VII. SUMMARY AND CONCLUSIONS

A. Site 18FR320 Summary

Ignoring for the moment the features associated with the Auburn driveway and the later road fills (i.e., Phase 5), site 18FR320 can be summed up as including or being bordered by the following significant features:

- an early raceway (F44) passing through the south part of the site, providing power to an installation to the east at a time when nothing else is on site;

- layers (reddish-brown silty clay and slag and charcoal layers) which include significant amounts of refining slag and charcoal, together with casting debris, fragments of cast iron artifacts, implements to finish the artifacts, and possible blacksmithing tools, all laid down at a time after the silting of the race;

- two structures, one of which (F1) certainly post-dates the layers above, the other of which (F4) is something of a "floater" stratigraphically, inasmuch as it may or may not pre-date the charcoal and slag layers;

- a stone and earth dam at the north also "floats" stratigraphically in relation to the rest of the site, but which must post-date at least one phase or lens of the slag and charcoal layers, and if the observations made in the last chapter hold, may post-date the abandonment of the structures.

What should immediately stand out is that, regardless of metallurgical and archeological evidence for both the refining of iron and the casting of iron artifacts (which is evidence either of smelting and founding or remelting and founding), nothing which can be interpreted as a forge or furnace structure was discovered in the excavation. As discussed in Chapter III, a blast furnace, remelting (either cupola or reverberatory) furnace, or forge would all have had fairly substantial foundations, and would have left other distinctive traces. No ore or flux were found at 18FR320, no substantial heaps of smelting slag, no burned or unburned molding sand, and probably no hammerscale. No evidence of a hammer emplacement was located within the structures, nor was anything like an anvil base, nor anything like the thick bed of sand (at least two feet thick) expected in a casting house or foundry (Overman 1872:50). The only finds that are evidence of some kind of furnace or forge fire were the fragments of "Berry's Premium Firebrick."

In sum, it is clear that the primary activities of casting and refining were not taking place within the confines of the excavation. The activity that 18FR320 was being utilized for, at least in the early stages of the period defined by the reddish-brown silty clay and charcoal and slag layers, was disposal of unwanted debris, specifically slag from the refining forge.

Charcoal is virtually the only material which is postulated to stem from a source on site. The construction of F4, the oral tradition, and the layers within and around it all are in keeping with an identification of it as a charcoal house. The feature identified as a causeway, therefore, might have connected the charcoal house with the refinery forge which according to this interpretation would have been to the southeast or east of the site.

No interpretation of F1 has been offered to this point. As discussed in the previous chapter, the artifacts found within what is interpreted as the floor level do not conclusively suggest a particular function. Casting debris, fragments of finished cast iron artifacts, finishing tools, and the possible pot stand indicating a stage of finishing beyond "fettling" might, if considered in isolation, suggest the use of F1 for the cleaning, finishing, and assembling of objects such as pots, kettles, and stoves. In support of this hypothesis might be the general absence of the diagnostic artifacts from the area within F1 suggesting the interior of the structure was kept clean.

This difference is more likely to be a consequence of excavation strategy than a deposition pattern which respected F1, however, since most of the artifacts occurred in layers which stratigraphically pre-dated the walls, and the floor stratum was not fully excavated inside F1. Also, the artifacts in the floor layer were similar to those in the earlier layers, and so it is assumed that it is simply residual material from earlier layers. Thus, while it seems likely indeed that some sort of finishing and assembling house existed near 18FR320 (given the numerous finds of files, chisels, and parts of rivetted and assembled objects), it is not believed that F1 was this structure.

It does not seem possible, in fact, to define a function for F1. When site 18FR320 is discussed in relation to the historical documentation and to the rest of the Catoctin complex, a few possibilities for its use will be put forward, but it must be stated now that the archeological evidence only revealed these points: that F1 was a two-roomed structure, or a one-roomed structure with an open-fronted addition; that it probably had a wooden superstructure on the stone foundation; that it had windows in the south side; that it possibly had an entrance in the southeast corner; and that it had a sand with clay floor.

Leaving aside for the moment the two constructions for water power, the dam and the race, which both apparently were intended to drive installations off the site, the area within 18FR320 seems quite clearly to be the locus of activities ancillary to primary ironworking activities of refining and casting. Only one structure on the site (F4) need be directly associated with those activities; otherwise, the site was a dumping ground for the waste products generated by those activities.

B. Site 18FR320 in Context

It should be remembered at the outset of this section that there were very few artifacts within the layers of interest that could be dated at all, let alone closely dated. So while the relative sequencing of layers and features within the site is quite solid (with the important exceptions already noted, namely F4 and the dam), tying that sequence into the historical chronology is risky. Accordingly, much of the following is somewhat speculative, and an attempt will be made to consider all the possibilities consistent with the archeological data, rather than advancing a single interpretation.

The race is the earliest feature on the site and the silting of the race is the longest archeologically defined hiatus on the site. There was no refining slag within the race fill, but there were small nodules of furnace glass (smelting slag) from a charcoal blast furnace. The race is likely to have been a head race, and it is dropping from west to east. The best date for the fill layers, based on the find of a gunpowder flask within them, is between 1800 and 1825.

It is postulated that this race was supplying water power for the first furnace at Catoctin, that which was in operation by 1776, and presumably out of blast sometime after 1787, the date when another furnace (Stack No. 1) was erected "about three fourths of a mile further up Little Hunting Creek and nearer the ore banks" (reference should be made to Chapter II for all historic citations not identified). By this interpretation, the furnace would have been substantially to the east of site 18FR320, since none of the indications of a blast furnace were present within the site. This would put it, perhaps, near the confluence of Little Hunting Creek with the stream which the race was probably fed by, or possibly in the region which was suggested by W. H. Enslow in the 1930's (Orr and Orr 1977:78). The presence of the Auburn ore bank, directly to the west of site 18FR320, is worth noting as support for this placement of the first furnace (Figure 1).

The rather long period of time which it must have taken for the race to silt up would then be equated with the period from 1787 to 1831. It should be remembered that the Auburn tract, within which site 18FR320 was probably subsumed, was resurveyed as an entity in 1802, and passed out of ownership of the furnace owners in 1811, when that tract was left by Baker Johnson to his son, as opposed to the furnace and furnace lands which he left to his daughters. It has been suggested above that when John Brien and John McPherson purchased additional land, which included part of Auburn, to add to their holdings at Catoctin, that site 18FR320 may have been in that tract, and that it thus passed back into furnace ownership at that date. It might be recollected that on the 1808 Varlé map no forge was located, and no forge was mentioned in the 1811 or 1820 sales notices, or in the 1825 Frederick County Assessment records (Thompson 1976:81).

Several sources suggest "rebuilding" of or "very expensive improvements" to the furnace and complex by Brien and McPherson (Lesley 1859:50; Alexander 1840:79). It is postulated that around 1831 a refinery forge constructed to the east of 18FR320 might have been one of these improvements, and that a foundry furnace in the same region may have been another.

