

# Excavations of an enclosure system at Rough Castle, Falkirk

Ian D Máté\*

with contributions by J Barber, M Baxter, M McBarron, R McCullagh, B Moffat & P Strong

## ABSTRACT

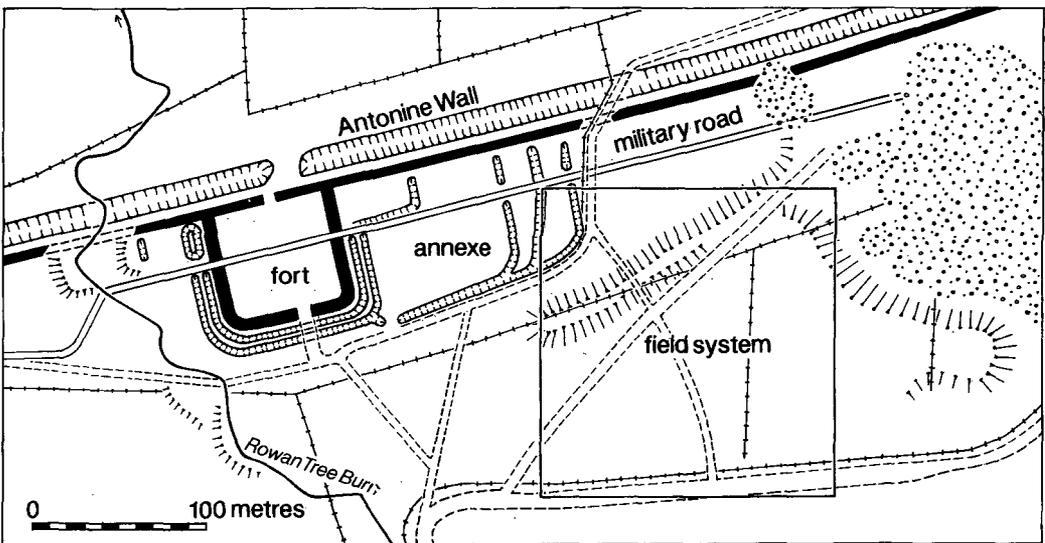
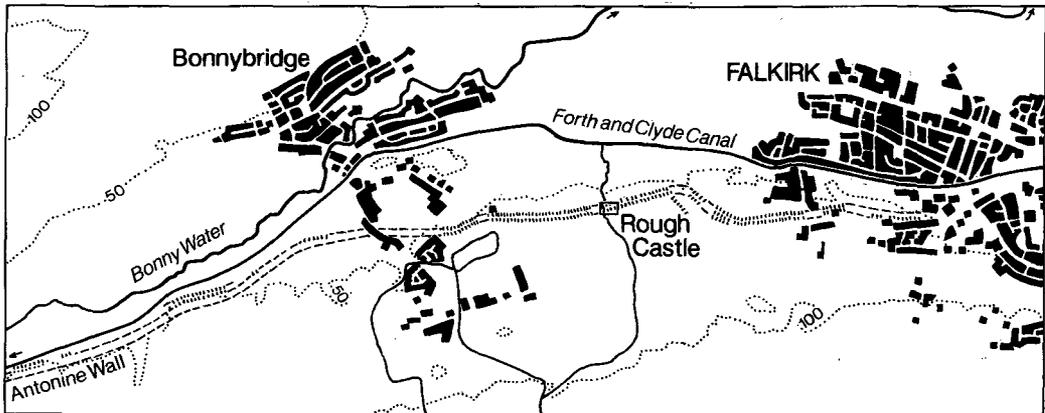
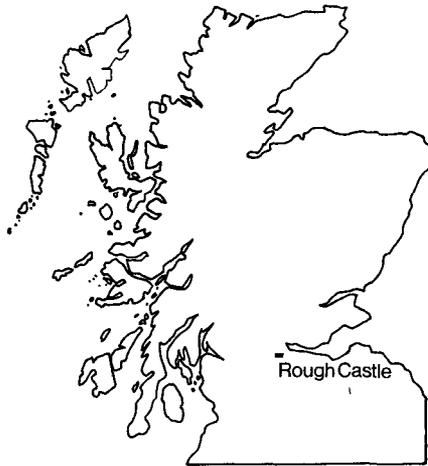
*Trenches were cut through the banks of enclosures and field systems adjacent to the Roman fort of Rough Castle on the Antonine Wall. The latest field system was of 19th-century date. A second field system is thought to be intermediate in date between this and a smaller enclosure system, the latter probably of Roman or prehistoric date. There are some similarities between the enclosures and those adjacent to other Roman forts. The only find was a Neolithic leaf-shaped arrowhead below a 19th-century field bank, and a charcoal concentration below an enclosure bank that gave a radiocarbon date within the Bronze Age. A possible Roman road runs through the enclosure system. Pollen analysis shed little light on the date or use of the site. Soil analysis confirmed phases of change during the life of the site and allowed the construction of a tentative relative chronology of non-contiguous bank segments.*

## INTRODUCTION

I Máté

The Roman fort at Rough Castle is the best-preserved earthwork among the Antonine Wall forts. It has been the subject of several excavations (GAS 1899; Buchanan 1905; Macdonald 1933; MacIvor *et al* 1980). The fort was occupied in the Antonine period from about AD 142–165. Banks of a late 18th- or 19th-century field system and of some 10–20 enclosures, arranged in an irregular sub-rectangular pattern, lie 60–100m south-east of the Roman fort (illus 1). The enclosures (illus 2) are centred on NGR NS 844798 and lie at about 70 m OD. Before the excavation described below, it had been suggested that the enclosures were contemporary with the fort. The latest field banks were identifiable on maps dating from 1824 to 1860. The specific area of the enclosure system had not previously been investigated. The enclosures and field system came under threat from adjacent open-cast mining and its associated activities in 1982. The area was surveyed by RCAHMS and a trial investigation was undertaken, directed by J Barber, with the aim of facilitating the preparation of a preservation policy for the site. The site has since been scheduled as an ancient monument under the terms of the Ancient Monuments and Archaeological Areas Act 1979. Throughout the text the oldest system of banks is referred to as enclosures, while the 18th- or 19th-century constructions are referred to as field banks or as a field system.

