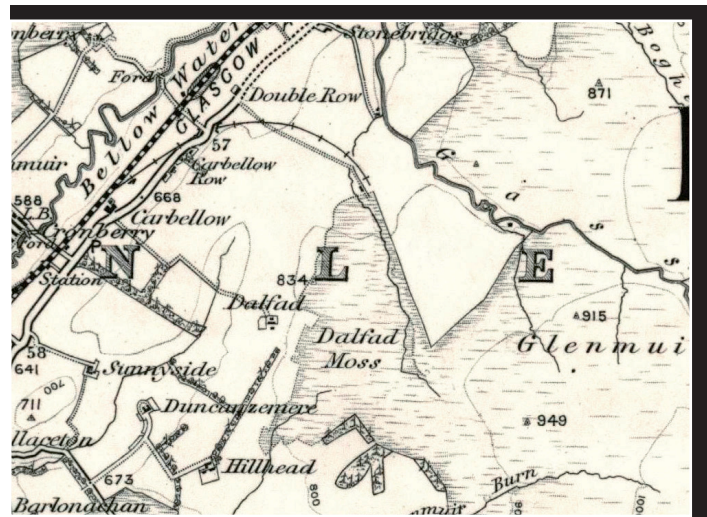
Illus 17a

OS 1st edition (1856)



Illus 17b

OS 2nd edition (1896)



Illus 17c

OS 3rd edition (1904)



Illus 17d

OS popular edition (1926)



5. APPENDICES

5.1 Appendix 1 – Photographic register

Photo no.	Direction facing	Description
001	NNE	View of Site 7
002	NNE	Detailed view of Site 7
003	NE	View of railway line leading to Site 6
004	SW	View of spoil heaps, Site 6
005	W	View of blocked shaft, Site 6
006	E	View of spoil heaps, Site 6
007	NE	General view of Site 6
008	W	General view of Site 6
009	W	View of railway cutting, Site 6
010	NE	View of railway cutting, Site 6
011	NE	View of pit bank, Site 5
012	SW	View of pit bank, Site 5
013	N	View of railway line, NW of Site 5
014	SE	View of railway line, SW of Site 5
015	W	View of railway line, SW of Site 5
016	N	View of railway line, SW of Site 5
017	S	View of Site 27 - N end, from W side
018	E	View of Site 27 - N end, from W side
019	N	View of Site 27 - N end, from W side
020	N	View of Site 27 - N end, from W side
021	S	View of Site 27 - S end, from W side
022	S	View of Site 27 - S end, from W side
023	N	View of Site 27 - S end, from quarry base
024	N	View of Site 27 - spoil heaps on E side, S end
025	NE	View of railway line, Site 27, from W side
026	S	View of Site 27 - spoil heaps on E side
027	N	View of Site 27 - spoil heaps on E side
028	N	Wooden post, Site 27
029	S	View of Site 27 - spoil heaps on E side, S end
030	SW	View of Site 27 - spoil heaps on E side, S end
031	N	View of railway line on E side of Site 27
032	W	View of Site 27 - spoil heaps on E side
033	S	View of Site 27 - spoil heaps on E side
034	S	View of railway line on E side of Site 27
035	S	View of Site 27 - spoil heaps on E side

Photo no.	Direction facing	Description
036	S	View of railway branch, Site 27
037	S	Northern end of Site 27
038	S	Northern end of Site 27
039	S	Northern end of Site 27
040	NE	Northern end of Site 27
041	NE	Northern end of Site 27
042	N	Northern end of Site 27
043	E	View of modern drainage cut, Site 27
044	N	Northern end of Site 27
045	NW	Modern shed, N end of Site 27
046	SW	Modern shed, N end of Site 27
047	NW	Northern end of Site 27

5.2 Appendix 2 – The Stratigraphic Investigation of an Area of Peatland and Core Retrieval, Dalfad Moss, Cronberry, East Ayrshire