This tie-in depends upon the dating of the layers with ironworking debris (reddish-brown silty clay and charcoal and slag layers) to the period between 1830 and 1850. As will be remembered, both those layers contained "Berry's Premium Firebricks," and at or on the surface of the latter was the "Ames" drawknife and possibly the 1842 dime. Thus, they must date after the 1830's, and the surface might have been open up to 1842 at least.

One difficulty with this interpretation is why a forge would have been built at Catoctin. Certainly, it is unlikely that it could ever have been producing commercially, and it must have been quite short-lived, as there is no mention of it in either the 1841 or 1856 sales notices. On the 1858 Bond map it is described as an "Old Forge." It can only be suggested that it was built to fill the intramural needs of the Catoctin Furnace complex for wrought iron and/or to experimentally test the quality of the wrought iron produced. While Brien and McPherson had owned the much larger Antietam Iron Works since 1806, which had two forges (from around 1815) producing bar iron, it is possible most of that output was going directly to the rolling and slitting mill at Antietam to be made into nail rod and other wrought products (Thompson 1976:79f). The expense of transportation of bar iron from Antietam to Catoctin may also have been a factor.

An admittedly weak point about this argument is that it assumes ignorance on the part of these two extremely knowledgeable iron manufacturers about the poor quality of the iron that would be produced. However, iron technology cannot really be considered a science in the nineteenth century. It was much more of a skill or an art, in which success or failure of a technological innovation was something to be empirically tested, rather than confidently predicted. The general surveys abound with examples of installations, particular furnaces being erected, in blast for a year or two, then abandoned, "the one proving unproductive, and the Iron indifferent" (Alexander 1840:78).

This point needs to be pursued further. It has been analytically established that the cast iron was high in phosphorus and that it would have made fine, sharp castings (thus, the claim in the 1820 sales notice that the area of the mine bank "is considered equal to any in the country for castings" has been validated). It has been assumed that wrought iron produced from this iron would be cold-short from the phosphorus and of poor quality, based on mid-nineteenth century and present knowledge of the metallurgical processes which take place in refining. However, this can be no more than an assumption until and unless checked by analyzing a piece of wrought iron that was a certain product of the forge. It may be that it was not so much that the iron was of poor quality as that it was expensive to refine. In the time it would take to remove the phosphorus (see Morton 1973:94, Fig. 2), appreciable oxidation of the iron would have occurred, with subsequent loss of that iron to the slag. It may be suggested that this might be the reason for the excessively high levels of iron in the slag.

The other possibility is that pig iron smelted from better ores was brought into the vicinity for refining in the forge. Only testing of the wrought iron could decide this. However, the find of the fragment of white pig iron with relatively high phosphorus suggests otherwise. It is very significant that, unlike virtually all the other irons tested, only the fragment of pig iron was white, with very low levels of silicon. De-siliconizing pig iron in the refinery was of crucial importance. With the advent of coke-smelted pig with its very much higher levels of silicon, because of the higher temperatures, an intermediate stage between smelting and refining in a charcoal forge had to be instituted, namely the desiliconizing in a run-out furnace (refinery) (Morton 1973:99; Overman 1854:256). This problem helped bring about the adoption of puddling. The fact that the pig had relatively high levels of phosphorus (though lower than all of the other examples except the sprue or riser) and low silicon might suggest deliberate manipulation of the ore and fuel charged to produce an iron well-adapted to refining. However, it must again be stressed that analysis of a single sample can only be suggestive, not conclusive, evidence.

It was noted above that a foundry furnace may also have been an improvement of this time. It is necessary to contemplate this possibility, although it is believed that the casting waste seen at 18FR320 was originally generated by casting from a furnace, specifically Stack No. 1. The reasons for and against this argument can be summarized as follows.

There was no certain remelting furnace slag identified, and none of the molding sand that would be expected if casting and "shake-out" of pieces were taking place near the site. There is no evidence for a foundry at Catoctin until the Census of 1860, while there is certain evidence that casting directly from the blast furnace to make "country castings" was common practice at Catoctin as at virtually all charcoal blast furnaces in the first half of the nineteenth century. Cupola furnaces were not common until the 1850's; the George's Creek Coal and Iron Company erected one at Lonaconing in 1839, but that was one of the most advanced furnaces in the United States at that time (Harvey 1977:54). The possible presence of a reverbatory or air furnace is an open question. What form of slag they would have produced is not known. Bining, however, notes that "air furnaces, the progenitors of modern cupolas, were usually built in towns or boroughs" (1979:37).

The only truly persuasive reason to imagine a foundry in operation near site 18FR320 is the quantity of gate metal, and the few implements and objects directly related to molding, which included possible molder's slicks, flask parts, and flask clamps. If the casting had been taking place up at Stack No. 1, there are only two ways the gate metal could have been brought down to the vicinity of 18FR320: attached to the castings, or brought down deliberately to be used as scrap metal. Postulating the former hypothesis forces one to assume that the founder at Catoctin so departed from traditional practice as to have castings carted about with the sprues on, instead of knocking them off immediately after shake-out; this is not thought to be very likely. The latter hypothesis only works with the assumption that the gate metal was being charged to the forge. As discussed above, this would seem to be unusual practice. It might be noted, however, that Walker writes, "Throughout its history Hopewell [Furnace, Pennsylvania] also sold pig iron and <u>gate metal</u> to <u>forges</u> where it was further treated" (emphasis added). Gate metal, he writes, "was not as convenient to handle; so it usually sold for about $2 per ton less than the price of pigs" (Walker 1967: 151).

In summary, the bulk of the evidence, both archeological and historical, suggests that a refinery forge was erected by Brien and McPherson starting sometime after 1831 and probably not continuing after 1839 at the latest (when the furnace apparently went out of blast until sometime after Fitzhugh purchased it). It is suggested as well that gate metal may possibly have been charged to the forge, and/or that a fettling and assembling shop was located near the forge, where the castings were trimmed of excess metal, scoured or cleaned, and (in the case of the stoves) assembled. It is quite possible that a smithy was in the area as well, based on the finds of blacksmithing tools found in conjunction with slag and casting debris. F4 is suggested as the charcoal house supplying the forge. F1 might have been the fettling shop, but is more likely to be a somewhat later ancillary structure.

Fitzhugh purchased the furnace in 1843, at which time it included Auburn Farm and, it is postulated, site 18FR320. In 1848, the "warehouse plot and other land was purchased by the Auburn owners. The eastern boundary of this tract was drawn to exclude the stream, the pond, and the forge site from Auburn. The warehouse was on the left of the driveway near the gate" (Heite 1980:3). This transaction has much information that is probably relevant to 18FR320. It indicates the dam is probably in existence at this time, and locates a warehouse, which might be on or near the site. It is not impossible that F1 had been the warehouse, or that F4 had been used as a warehouse after the forge went out of use.

The question of the dam and its construction date is of crucial importance for site 18FR320. It is suggested that given the date of c.1845 for its construction cited by earlier researchers as well as the reference mentioned above, that a construction date sometime shortly after Fitzhugh's purchase of the property in 1843 is quite reasonable, and that the dam was one of the improvements he made to the property.