\* Chantstoun, South Mains, Bathgate Hills, West Lothian EH48 4NP



modern fence line    
  modern track    
  modern industrial spoil

Illus 1 Location maps. (Based on the Ordnance Survey map © Crown copyright)

## GEOLOGY

### I Máté

The local bedrock is Lower Group Productive Coal Measures of the Upper Carboniferous System (Geology Survey 1924). The boundary between this and the underlying strata, Millstone Grit, lies close to the site but both strata are dominated by sandstones (MacGregor & MacGregor 1948, 34). There is a 5 m deep covering of till (Buchanan 1905, pl 1). The upper part of this drift material is dominated by sandstone, presumably Carboniferous: a stone count of the fraction greater than 2 mm showed that 95% of the 71 stones identified were sandstone. During the field investigation the presence of coal was noted. Surface features indicate that the lower drift material drains poorly.

## VEGETATIONAL HISTORY

### I Máté, B Moffat & P Strong

The nearest pollen-core recorded is from over 40 km away at a site in the Forth Valley, upstream from Stirling (Durno 1956; Newey 1966; Brooks 1972) and is therefore not relevant to the present site. It has been postulated that without human interference the vegetation of the region would have been dominated by *Quercus* (oak) and *Betula* (birch) (Boyd 1984, quoting McVean & Ratcliffe 1962, and Birks's synthesis of studies of vegetation of eastern Scotland 1977). Pollen analysis generally indicates a change from forest-dominated landscapes in the Iron Age to open landscapes in the post-Roman period (Turner 1979). Pollen from turves from the Antonine forts at Bearsden (Dickson & Dickson 1988) and Bar Hill and the Agricolan fort at Mollins (Boyd 1984), 6 km south of the Wall indicate, however, that there had been extensive pre-Roman clearance, and Hanson & Macinnes (1980) have argued that the construction of Roman forts would not have caused further substantial regional clearance.

Information from the current excavations concerning the vegetational history of the vicinity of Rough Castle has been confined, for the most part, to the study of charcoal from excavations at the fort. Barber (1980, 271–3) identified *Quercus* (oak), *Abies alba* (silver fir), *Carpinus betula* (hornbeam), *Betula* (birch), *Pinus sylvestris* (Scots pine), and *Fraxinus excelsior* (ash). Hornbeam is considered by Godwin (1975, 264–7) to have come from south England, and *Abies alba* is probably also an import (Dickson & Dickson 1988; Godwin 1975, 101–3). In the 18th century the fort is described as overgrown with heath (Horsley 1732, 173; Nimmo 1777, 8).

A field system is shown on an estate map of about 1820 (RHP 14351). On the basis of its relationships with the Forth-Clyde Canal, the survey of which is dated 1768, and the Garnkirk to Glasgow railway line which opened in 1831 (Thomas 1984, 43), it can be concluded that the system was laid out between 1768 and about 1830. The estate map indicates that the area was cultivated but this may have been an idealized situation as a survey of the alignment of the proposed Garnkirk to Glasgow railway (RHP 13329, 1830) shows it as uncultivated scrub and woodland. Therefore, though the area was enclosed during the improvements period, it seems likely that cultivation, if it occurred, was on a limited scale.

## THE SOILS

### I Máté

Soils derived from similar parent materials are grouped into Associations and those formed from Millstone Grit belong to the Giffnock Association. Soils are further divided according to profile development into 'series'. The soils of the site are Bathmoor series soils which are the freely

drained humus iron podzol variants of the Giffnock Association (Soil Survey, Sheet 31). The freely drained nature of the soils is in contrast to the wetness found in topographical lows, which suggests a change to a more clay-rich substrate with depth.

Soils of the same series, wherever they occur, have like chemical properties. Bathmoor series have an acid litter layer, a sandy loam matrix characteristically with an acid pH and extremely low nutrient levels. The clay fraction is generally below 8% (Macaulay Institute unpublished data). These figures suggest that their 'light' nature would render them easy to cultivate and the combination of freely drained soils lying over poorly drained material would provide an ideal substrate for early agriculture, although this would be unsustainable in the medium to long term without the addition of fertilizer.

## EXCAVATION

### J Barber, I Máté & P Strong

Eight trenches were excavated where a relatively modern track had cut through field enclosure banks. A further five trenches were also excavated. The site plan (illus 2) is based on a survey undertaken by the Royal Commission on the Ancient and Historical Monuments of Scotland and is reproduced here with their kind permission. The profiles were drawn and described, and most were sampled.

#### TRENCH 1 (ILLUS 2 & 3:1)

This trench cut a 0.3 m high single-phase enclosure bank. The bank overlay a 0.1–0.2 m ridge of relatively charcoal-rich loam to sandy loam which in turn overlay a ditch-like feature interpreted as of natural origin because its loam to sandy loam fill was strongly indurated.