Dr Scott Timpany

Introduction

A proposed area of open cast mining extraction will affect an area of existing peatland; Dalfad Moss. The potential for features of archaeological interest such as field walls and trackways within the peats, together with the palaeoenvironmental potential of the peat themselves was highlighted. In order to investigate the presence of such features a coring exercise was undertaken using a manual gouge auger across the peatland. As part of the gouge auger survey the depth of the peats and underlying sediments were also recorded in order to gain an insight into the palaeotopography of the site. The sediment depths have been used to construct a Digital Elevation Model (DEM) of the area to illustrate the peat depth across the site. Radiocarbon dates were also obtained for the basal peat layer of the area of deepest and shallowest peats to investigate how the lowland raised mire may have spread across the area.

Method

Fieldwork

A total of thirty-two auger points were undertaken across the peatland using a manual gouge auger. The sedimentary sequence was recorded at each location, together with any possible features encountered. All of the auger points were leveled through survey in the field, with a Trimble GPS system to record their position and the OD heights of the current peat surface. At the deepest peat location, Auger Point (AP) 7 and the shallowest peat location, AP 18, core samples were collected using a Russian Corer (*cf.* Jowsey, 1966) so that peat from the base of the sequences could be sampled for radiocarbon dating. The cores have been stored at Headland Archaeology (UK) Ltd in case any further study is warranted.

DEM construction

The auger and survey data have been combined using Geographic Information System (GIS) to produce a DEM of the peat thickness and depth of the deposit.

Results

Sedimentary sequence

Three main lithostratigraphic units were encountered at the site; raised mire peat (Unit I), a peaty clay layer (Unit II) and glacial till (Unit III). The raised mire peat was

observed to be a monocotyledon peat, which in some locations was also found to contain wood fragments. The monocotyledon plant fragments within the peat show the former growth of plants such as grasses, which in the case of Dalfad Moss is likely to represent species such as cottongrass (*Eriophorum* sp.), purple moor grass (*Molinia caerulea*) and sedges (*Carex* sp.) on the peat surface. The wood fragments are likely to represent phases of tree growth on the bog, such as wetland carr-woodland, comprised of trees such as alder (*Alnus glutinosa*), birch (*Betula* sp.) and willow (*Salix* sp.). The depth of the peat was seen to vary across the site, being deepest in the eastern area of the site where it extends to a depth of 6m at AP7 and shallowest to the western edge of the site, where it thins out to 0.4m at AP9 (see Illus 18).

Underlying the peat in several locations was peaty clay, which is likely to reflect pockets of open pools of water, which subsequently became infilled as peat began to develop and spread across the area. The radiocarbon dates from the cores indicate that peat began to develop at approximately 6650–6480 cal BC. The base of the sedimentary sequence was a glacial till represented by silty sand with small sub-angular to angular clasts.