The assumption throughout this report has been that the dam postdated virtually all the activities on the site, based on the best interpretation of the stratigraphic evidence. However, that creates two major inconsistencies: what was powering the forge? and what was the dam powering? It would certainly be neater to put dam and forge together and this would seem to be more in keeping with the oral tradition as well. But based on the evidence as it now stands, the phasing as described in Chapter VI is the best fit to the archeological data, and the inconsistencies will have to remain, as the area below the wheel pit and in the probable vicinity of the forge was not investigated below the heavy layer of slag fill.

In any case, the buildings on site 18FR320 must have been in a derelict condition from the time they were covered in part with various layers of water-washed gravel or sheet wash, layers which unfortunately could not be dated at all. It seems likely that all or part of 18FR-320 was on the "warehouse tract," and that, therefore, its connection with the furnace lands ceased before the mid-nineteenth century. It is suggested that the configuration of the land boundaries around the road (early Maryland 806 or the Frederick and Emmitsburg Turnpike) and pond seen identically on two late nineteenth century deed maps (1980 Figures 2 and 3 in Appendix 1) may have been established around mid-century. The scale of those maps obviously differs by a factor of about five, but examination of Figure 3 suggests that almost all of site 18FR320 is subsumed within Auburn lands, with the south-western boundary perhaps coinciding with the north/south branch of F4.

There may have been quite a long hiatus before the deposition of the clay with flecks of rust. In the meantime, it is not impossible that another forge was in operation off the site being powered by the pond contained by Auburn Dam. There has always been a certain amount of difficulty in getting the "Old Forge" of 1858 to be in accord with the "forge" which seems to be within living memory, and possibly two successive forges or phases of the same forge on more or less the same site is the answer. The question of the clay with flecks of oxidized iron, and its connection to that possible second forge, has already been reflected on above. In any case, this is somewhat academic as it is clear that nothing of consequence was happening on site 18FR320 at that time.

C. Conclusions

The goals of the excavation at 18FR320 were stated in the introduction. To recapitulate, they were (1) to determine the extent of the ironworking horizons; (2) to determine details of ironworking technology; (3) to determine site chronology; and (4) to determine the functions of the structures. It is believed that these goals have been achieved to the extent possible for site 18FR320, with a few queries left unresolved largely because of inconclusive artifactual evidence. Thus, nothing in or about F1 suggested a definitive function for that structure; and while the relative site chronology is well understood, the lack of datable artifacts means the site is not securely tied into the historical sequence. However, the 20 year span between 1830 to 1850 is clearly the crucial period for the site's use and the spike of activity seen in the charcoal and slag layers equates most probably to the period of fluoresence of the accession of John Brien and John McPherson, less probably (if the dam and the forge producing those layers at 18FR320 are functionally associated) to the program of improvements surrounding Peregrine Fitzhugh's ownership.

The metallurgical program gave good substantiation to the contemporary claims of the superiority of the iron for casting purposes. Most importantly, perhaps, it necessitated the existence of a refining forge near the site in the first half of the nineteenth century, suggesting an empirical test by one of the iron manufacturers of Catoctin of the possibility of producing wrought iron from Catoctin pig. Judging by the almost complete absence of this forge from the records, it was probably not a success.

It is felt that the mitigation of adverse effects to site 18FR320, considered as a locus of activities ancillary to primary ironworking activities to the east (possibly including the first furnace at Catoctin, certainly including the refining forge) has been achieved. Virtually all of the area within F1 was excavated at least to the level of the floor; thus the inability to define its purpose is a function of the paucity of remains, while the portion of F4 unexcavated was that which extended beneath the ditch and berm of U. S. Route 15 to the west. The sequence of activities within the site, and the horizontal location of features over the area to be impacted by the dualization of U. S. 15 are well documented and understood.

The question of the forge or forges outside the area of impact is that while the refining of iron and perhaps the casting of iron were taking place near site 18FR320, it was at a locus well outside the area of impact and probably, as indicated by earlier researchers, beneath the road (Maryland 806) or road fill. The relationship of 18FR320 and the forge site has been discussed; further excavation within the area of impact would be unlikely to add to the understanding of that relationship.

Accordingly, it is believed that the archeological research potential of site 18FR320 has been realized and that its significant information has been recovered. Since it is anticipated that this report will prove useful as a document not only to the State Highway Administration but also to public and private organizations concerned with the management and development of Catoctin's archeological and historical resources, some points which arise out of this work will be discussed.

One point which perhaps is obvious, but needs to be explicitly stated, is the problem of site definition. Obviously, some breakdown of a complex as extensive, both chronologically and spatially, as Catoctin was, is necessary to study its component functional units. The difficulty is that this tends to impose a division on the material and limits on the study of it which are counterproductive to an understanding of how the units interrelated and worked together as a functional whole. It is well-understood that this is a problem confronted by every archeologist, indeed every researcher; lines have to be drawn somewhere in every discipline to demarcate areas of study. In this case, the mental line between site 18FR320 and the forge site was quite understandable given the initial prediction of a relatively early foundry and a relatively late forge, and was, of course, accentuated by the highway right-of-way line. In hindsight, it is clear that it fostered an approach which was not revised until the identification of the ferrous slag as refining slag.

NOTES

[1]While it can be assumed that virtually all of these elements were in the form of oxides, which oxides were present and in what proportion, particularly for the iron, is not known. Accordingly, the composition has been left as relative percentages of the elements detected. This should be taken into account when comparing these analyses with published analyses, which generally are in the form of percentages of oxides present.

[2]We are indebted to Robert Gordon for this reference.

[3]The site was reported by Beth Bower at the annual meeting of the Council for Northeast Historical Archaeology in Windsor, Canada, October 16-18, 1981. Slag samples from the site were supplied courtesy of Sheila Charles of the Museum of Afro-American History, Boston, Massachusetts.

[4]Professors in various universities, including Michael Notis, Department of Metallurgy and Materials Science, Lehigh University; David Gaskell, Department of Materials Science and Engineering, University of Pennsylvania; and Robert Gordon, Department of Geology and Geophysics, Yale University, were consulted on the possibility and/or likelihood of the ferrous slags being the product of a remelting furnace. The general consensus was that it was almost impossible to believe the iron content of such slags could be as high as in the Catoctin slag.

[5]The Musuem Applied Science Center intends to pursue this point by analyzing the slag samples from the Highland Foundry site.

[6]Unfortunately, the carbon content of these samples cannot be determined through PIXE analysis. Chemical analysis is now being undertaken, but the results will not be available for this report.

[7]This site was reported by Herbert Fisher at the annual meeting of the Society for Historical Archaeology in Philadelphia, Pennsylvania, January 7-10, 1982.

[8]Three wood samples from the fill of the raceway (F44) were sent to the Center for Wood Anatomy Research, U. S. Forest Products Laboratory, Madison, Wisconsin where they were identified as white oak (<u>Quercus</u>). All three samples had cut edges where they had been sawed and were representative of the type of wood remains found in the race fill. The identification of the wood as oak is more in keeping with a structural function for these timbers rather than fragments of flask molds.