#### TRENCH 2 (ILLUS 2)

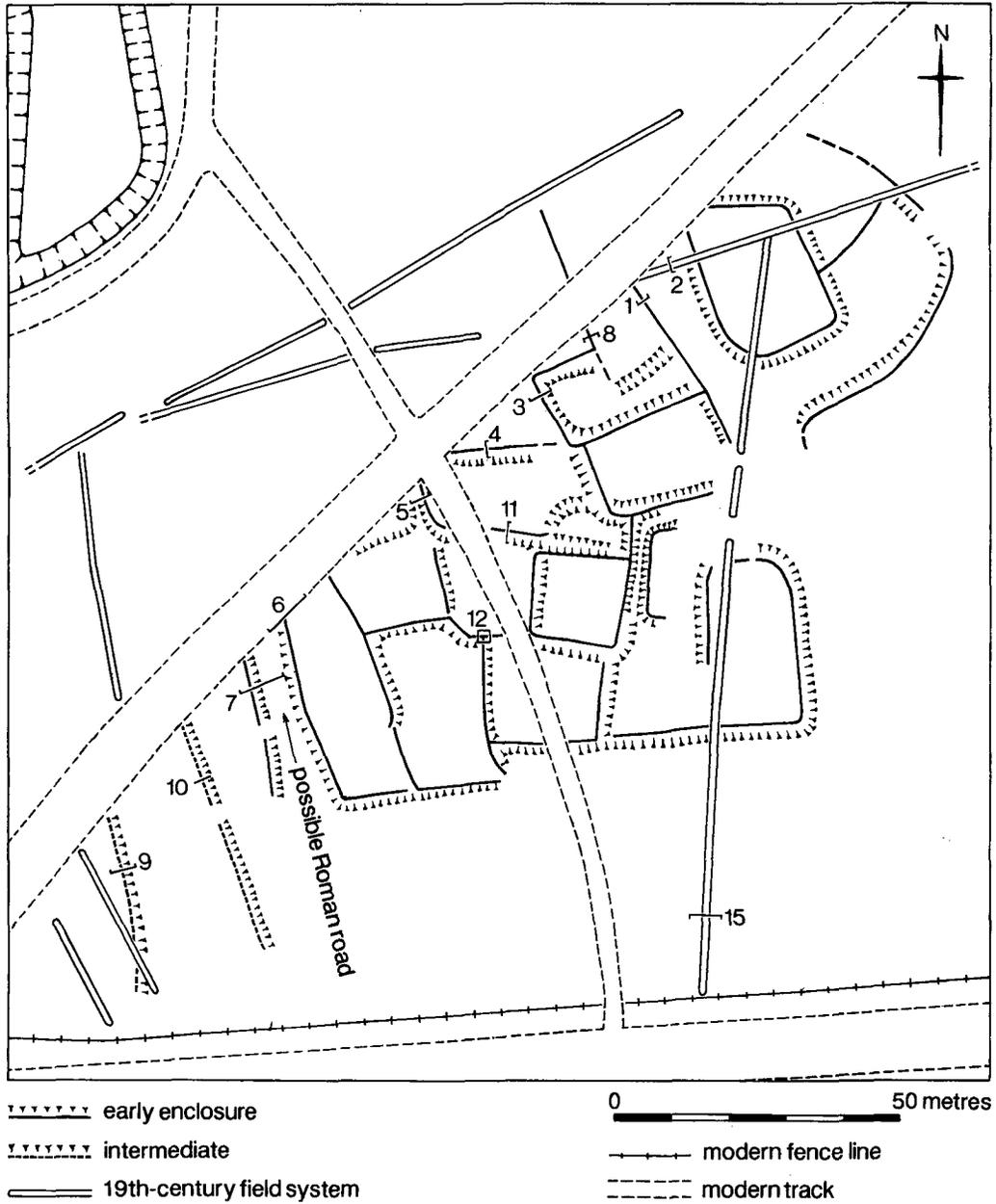
This cut a 1 m high single-phase 19th-century field bank. It was clearly built of alternate layers of peaty turf and mineral soil. The bank had a stone facing on the south side and may have also been lined on the north side, but animal disturbance and stone robbing had removed most of the evidence for this. The uppermost horizon of the buried soil profile was a 0.1 m mor (peaty) accumulation.

#### TRENCH 3 (ILLUS 2)

This crossed an enclosure bank and ditch which survived to about 0.3 m high and deep respectively. The bank was composed of soil and a high proportion of boulders, up to 0.4 m in diameter. The ditch lay on the east side. The bank was single phase and buried a profile with a 50 mm thick peaty O-horizon.

#### TRENCH 4 (ILLUS 2)

The trench cut an enclosure bank and ditch, some 0.2 m high and deep respectively, but soil processes had obliterated the distinction between the buried soil profile, the bank and any internal structure the bank may have had.



Illus 2 The enclosures and fields

## TRENCH 5 (ILLUS 2)

This crossed an enclosure bank which was cut and disturbed by a modern ditch, and the upcast from it; 0.2 m of possible bank material remained over a strongly leached buried soil.

## TRENCHES 6 &amp; 7 (ILLUS 2 &amp; 3)

Trenches 6 and 7, lying east/west, each cut through a bank and adjacent ditch, on either side of a road-like feature. The 'road' ran approximately north/south, with the accompanying banks and ditches, for a distance of some 50 m. Trenches 6 and 7 were some 8 m apart (illus 2). A ditch lay under the road, running at a slight angle to the line of the road (illus 3:7).

## THE EAST BANK AND DITCH (ILLUS 2 &amp; 3:6)

The East Bank stood about 0.2 m–0.3 m high and was single phase. The bank layers were sharply cut to the east, as if by cultivation. To the west, the bank layers sloped into a single-phase ditch. The bank and buried soil stratigraphy appeared complex but most features were ascribed to the varied and varying effects of gleying and podzolization, with translocation of humus and iron, and areas of iron mottling, panning and segregation. This was accentuated by the mixture of turf and subsoil used in the bank's construction. Some originally humus-rich layers had undergone intense gleying associated with organic matter decomposition.