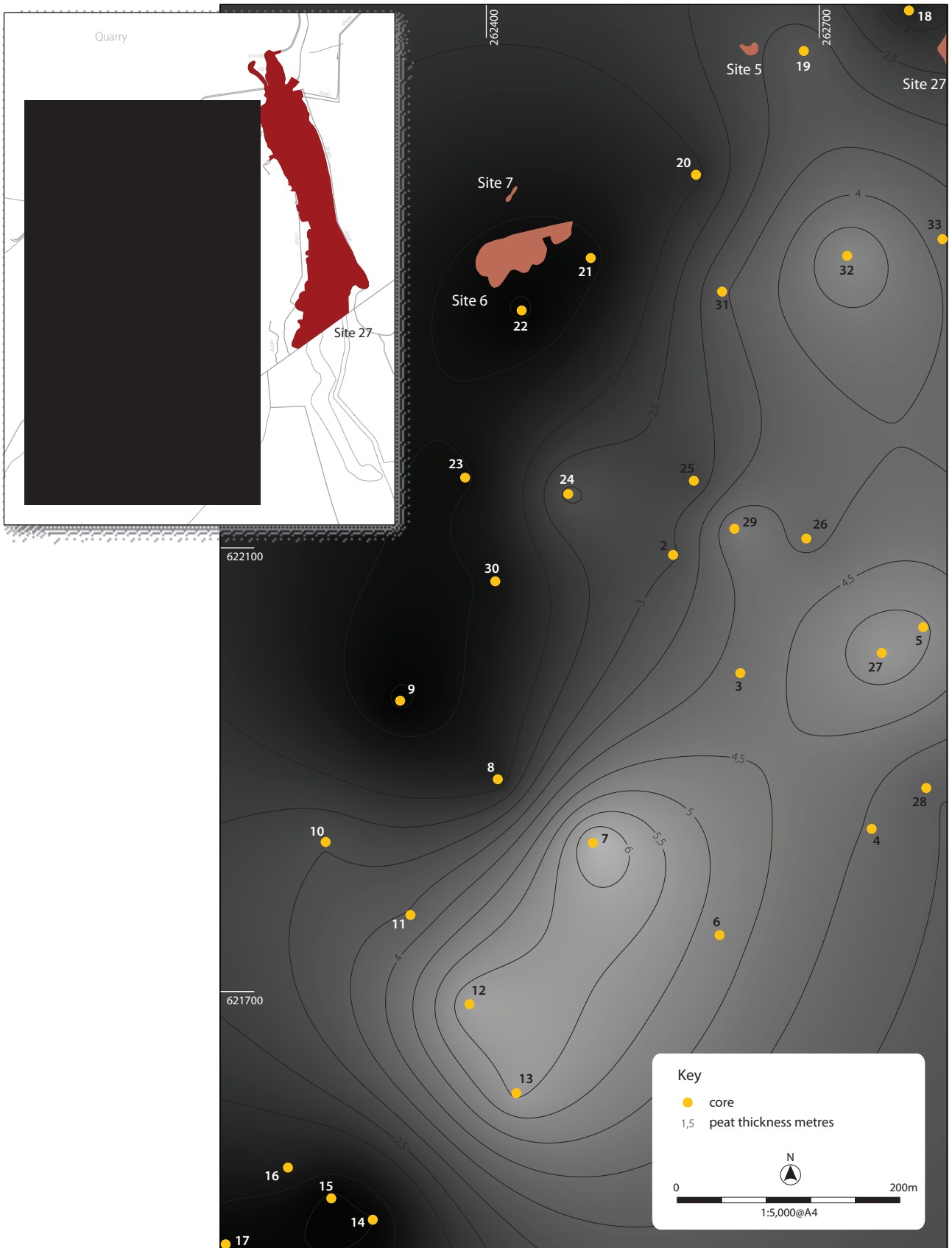
A DEM has been constructed for the area to illustrate the depth and thickness of the peat deposit; this is shown in Illustration 18.

Radiocarbon dates

The dated peat sequences indicate that peat formed at the site during the Late Mesolithic period, with a radiocarbon date of 6650–6480 cal BC (SUERC-34418; 7745±35 BP) from the base of the peat layer (Unit I) at AP7. The deeper peats are seen to center in the northeast of the site with depths reaching between 4–6m (see Illus. 18). The shallowest sequences of peat were found to the west, with depths of 0.4–2.5m (see Illus 18). A date from the base of AP18, located at the north east of the site contained one of the shallowest peat sequences of 1.8m and showed peat encroachment, reached this part of the site also in the Late Mesolithic at 4990–4790 cal BC (SUERC-34417; 6000±30 BP). No top dates were available for the peat sequence but given the basal dates and the depth of peats across the sites it is likely that a near full Holocene sequence is present at the site. The radiocarbon date results are presented in Table A2.1.