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FIGURES

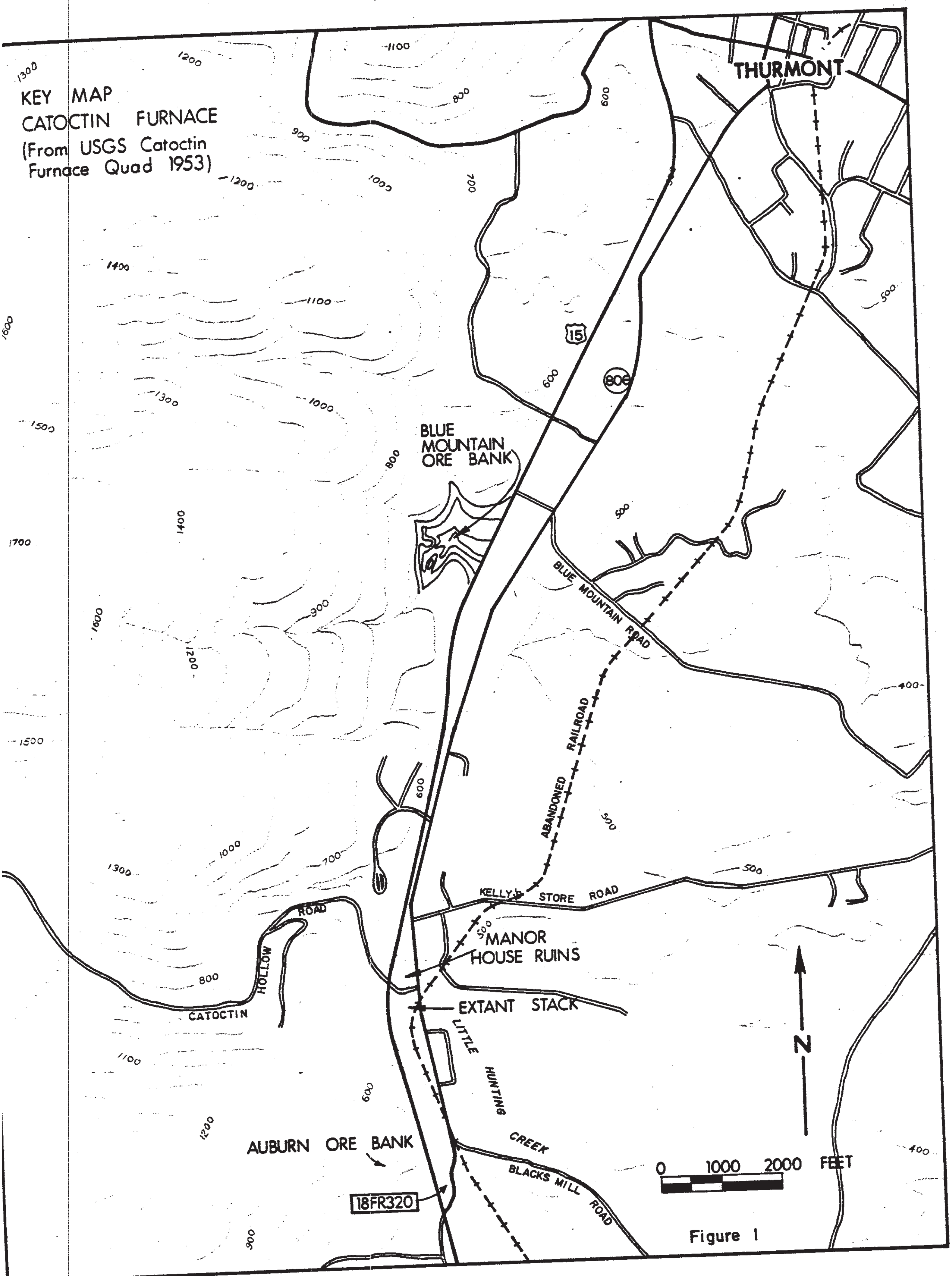

KEY MAP
CATOCTIN FURNACE
(From USGS Catoctin
Furnace Quad 1953)
THURMONT
15
806
BLUE
MOUNTAIN
ORE BANK
BLUE MOUNTAIN ROAD
ABANDONED RAILROAD
KELLY'S STORE ROAD
MANOR
HOUSE RUINS
EXTANT STACK
CATOCTIN HOLLOW ROAD
LITTLE HUNTING CREEK
AUBURN ORE BANK
18FR320
BLACKS MILL ROAD
0 1000 2000 FEET
N