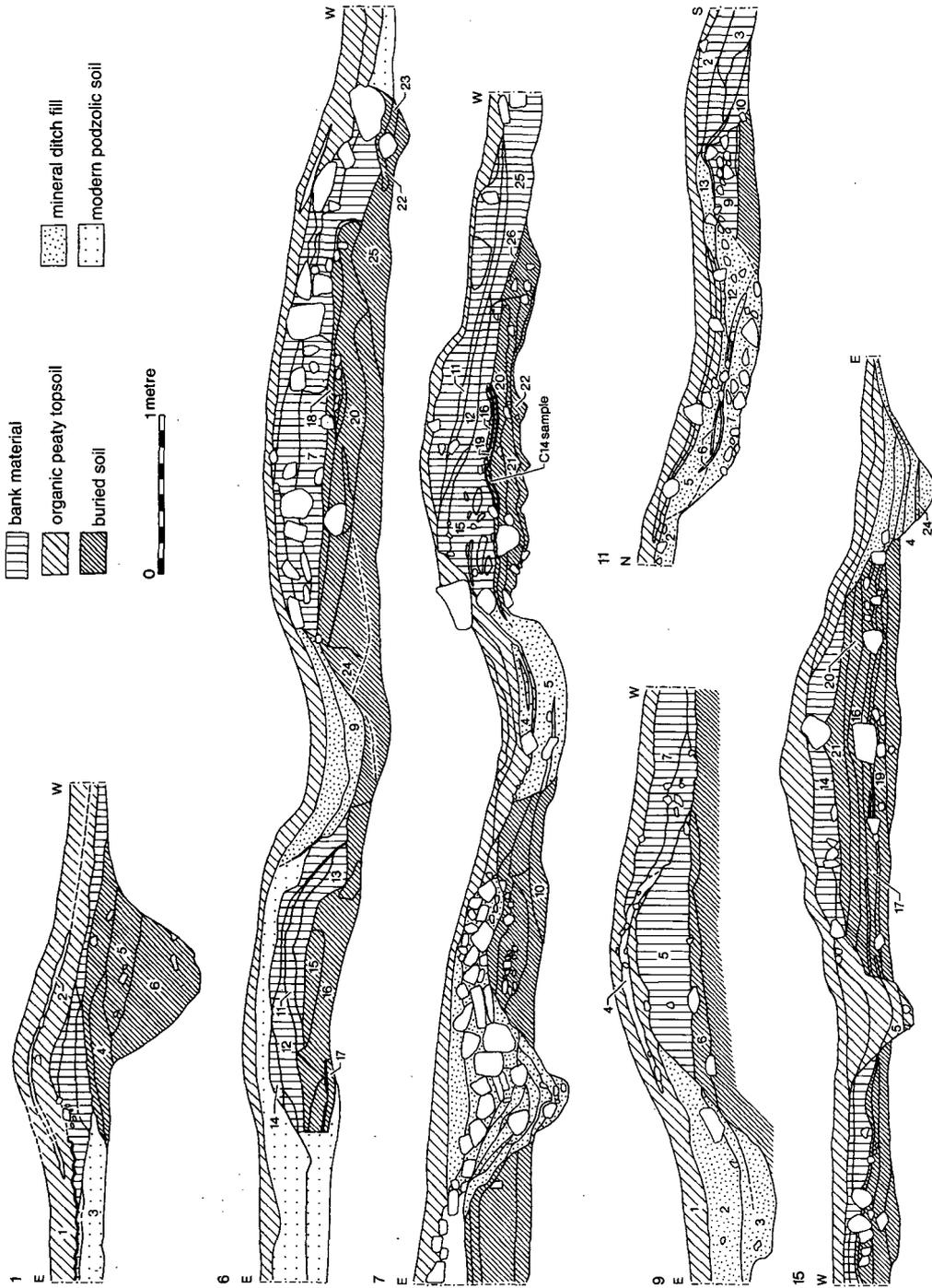
## THE ROAD (ILLUS 2, 3:6 &amp; 3:7)

This feature formed a low topographical 'hump' some 3 m across, up to 0.4 m high, and about 50 m long. A thin turf and E-horizon had formed in sand which lay over a poorly and loosely arranged layer of paving. The paving was made of angular sandstone blocks, around 0.3 m to 0.4 m in size, with the flatter sides apparently underneath. They were set in a matrix of redeposited dark brown sandy loam (Trench 6) and sand (Trench 7).

There was a sharp change to the underlying sandy loam, which was generally very dark brown but included reddish-brown, grey and dark brown aggregations derived from different horizons of the contemporaneous soil profile. This layer was interpreted as a foundation layer. The original soil profile underneath was marked by an organic upper layer. In places the upper horizon of this profile contained 0.1 m-long stones, which extended down into the subjacent layers. While the horizons were those expected in a natural profile, they also contained lenses of charcoal within humus-rich layers. Again the superimposition of podzolic features on archaeological features had occurred. The west side of the road was revetted by a 0.3 m high stone kerb set upright into the buried soil or the fill of the underlying ditch. The kerb does not appear in the drawn section.

## THE DITCH BELOW THE ROAD (ILLUS 3:7)

The continuity of the soil profile buried by the road was broken by a ditch which ran at a slight angle to the line of the road and underneath it. This ditch deepened to the south. The road foundation layer ran out over this ditch which had infilled naturally – with layers of organic and mineral layers within the fill, and with an upper layer in places formed from laminae of organic material. The depression which remained when the 'road' was constructed was filled with vacuous rubble, continuous with the foundation, though now in a soil matrix with a markedly different appearance.



Illus 3 Sections

## THE WEST BANK AND DITCH (ILLUS 3:7)

The stratigraphical evidence suggests that the west ditch was contemporaneous with the road, but this could not be demonstrated with certainty. The ditch in-silted naturally from both sides. The bank had three phases indicated by two thin intra-bank organic horizons. The lowest bank includes peat ash, charcoal and mixed soil materials. The middle bank was darkened by organic matter but also had appreciable amounts of charcoal. The uppermost bank appeared to have least anthropogenic material.

The buried soil under the earliest phase of banking had appreciable amounts of charcoal in its upper horizon; a radiocarbon date of  $3435 \pm 135$  BP ( $1485 \pm 135$  BC uncal) was obtained from this layer. The horizons of the underlying buried profile were cut to the west, as if by cultivation, but this may have occurred during the construction of the bank.