Discussion

The peat sequences were seen to overlie the peaty-clay layer, which in turn overlies glacial till. This sequence suggests that open pools of probable shallow water, existed across the site following the glacial period. As the area became more vegetated the pools were infilled as vegetation spread. The basal peat dates indicate this occurred prior



16

Illus 18

DEM showing peat depth across the area

Core	Sample depth (cm)	Dating material	Date BP	Date Calibrated (2σ)	Radiocarbon determination
18	107-108	Peat – humic acid	6000±30	4990-4790 cal BC	
7	598-599	Peat – humic acid	7745±35	6650-6480 cal BC	

Table A2.1
Radiocarbon dating results from core samples

to the Late Mesolithic period (6650–6480 cal BC). A layer of wood peat was seen to overlie the peaty-clay and in some locations such as AP12 wood fragments could also be seen protruding from the peaty-clay layer, which may represent root fragments. The presence of the wood fragments indicates that as the former open water pools infilled and became terrestrialized they were colonized by trees. The wet environment that would have existed suggests the likely presence of damp-loving trees forming open carr-woodland; this is likely to include trees such as alder, willow, birch and hazel (*Corylus avellana*). Recent studies of Mesolithic buried woodland in Scotland have shown these early woodlands were dominated by species such as willow (*e.g.* Tipping *et al.*, forthcoming).

The spread of peat across the area of Dalfad Moss appears to have been quite rapid taking approximately 1500 years with a basal peat date from the very north east of the Moss providing a date of 4990–4790 cal BC. The wood peat layer at the base of the peat was also recorded in the shallower sequences such as AP19 and show that the carr-woodland was spreading with the peat, colonizing areas as the peat formed. Indeed an increase decaying organic materials from the carr-woodland (*e.g.* bark fragments, leaves, seeds *etc.*) may have helped drive peat accretion across the area. Overlying the wood peat layer, there is a gradual change to a monocotyledon peat, showing a

vegetational succession from carr-woodland to raised mire vegetation of grasses, sedges and heather, which would have been similar to the present vegetation. This form of succession from woodland to raised mire has been seen at numerous sites across the UK (Walker, 1970), as the bog surface become too wet for tree growth. It is unknown when this change occurred at Dalfad Moss, but at other sites across central Scotland similar stratigraphic changes have been recorded during the Bronze Age period (*e.g.* Birks, 1975; Dickinson, 1981).

The auguring across the area of peatland revealed no archaeological structures or features below or within the peats. There is still some potential for archaeological features to exist in the area, but this is thought to be low given the dates of the peat spread. The early date for peat accumulation at the site suggests that by the Late Mesolithic period c. 4800 cal BC most of this area would have already been under blanket peat; thus impeding the availability of land for agriculture. The development of carr-woodland across the area also indicates low potential for archaeology with areas of settlement (*e.g.* structures) unlikely to have been constructed within this wet, entangled environment. Studies of such woodland from submerged forest investigations have shown that although open, these woodlands would have been very wet underfoot with ground vegetation including sedges



and brambles (*e.g.* Timpany, 2005). Archaeology has been found in raised mire locations such as trackways and platforms (*e.g.* Raftery, 1996, Moore, 2008); however, despite the likely presence of small bog pools on the moss it would have been easily traversable without the need to construct such features. Thus the presence of such archaeological features is considered to be low, though this does not preclude the absence of people in the area.

During the auguring survey, visible macrofossils of wood and monocotyledon plant fragments were observed within the peat. The presence of such well preserved vegetational material suggests that microfossils, such as pollen and non-pollen palynomorphs (fungal spores) will also be present in the peats. Indeed peats are one of the most valuable deposits in terms of preserving micro- and macrofossils that can provide information not only on the landscapes of the past but also evidence of the people who lived in these environments (Dimpleby, 1985).

The early date for peat accumulation at the site indicates the peats would be a good source of palaeoenvironmental information for investigating landscape change during the early Holocene. Despite the lack of visible archaeology at the site it is important to note that through proxies such as pollen studies we may find evidence of people and their activities in the landscape (Whittington and Edwards, 1994); thus an absence of archaeology may not necessarily preclude an absence of evidence for anthropogenic activity.