Figure 1

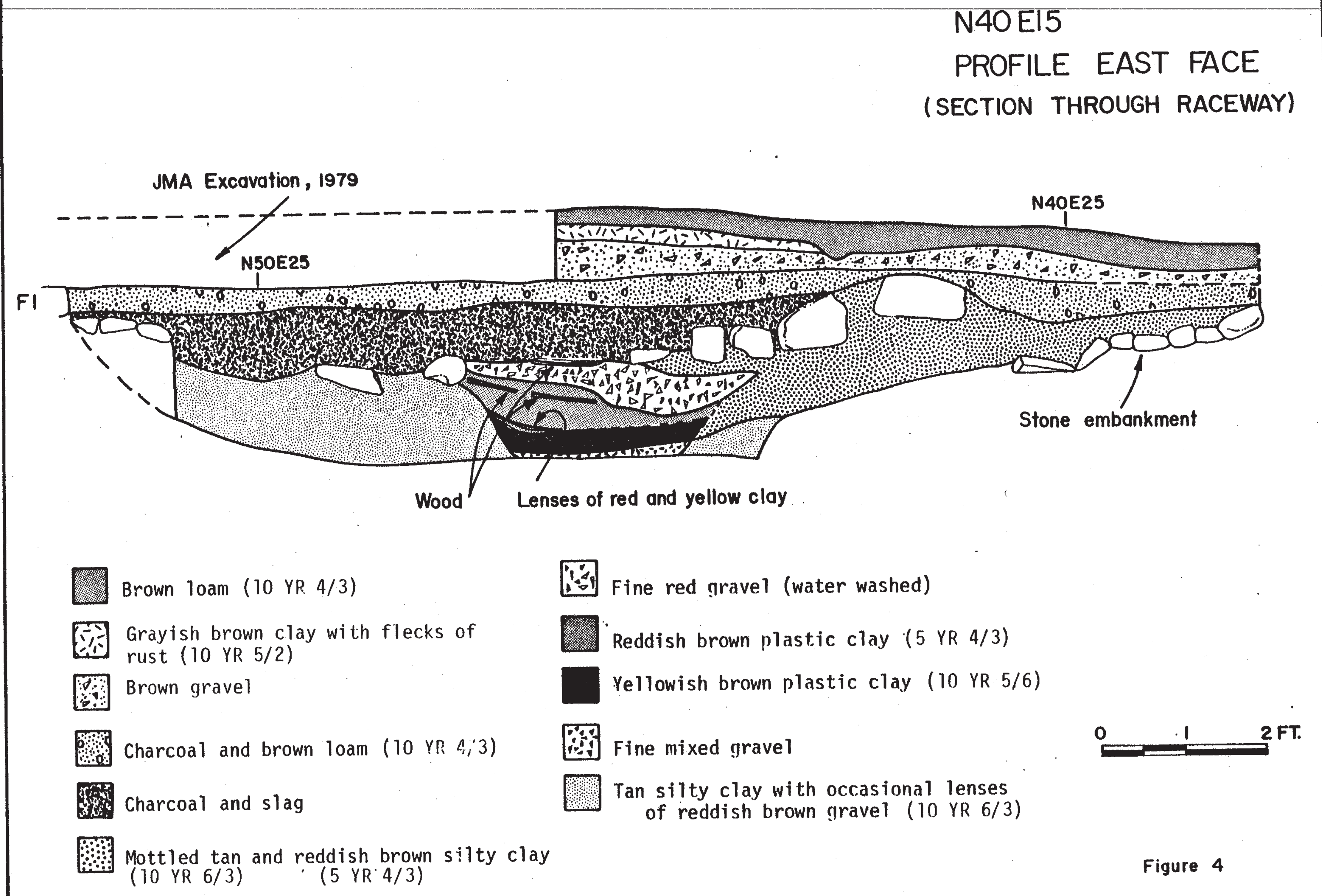

N40 E15
PROFILE EAST FACE
(SECTION THROUGH RACEWAY)
JMA Excavation, 1979
N40E25
N50E25
F1
Stone embankment
Wood
Lenses of red and yellow clay
Brown loam (10 YR 4/3)
Grayish brown clay with flecks of rust (10 YR 5/2)
Brown gravel
Charcoal and brown loam (10 YR 4/3)
Charcoal and slag