The buried soil, from which the carbon sample came, extends as a lens into the ditch alongside the road. The obvious implication is that the layer formed after the ditch infilled, but before the bank was built. However, this configuration was interpreted as the result of erosion of the soils of the side of the ditch from beneath the lens of soil above it. The lens then slumped, slightly, into the upper part of the ditch, giving an erroneous impression of being later than the entire fill of the ditch.

## TRENCH 8 (ILLUS 2)

The trench revealed a shallow rise, accentuated by peat growth, within which no stratigraphy survived.

## TRENCH 9 (ILLUS 2 &amp; 3:9)

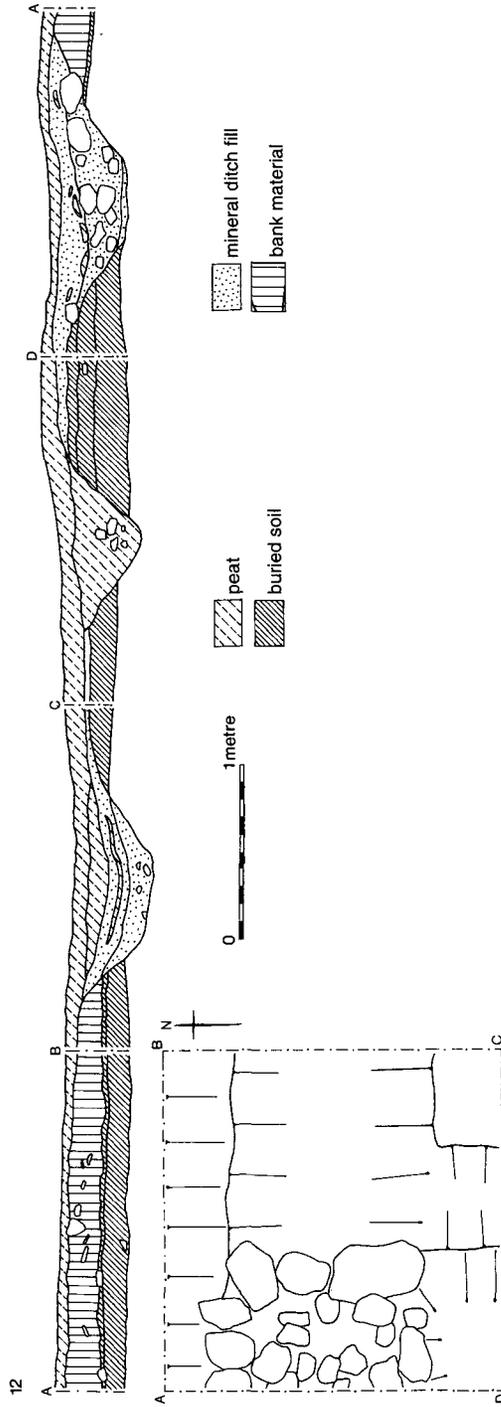
The trench cut a relatively well-preserved simple ditch, 0.4 m deep and bank, 0.5 m high. There was a thin black layer at the bottom of the ditch overlain by in-silted material overlain in turn by an organic-rich layer. The uppermost layer above this was composed of degraded bank material. The bank was built from a mixture of soil material including turves. The buried soil had a thin layer of mor humus (little-decomposed plant-remains, matted together and sharply defined from the mineral soil beneath).

## TRENCH 10 (ILLUS 2)

The revealed 0.3 m high field bank was revetted to the east, with some of the stones of the revetment filling a hollow feature cut into the subsoil. There was no clear buried profile and the stratigraphy had apparently been disturbed by cultivation with sorted stones to the base of the layer. A possible ditch to the west of the bank would have become poorly defined through the processes of cultivation and micro-colluviation. The original bank was less than a metre across.

## TRENCH 11 (ILLUS 2 &amp; 3:11)

This trench cut a 0.25 m high enclosure bank and a 0.3 m deep ditch some 1.7 m across. There was *no indication that the bank was other than single phase, but thin peat separated two distinct mineral ditch fills*. Surface peat, some 150 mm thick, overlay the upper mineral layer. It had a mineral rich band within it. The ditch stratigraphy implies three periods of activity, the breaks between them marked by peats. The lower ditch fills were dominated by stone as was the bank which also had charcoal in its interstices.



Illus 4 Section, trench 12

## TRENCH 12 (ILLUS 2 &amp; 4)

This site boxed the intersection of two enclosure banks and their respective ditches. The north/south ditch proved to be the later feature since a layer within the east/west ditch was cut by the north/south ditch. The east/west ditch was also blocked by large stones to the west of the ditches intersection, indicating that this part of the ditch was no longer in use when the north/south ditch was built. Both sets of bank and ditch were single-phase constructions.

## TRENCH 15 (ILLUS 2 &amp; 3)

This trench cut a 0.4–0.5 m high bank of the 19th-century field system and the ditches on either side, both about 0.4 m deep. The bank was built of mixed subsoil and turf, over large stones laid along the line of the bank. The bank lay over a disturbed buried profile with charcoal and organic-rich lenses and concentrations of stones with average dimensions of 150 mm by 300 mm. Further, the lowest layer, above the subsoil horizons (Bs and Cx), had linear markings some 30 mm wide, interpreted as cultivation marks. The marks lay immediately under the stones, mentioned previously, but could not have been formed had the stones then been present. The evidence therefore suggests that a period of clearance and cultivation was followed by a change in land use when the stones were deposited. A leaf-shaped arrowhead was found among the stones in the upper part of the buried profile. The ditch fills were dominated by peat but incorporate mineral lenses.

## POST-EXCAVATION ANALYSIS

## THE RADIOCARBON DATING SAMPLE

## R McCullagh

The sample came from the uppermost horizon under the roadside west bank in Trench 7 (illus 3:7) and was composed mainly of small fragments of strongly abraded charcoal. Some 15 pieces were examined of which four could be positively identified; three were *Quercus* sp and one *Pinus sylvestris*.