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Conclusion

- No archaeological features were encountered during the coring exercise.
- The dates show that peat began forming at the site approximately 6650–6480 cal BC and covered the site by around 4990–4790 cal BC.
- The radiocarbon dates indicate that blanket peat spread outwards from the central and eastern parts of the site.
- Given the sequence of carr-woodland development from the Late Mesolithic through to raised mire heath vegetation the potential for the presence of archaeological features is considered to be low.
- The peat deposits have excellent palaeoenvironmental potential and could inform on early Holocene vegetation change, together with investigating the presence of past peoples in the landscape.

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5.3 Appendix 3 – DES entry

LOCAL AUTHORITY:	East Ayrshire Council
PROJECT TITLE/SITE NAME:	Dalfad Surface Mine, Muirkirk, South Ayrshire
PROJECT CODE:	DSCM11
PARISH:	Auchinleck
NAME OF CONTRIBUTOR:	Jürgen van Wessel, Scott Timpany
NAME OF ORGANISATION:	Headland Archaeology Ltd
TYPE(S) OF PROJECT:	Topographic Survey, Peat Investigation
NMRS NO(S):	-
SITE/MONUMENT TYPE(S):	Limestone Quarry, Coal Mining Site, Mineral Railway, Dyke (possible)
SIGNIFICANT FINDS:	-
NGR (2 letters, 8 or 10 figures)	NS 62585 22385
START DATE (this season)	April 2011
END DATE (this season)	April 2011
PREVIOUS WORK (incl. DES ref.)	Cressey, M, & Finlayson, W M, 1996, <i>Gasswater prospective Opencast Coal Site, Cronberry, Lugar, Ayrshire: Environmental Assessment Archaeological Baseline Report</i> , unpublished CFA report, Edinburgh. van Wessel, J, 2011, <i>Dalfad Surface Coal Mine – Written Scheme of Investigation (Appendix 1 – Baseline Survey)</i> , unpublished Headland Archaeology report, Edinburgh.
MAIN (NARRATIVE) DESCRIPTION: (May include information from other fields)	<p>A topographic survey was undertaken in April 2011 as part of a programme of archaeological mitigation in advance of works at Dalfad surface coal mine, near Muirkirk, East Ayrshire. Previous surveys had established the existence of a number of agricultural and industrial sites within the development area, primarily relating to 19th century limestone and coal extraction. The present work aimed to create a permanent measured and photographic record of two coal pits and a substantial linear limestone quarry (along with associated spoil heaps and railway branches), and a small area of rig and furrow with an associated bank or dyke.</p> <p>Though weathered and altered in places by more recent development, the industrial remains still bore considerable detail, especially with regards to the alignments of the railway branches serving the works. The rig and furrow was no longer visible at the time of the survey, though a small spread of stones may represent the remains of the bank/dyke. As part of the same mitigation programme, a known area of peatland, Dalfad Moss, was investigated in order to examine the nature and depth of the peat sediments across the area of the moss. A manual gouge auger was used to investigate peat depth and a Russian corer was used to take a core sample of the peat at the deepest and shallowest locations in order to date the base of the peats. The results of the investigation showed that peat depth varied across the peatland between 0.4 to 6m. A generalised sediment sequence across the peatland showed raised mire monocotyledon peat with wood fragments towards the base, underlain by a peaty clay layer, which in turn was underlain by glacial deposits. Radiocarbon dates from the peat show that it began to form in the Late Mesolithic period between 6650-6480 cal BC (SUERC-34418; 7745±35 BP) and 4990-4790 cal BC (SUERC-34417; 6000±30 BP)</p>
PROPOSED FUTURE WORK:	None
SPONSOR OR FUNDING BODY:	Scottish Resource Group
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ARCHIVE LOCATION (intended/ deposited)	NMRS



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