Mottled tan and reddish brown silty clay (10 YR 6/3) (5 YR 4/3)
Fine red gravel (water washed)
Reddish brown plastic clay (5 YR 4/3)
Yellowish brown plastic clay (10 YR 5/6)
Fine mixed gravel
Tan silty clay with occasional lenses of reddish brown gravel (10 YR 6/3)
0
1
2 FT.

Figure 4

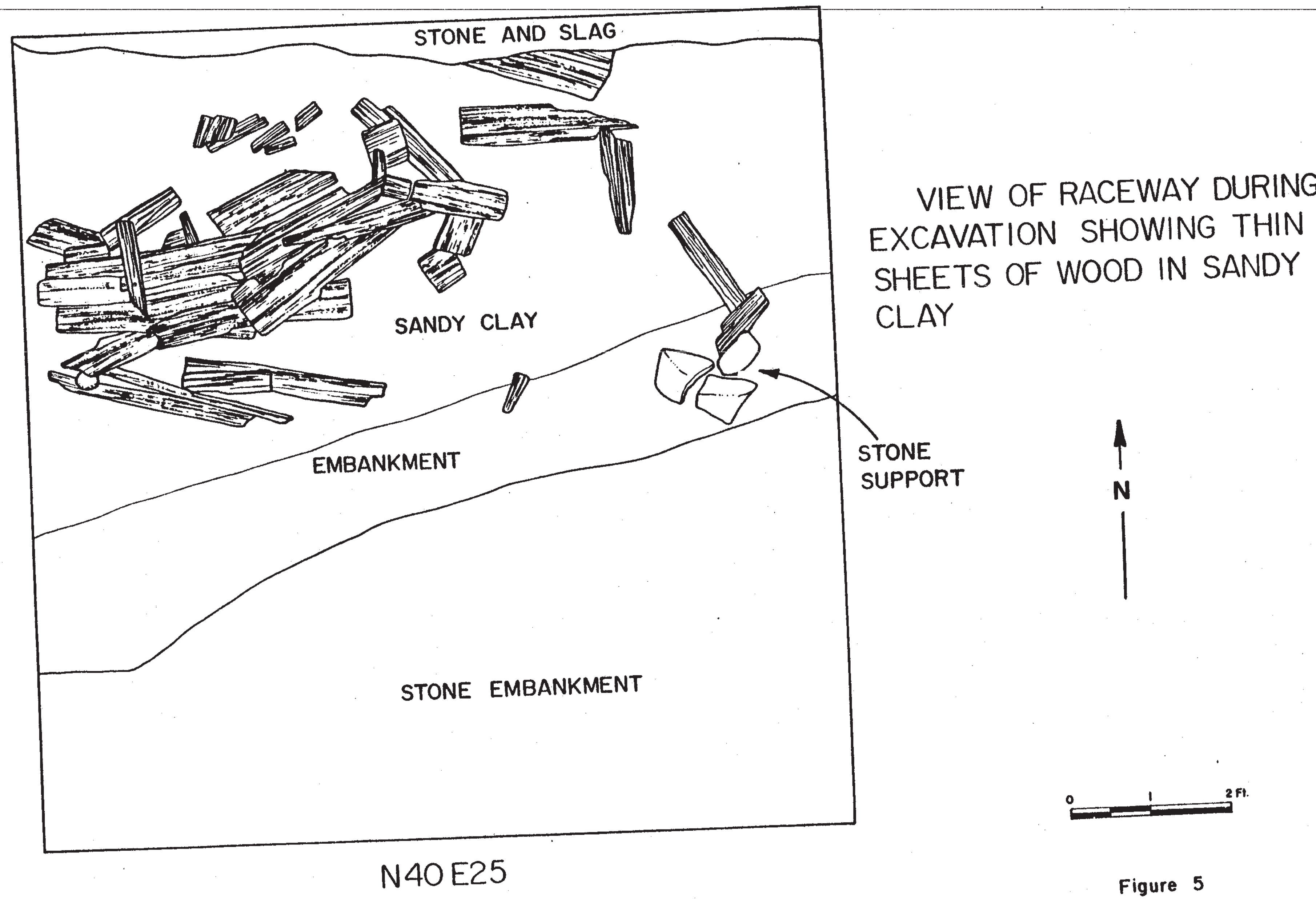
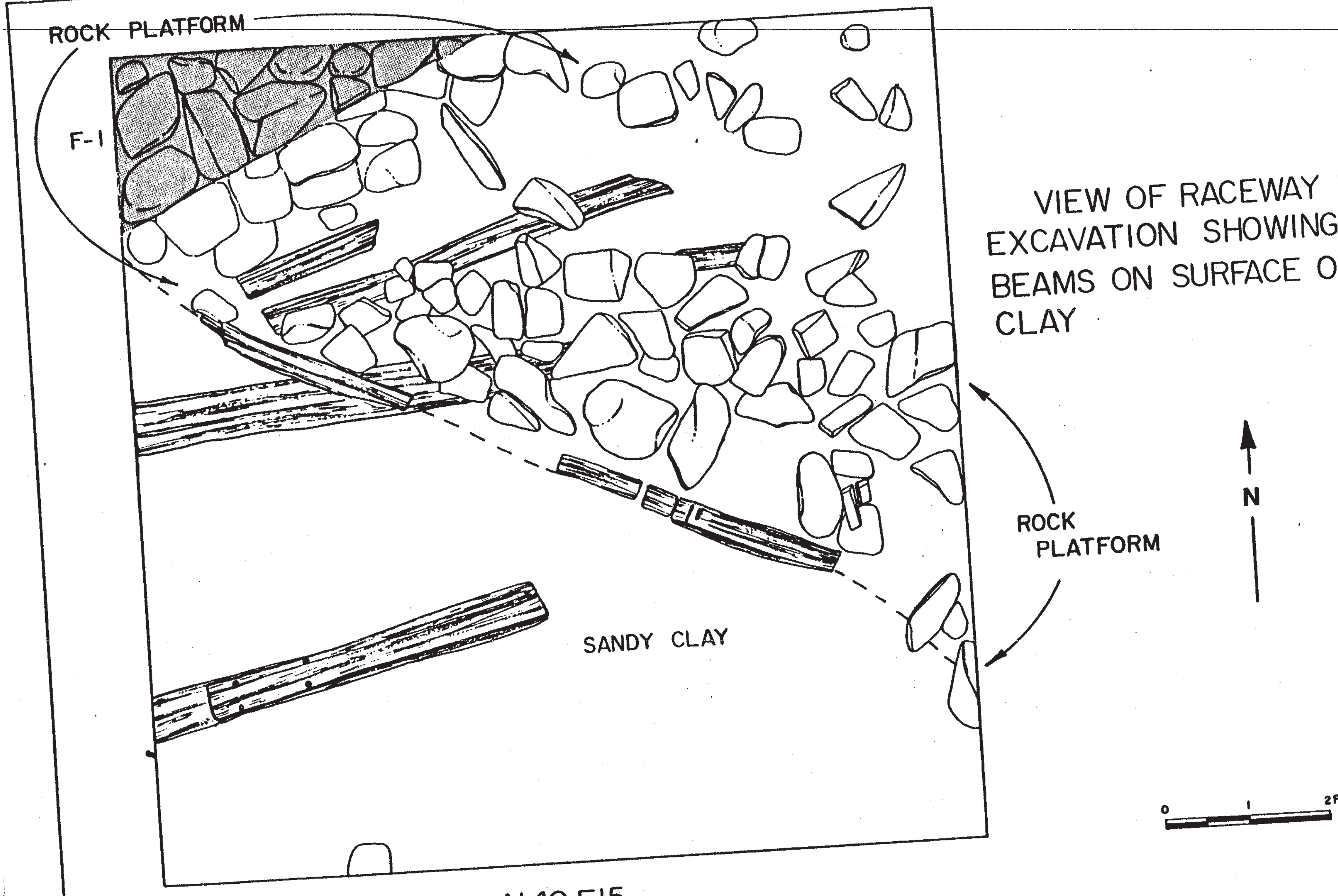