The result of the determination was:

GU-1630 3435±135 BP

This calibrates to the range of 1440 BC to 2134 BC at two sigma (Stuiver & Pearson 1986). The charcoal came from a layer which also contained peat ash. It is unlikely, however, that this will have invalidated the date. It is possible from the degree of abrasion of the charcoal either that it was old at the time it was incorporated in the layer or that it underwent disturbance while in the layer, by ploughing for example. On balance, it is probable that the date indicates activity in the immediate environs during the Bronze Age.

## SOIL ANALYSIS

## M McBarron &amp; I Máté

The soil analyses were selected to establish the range of nutrients in the soils of the enclosure system. The results provide a background for future excavations at the site. The results of the soil analyses are summarized in Table 1. The full methods and results are presented in fiche. A full

statistical analysis has been archived. For archaeological reasons, the soils in Trenches 2, 4, 5, 8 and 12 were either not sampled or the analytical results were not archaeologically significant.

### *Charcoal*

Charcoal was present in all profile and ditch fills. Within the buried profiles it was present throughout the O- and A-horizons, implying that some clearance phases predated the enclosures by a significant period. Charcoal dispersion implies the presence of effective soil-sorting fauna and therefore that the soils were brown earths during the early clearance phases.

### *Phosphates*

The mean phosphate (P) level of the analysed samples was about 60 ppm with a standard deviation of about 90. Removing the top eight values from the calculations gives a mean of 40 ppm P and a standard deviation of 30 ppm P. The shift in these measures when omitting these few extreme values is considerable, and implies that more than one factor has influenced the distribution of soil P. Values greater than 110 ppm are probably due to anthropogenic inputs.

High P values were found in the hollow (interpreted as natural) under the bank in Trench 1 (illus 3), within the organic lens of the ditch in Trench 11 and on the upper surface of the buried profile under the west bank in Trench 7 (illus 3). All these contexts were associated with the enclosure system. Raised P levels were also found in the upper profile and throughout the ditch in Trench 9 (illus 3) and in one layer of the ditch in Trench 15 (illus 3). The Trench 15 bank is 19th-century and the bank in Trench 9 is thought to be later than the enclosure system.

### *Nutrient cations*

K, Mg and Na levels were higher than the general level in very few contexts, other than in surface layers (where they occurred with raised Ca levels). They were higher in the top of the buried profile under the road in both Trenches 6 and 7, in an organic lens from the sub-road ditch, and in an intra-bank soil from the west bank of Trench 7 (illus 3:7). Raised K levels were seemingly associated with higher Na levels. These enhanced levels may be due to fertiliser additions within a field system but they could also be the by-product of clearance, fertiliser preparation, or burning of domestic fuels. Raised levels may be due to wood (5% K<sub>2</sub>O) or bracken ash (40% K<sub>2</sub>O) or perhaps kelp (12–16% K<sub>2</sub>O; Robinson 1972, 185), the latter perhaps explaining the apparently related enhancements of Na.

There was a contrast in elemental concentrations between the layer buried by the west bank in Trench 7 and the layers within that bank (illus 3). The lower surface had high P as did inclusions within the bank of that surface, while the higher surface has increased nutrient cations. This indicates a change in activities in the enclosure to the west of the bank. The change occurred after the road was built. There is no evidence for the relative date of the first activity phase, except that raised P levels are not found under the road.

### *Pollen*

#### **B Moffat**

The full methods and discussion of results are lodged with the National Monuments Record of Scotland. Standard methods of pollen preparations were used and counts of 400 terrestrial pollen grains and spores on all samples were achieved. The discussion below is of results weighted for differential productivity. The results indicate a pollen assemblage rather unvarying through time. The major elements in the vegetation (namely grasses and sedges with herbs; ericaceous species; birch, willow and hazel scrub; and a minor 'forest-forming' element of oak and elm) continuously

adjust in relation to one another. Bracken spore levels are consistently low, where today bracken is abundant and, as thickets, locally dominant.

Had the enclosure system carried crops for any protracted period of time the pollen of the crop would be expected to be present in considerable numbers in samples from the ditch or elsewhere. Two grains of flax (*Linum* sp) were identified in a single sample from a recent context. These could have come from mid 18th- to 19th-century flax fields when cultivation of flax was at its most extensive (Turner 1972; Whyte 1979), although it was also grown in small plots in the 17th century (Whyte 1979, 65). At present it is thought that, even at the level detected, flax pollen may be a significant indicator of local land use. It is possible that flax was harvested before flowering. Typically flax grown for fibre rather than for its oleaginous seed is a green crop.

### *Chronology*

The modern soils are rather poor and acidic. They have a peaty top about 150 mm thick with a pH between 3.9 and 3.4, but have higher levels of nutrient cations – potassium (K) magnesium (Mg), calcium (Ca) and sodium (Na) – than other horizons and contexts. Ca was found at raised level in the 19th century contexts, and within the bank in Trench 9. The pH range (below 5) of the soils is such that aluminium becomes soluble (Adams *et al* 1980); plant nutrient cations are rapidly leached, and iron is mobile.

The 19th-century field bank (illus 3:15) buried a profile with a 100 mm peaty top. Its pH is 4.7, but this is influenced by leaching through overburden (which has a similar pH), since its pH is towards the upper limit of the range in which organic mats form in freely drained substrates (Máté 1985).

The 19th-century ditch fills have pH levels about 3.8 but are rich in nutrient cations, including Ca, and suggest the addition of fertilisers to the area at the time of the field system construction or subsequently. These cations are not present at raised levels in the buried profile. The presence of charcoal in the ditches may indicate clearance but could also be the result of manuring practice, since wood ash was a known source of potassium (Hall 1929, 170). The charcoal may also be relict, given its abundance in earlier deposits on the site.

Soil morphology and analysis suggests a relative chronology for the other banks. The Trench 9 bank (illus 3:9) covered a soil profile with a 0.1 m acid litter layer (pH of 4.9); the bank material is high in Ca; the bank's form is well preserved; the cation exchanges sites in the ditch fill materials are dominated by hydrogen and aluminium. This suggests that the bank lies chronologically between 19th-century field banks and other enclosures, but nearer to the 19th-century banks. The bank in Trench 10 had some similar characteristics, but had no clear buried profile underneath.

The buried soil in trench 3 had a 50 mm thick surface organic layer, in contrast to the buried soil of Trench 1 (illus 3:1), even though the two monuments are contiguous. There is obviously a limit to the interpretative value of the thickness of the buried O-horizons under the Rough Castle enclosures. However, in Trench 12 (illus 4) the earlier of the two clearly stratigraphically separated buried organic horizons was thinner; they retained their appropriate and respective thicknesses, and indicated a significant interval between constructions.

These arguments group the banks in Trenches 15 and 2 as 19th-century; 9 and perhaps 10 as intermediate; 3, 5 and the later bank in Trench 12 as the later phase of the enclosure period and 1, 4, 11 and the earlier bank in Trench 12 as the earlier phase of the enclosure period. Features within Trenches 6 and 7 may be ascribed to at least two phases which fall in the enclosure period.

## DISCUSSION

### I Máté & J Barber

The area of this site has a very long history of use. The stones, within which the leaf-shaped arrowhead was found, and the underlying cultivation marks point to a phase of land use in the Neolithic or Early Bronze Age. The deposit from which the arrowhead was retrieved was rich in charcoal as were several other pre-enclosure deposits in the area.

The radiocarbon date indicates that a phase of clearance, or possibly of manuring, took place in the second millennium BC, before the erection of some, at least, of the enclosure banks. Abrasion of the charcoal in the pre-enclosure deposits is interpreted as the result of bioturbation in brown earth soils and/or cultivation. The absence of mor humus horizons on the soils buried beneath some of the banks together with the absence of mor humus turves from the make up of the banks, and the absence of organic deposits from the associated ditches, all indicate that these banks were erected before the local onset of mor humus development (probably before the sub-Boreal/sub-Atlantic transition in the mid first millennium BC, given the presence of mor humus turves in the rampart of the adjacent Roman fort (Buchanan 1905)). Conversely, the presence of buried mor humus horizons beneath other banks, together with organic layers, dividing phases of rebuilding, within the banks and organic layers formed in the associated ditches all attest to the construction of some of the banks after the mid first millennium BC. The interval between these episodes is not likely to have been a short one, given the absence of mor humus on the one hand and the presence of fully formed and relatively deep mor humus on the other.

The radiocarbon sample, from a non-mor humus horizon under a bank, provided a *terminus post quem* date for the bank of  $1485 \pm 135$  BC, a date consistent with the pedogenetic status of the context from which the sample was retrieved. The interval between the deposition of the sample and the construction of the bank may not have been a long one and the construction of the bank certainly antedates the local advent of mor humus formation. Thus, this bank appears to have been erected between the mid second and the mid first millennium BC.

Given the chronological depth of the bank and the ditch system, their aggregative appearance (*sensu* Dodgson 1980, 62) is somewhat misleading. They are a palimpsest of features of at least two periods (pre- and post-sub-Atlantic) and of several phases (see the ditch beneath the road, for example, or the evidence from Trench 12). The irregularity and size range of the apparent enclosures reflects this evolution. The irregularly shaped area just east of Trench 11, considered as an enclosure, is about 33 sq m while an area of 350 sq m is more typical of the bounded areas and one or two exceed 400 sq m. The enclosures do not conform to official Roman land divisions, as summarized by Bowen (1961, 25); the smallest Roman land unit, the *scripulum*, was about 3 sq m, 288 of which would make an *iugerum* (Varro, *in* Loeb 1937, 243). However, this does not rule out the possibility that the area was used by the occupants of the fort, possibly as garden plots or market gardens.

The road-like feature lies on the western edge of the enclosed areas; the banks lying to the west of the road are all recent. It aligns roughly on the Military Way, the east/west access road of the Antonine Wall, where it branches south along the east side of the fort's annexe, to pass around the fort. Its eastern boundary bank, on the evidence of the soils, is prehistoric. The western boundary bank may be contemporaneous with the construction of the road. The road is constructed in a fashion typical of Roman engineers (Collingwood & Richmond 1969, 2) and is likely to be Roman. It may represent no more than an access way to the fort from the south, skirting the western edge of the enclosure area.

## CONCLUSION

These limited trial excavations gave evidence of activity in the Neolithic period (arrowhead) and the Bronze Age (radiocarbon date), but no evidence of associated settlements. Other evidence, for example the presence of buried or humus horizons under the enclosure banks, suggests extended use and reuse of the site through time from the Bronze Age onwards. This second type of evidence is subject to the vagaries of alteration over time and direct interference by man, eg turf stripping to

build the Antonine Wall. Therefore, although a Roman date for the enclosure system cannot be ruled out, the evidence does not lead to that conclusion. We may speculate that the circumstances which prompted the siting of the Roman fort may not have differed from those which drew the prehistoric settlers to this area.

Similar enclosures have been found beside the Roman forts at Carriden, Cramond (Goodburn 1978) and Croy Hill (Hanson 1979, 19–20). There is good evidence of field systems close to civilian occupation from Inveresk (Leslie 1990, 29) but none, as yet, for comparable enclosures.

It must be emphasized that these conclusions are extremely tentative. The very small areas examined and the chronological depth of the site both militate against confidence in the results obtained. These results must be viewed as no more than working hypotheses until further and more extensive excavations can be undertaken to test them.

## ACKNOWLEDGEMENTS

This work was funded by Historic Scotland and its predecessor departments. The RCAHMS surveyed the system and provided the survey on which *illus 2* is based. The following must also be thanked for reading and commenting on this text: E Máté, Dr D J Breeze, P J Ashmore, S Halliday, H James, and O Owen. C Unwin prepared the drawings, of which *illus 2–5* are based on drafts prepared by K Speller.