STONE AND SLAG
SANDY CLAY
EMBANKMENT
STONE EMBANKMENT
STONE SUPPORT
VIEW OF RACEWAY DURING EXCAVATION SHOWING THIN SHEETS OF WOOD IN SANDY CLAY
N
0
1
2 Ft.
N40 E25

Figure 5



VIEW OF RACEWAY DURING EXCAVATION SHOWING WOOD BEAMS ON SURFACE OF SANDY CLAY

Figure 7

N50 W5

PROFILE NORTH FACE

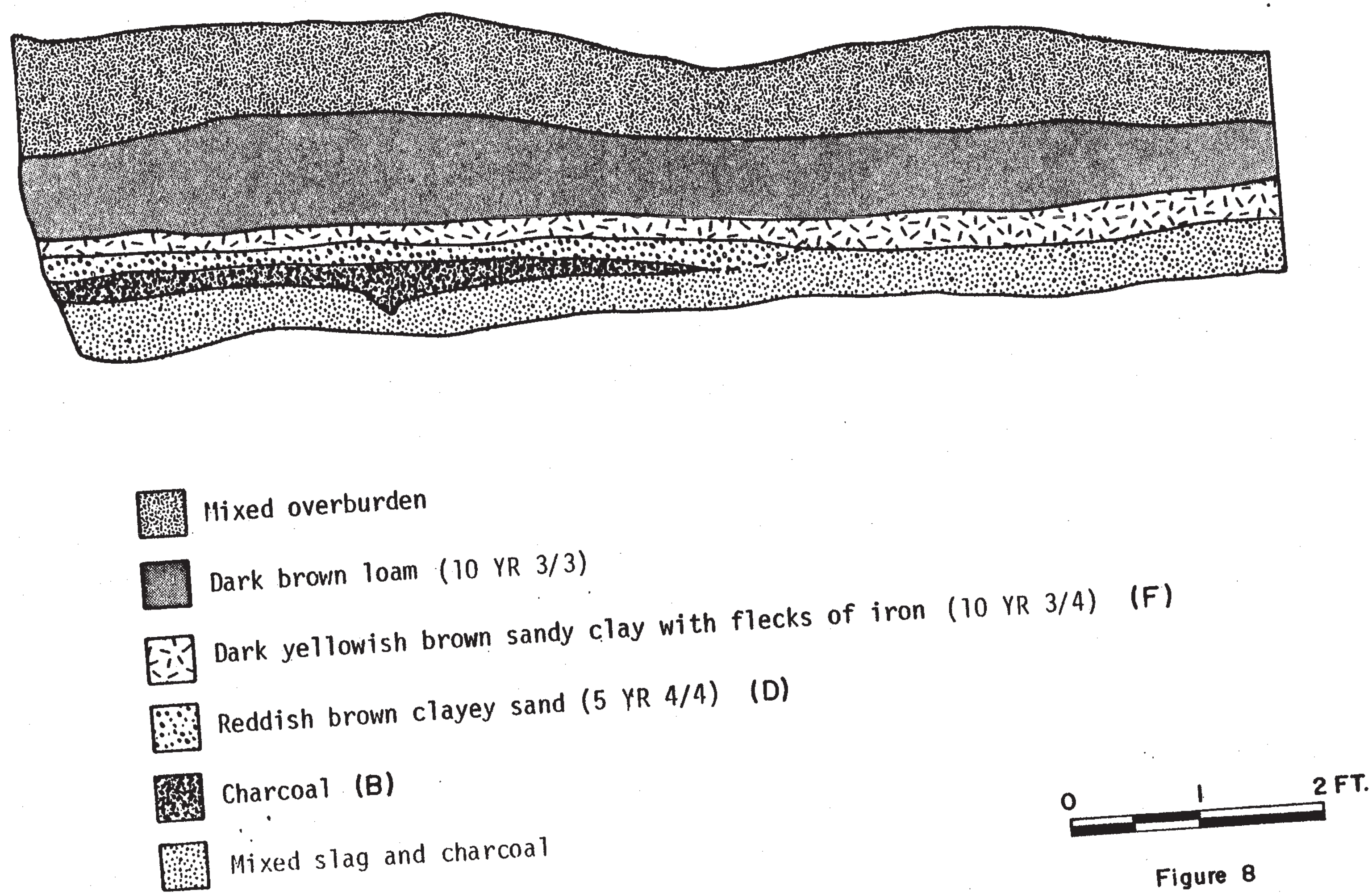


Figure 8

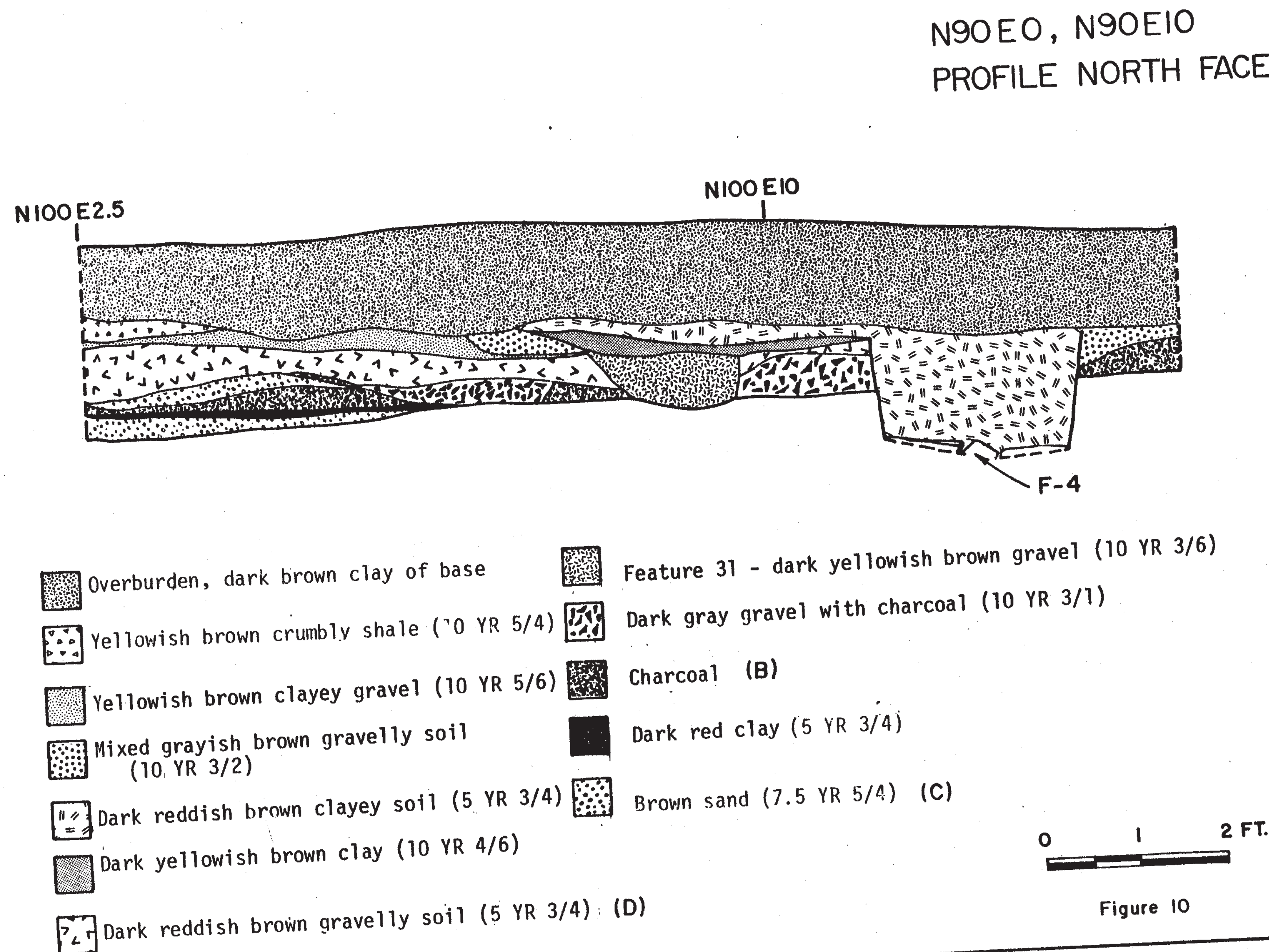

N90E0, N90E10
PROFILE NORTH FACE
N100E2.5
N100E10
F-4
Overburden, dark brown clay of base
Yellowish brown crumbly shale ('0 YR 5/4)
Yellowish brown clayey gravel (10 YR 5/6)
Mixed grayish brown gravelly soil (10 YR 3/2)
Dark reddish brown clayey soil (5 YR 3/4)
Dark yellowish brown clay (10 YR 4/6)
Dark reddish brown gravelly soil (5 YR 3/4) (D)
Feature 31 - dark yellowish brown gravel (10 YR 3/6)
Dark gray gravel with charcoal (10 YR 3/1)
Charcoal (B)
Dark red clay (5 YR 3/4)
Brown sand (7.5 YR 5/4) (C)
0
1
2 FT.