## REFERENCES

- Adams, W A, Raza M A, & Evans, L J 1980 'Relationships between net redistribution of Al and Fe and extractable levels in podzolic soils derived from Lower Palaeozoic sedimentary rock', *Soil Sci*, 31 (1980), 533–45.
- Barber, J W 1980 'Wood and Charcoal', in MacIvor, I, Thomas, M C & Breeze, D J 1980, 'Excavations on the Antonine Wall fort of Rough Castle, Stirlingshire, 1957–61', *Proc Soc Ant Scot*, 110 (1978–80), 271–3.
- Birks, H J B 1977 'The Flandrian forest history of Scotland; a preliminary synthesis', in Shotton F W (ed) *British Quaternary Studies*. Oxford, 119–35.
- Bowen, H C 1961 *Ancient Fields*. London.
- Boyd, W E 1984 'Environmental change and Iron Age land management in the area of the Antonine Wall, central Scotland: a summary', *Glasgow Archaeol J*, 11 (1984), 75–81.
- Breeze, D J 1982 *The Northern Frontiers of Roman Britain*. London.
- Brooks, C L 1972 'Pollen analysis and the Main Buried Beach in the western part of the Forth Valley', *Trans Inst Brit Geographers*, 55 (1972), 161–70.
- Buchanan, M 1905 'Report on the society's excavation of Rough Castle on the Antonine Vallum', *Proc Soc Ant Scot*, 39 (1904–5), 442–99.
- Collingwood, R G & Richmond, I 1969 *The Archaeology of Roman Britain*. London.
- Dickson, C and Dickson, J 1988 'The diet of the Roman army in deforested central Scotland', *Plants Today*, 1 (4) (1988), 121–6.
- Dodgson, R A, 1980. *The Origin of British Field Systems*. London.
- Durno, S 1956 'Pollen analysis of peat deposits in Scotland', *Scot Geog Mag*, 72 (1956), 177–87.
- Fitzpatrick, E A 1977 *Soil Description*. Department of Soil Science, Aberdeen University.
- GAS 1899 *The Antonine Wall Report*, Glasgow Archaeol Soc.
- Geology Survey 1924 *Airdrie Sheet 31 (Solid)*, 1875, rev 1924. Southampton.
- Godwin, H 1975 *History of The British Flora*, 2nd edn. Cambridge.
- Goodburn, R 1978 'Roman Britain in 1977: I, Sites Explored', *Britannia*, 9 (1978), 404–72.
- Hall, A D 1929 *Fertilisers and Manures*, 3rd edn. London.

- Hanson, W S 1979 'Croy Hill', in Breeze, D J (ed) 1979 *Roman Scotland: Some Recent Excavations*. Edinburgh.
- Hanson, W S & Macinnes L 1980 'Forests, forts and field; a discussion', *Glasgow Archaeol J*, 12 (1980), 98–113
- Horsley, J 1732 *Britannia Romana*. London.
- Leslie, A 1990 'Inveresk', *Discovery Excav Scot* 1990, 29–30.
- Macdonald, G 1933 'Notes on the Roman forts at Rough Castle and Westerwood with a postscript', *Proc Soc Ant Scot*, 67 (1932–3), 243–96.
- MacGregor, M & MacGregor, A G 1948 *The Midland Valley of Scotland British Regional Geology*, rev 2nd edn. Edinburgh.
- MacIvor, I, Thomas, M C & Breeze, D J. 1980 'Excavation on the Antonine Wall fort of Rough Castle, Stirlingshire, 1957–61', *Proc Soc Ant Scot*, 110 (1978–80), 230–85.
- McVean, D N & Ratcliffe, D A 1962 *Plant Communities of the Scottish Highlands*. Monograph Nature Conservancy 1. London.
- MAFF 1981 Technical Bulletin RB 427: *The Analysis of Agricultural Materials*. Ministry of Agriculture, Fisheries & Food.
- Máté, I D 1985 *The Process Within and Interpretation of Buried Soils from SE Scotland*. Unpublished Dissertation for Soil Science Department, Newcastle University.
- Newey, W W 1966 'Pollen analysis of sub-carse peats of the Forth Valley', *Trans Brit Inst Geographers*, 39 (1966), 53–9.
- Nimmo, W 1777 *History of Stirlingshire*. Edinburgh.
- Robinson, D H (ed) 1972 *Fream's Elements of Agriculture*, 15th edn. London.
- RHP 14351 1820 Scottish Records Office Document.
- RHP 13329 1830 Scottish Records Office Document.
- Shackley, M L 1975 *Archaeological Sediments*. London.
- Stuiver, M & Pearson, G W 1986 'High-precision radiocarbon time-scale calibration from the present to 500 bc', in Stuiver, M & Kra, R S (eds) *12th International 14C Conference Proceedings. Radiocarbon 28* (1986), 805–38.
- Thomas, J (ed: rev Paterson, A J S) 1984 *A Regional History of the Railways of Great Britain, Volume VI: Scotland: The Lowlands and the Borders*. Newton Abbot.
- Turner, J 1979 'The environment of north-east England during Roman times as shown by pollen analysis', *J Archaeol Sci*, 6 (1979), 285–90.
- Turner, W H K 1972 'Flax cultivation in Scotland: an Historical Geography', *Trans Inst Brit Geographers*, o.s. 55 (1972), 127–43.
- Varro, M T *Res Rusticae* (trans W D Hooper) 1937 Loeb edn.
- Whyte, I D 1979 *Agriculture and Society in Seventeenth Century Scotland*. Edinburgh.
- Yuan, T L 1959 'Determination of exchangeable hydrogen in soils by a titration method', *Soil Sci*, 88 (1959), 164–7.

*This paper is published with the aid of a grant from Historic Scotland*