Figure 10

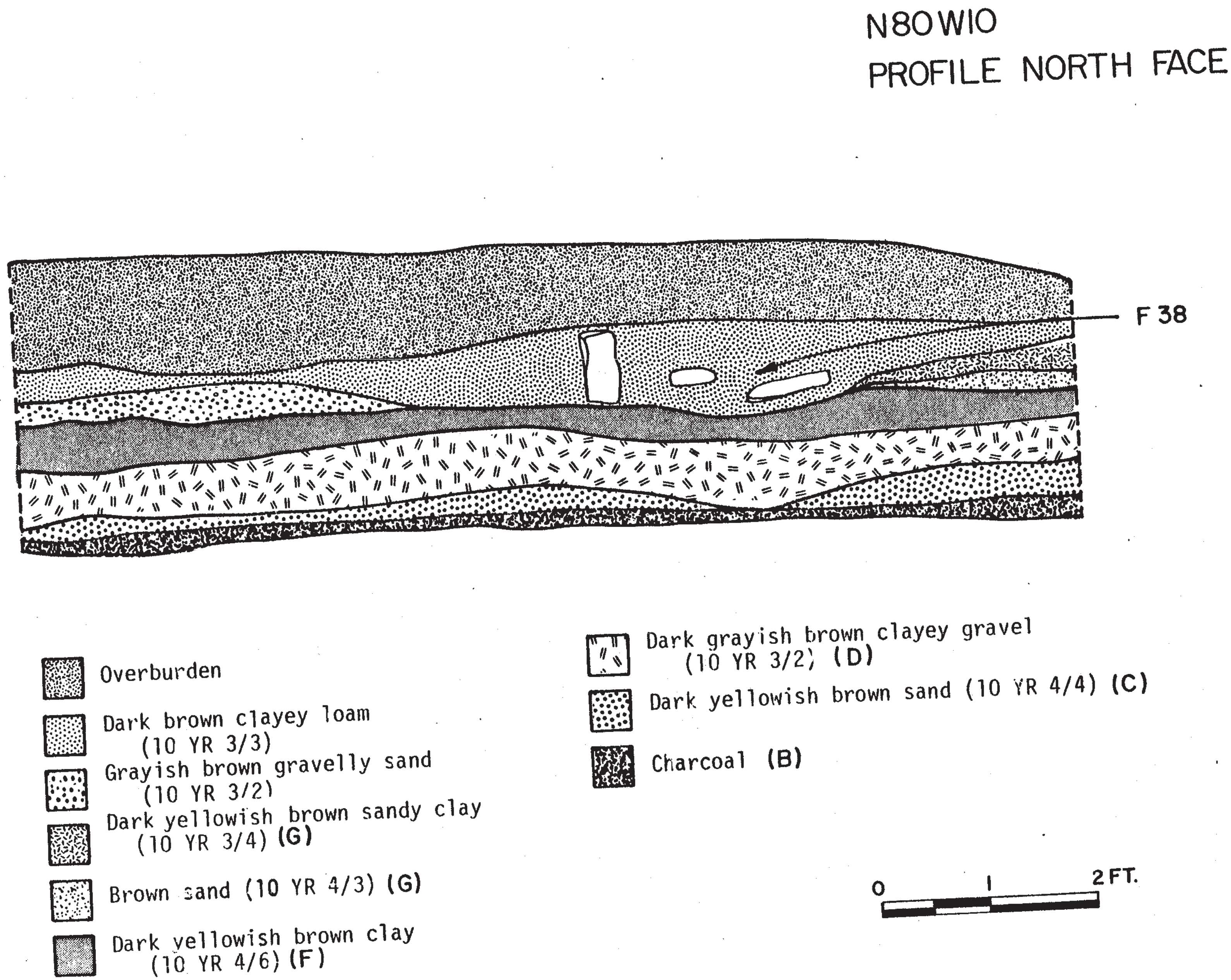

N80W10
PROFILE NORTH FACE
F 38
Overburden
Dark brown clayey loam (10 YR 3/3)
Grayish brown gravelly sand (10 YR 3/2)
Dark yellowish brown sandy clay (10 YR 3/4) (G)
Brown sand (10 YR 4/3) (G)
Dark yellowish brown clay (10 YR 4/6) (F)
Dark grayish brown clayey gravel (10 YR 3/2) (D)
Dark yellowish brown sand (10 YR 4/4) (C)
Charcoal (B)
0
1
2 FT.

Figure 11

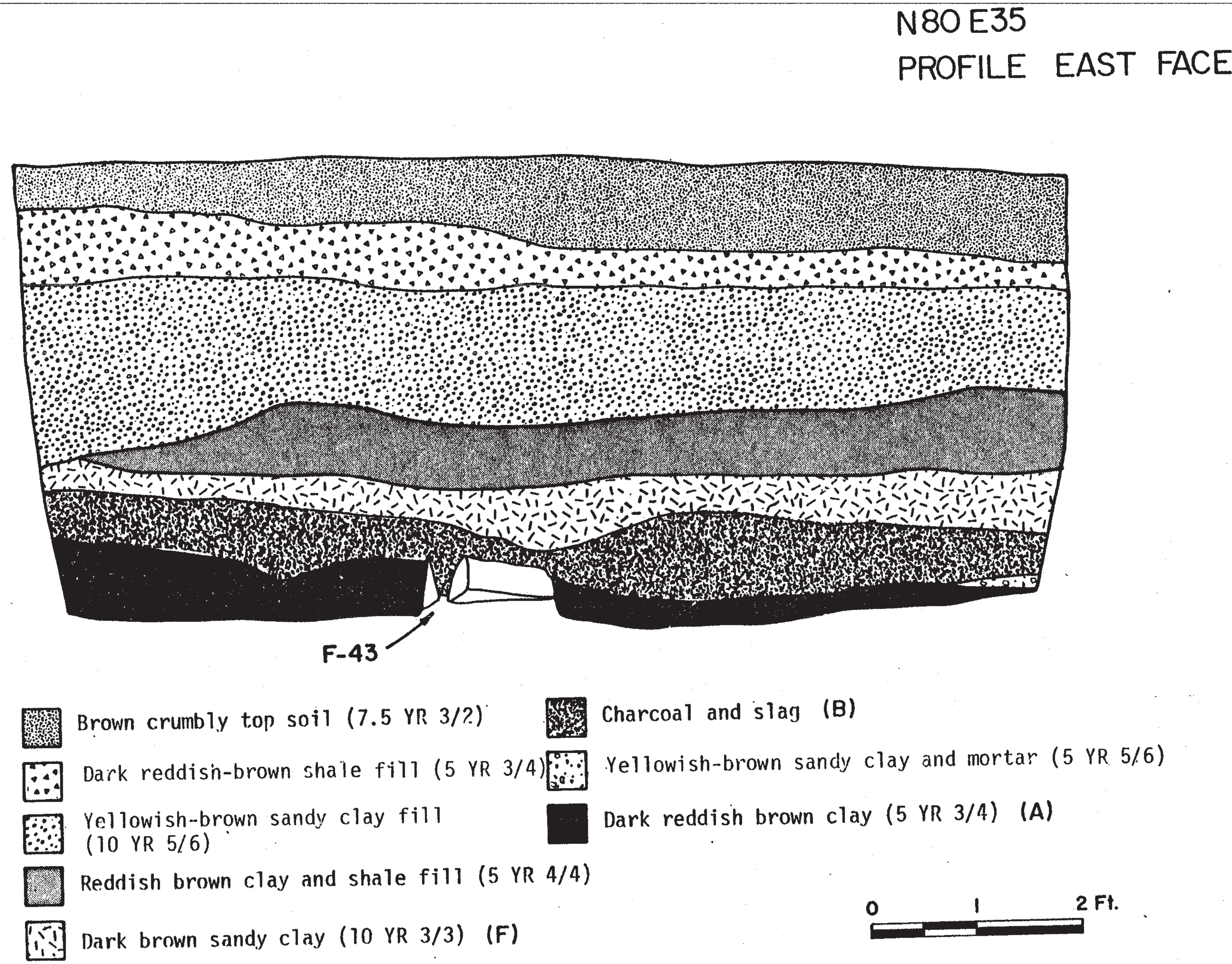

N80 E35
PROFILE EAST FACE
F-43
Brown crumbly top soil (7.5 YR 3/2)
Dark reddish-brown shale fill (5 YR 3/4)
Yellowish-brown sandy clay fill (10 YR 5/6)
Reddish brown clay and shale fill (5 YR 4/4)
Dark brown sandy clay (10 YR 3/3) (F)
Charcoal and slag (B)
Yellowish-brown sandy clay and mortar (5 YR 5/6)
Dark reddish brown clay (5 YR 3/4) (A)
0
1
2 Ft.

Figure 12

N30 TRENCH
PROFILE SOUTH FACE

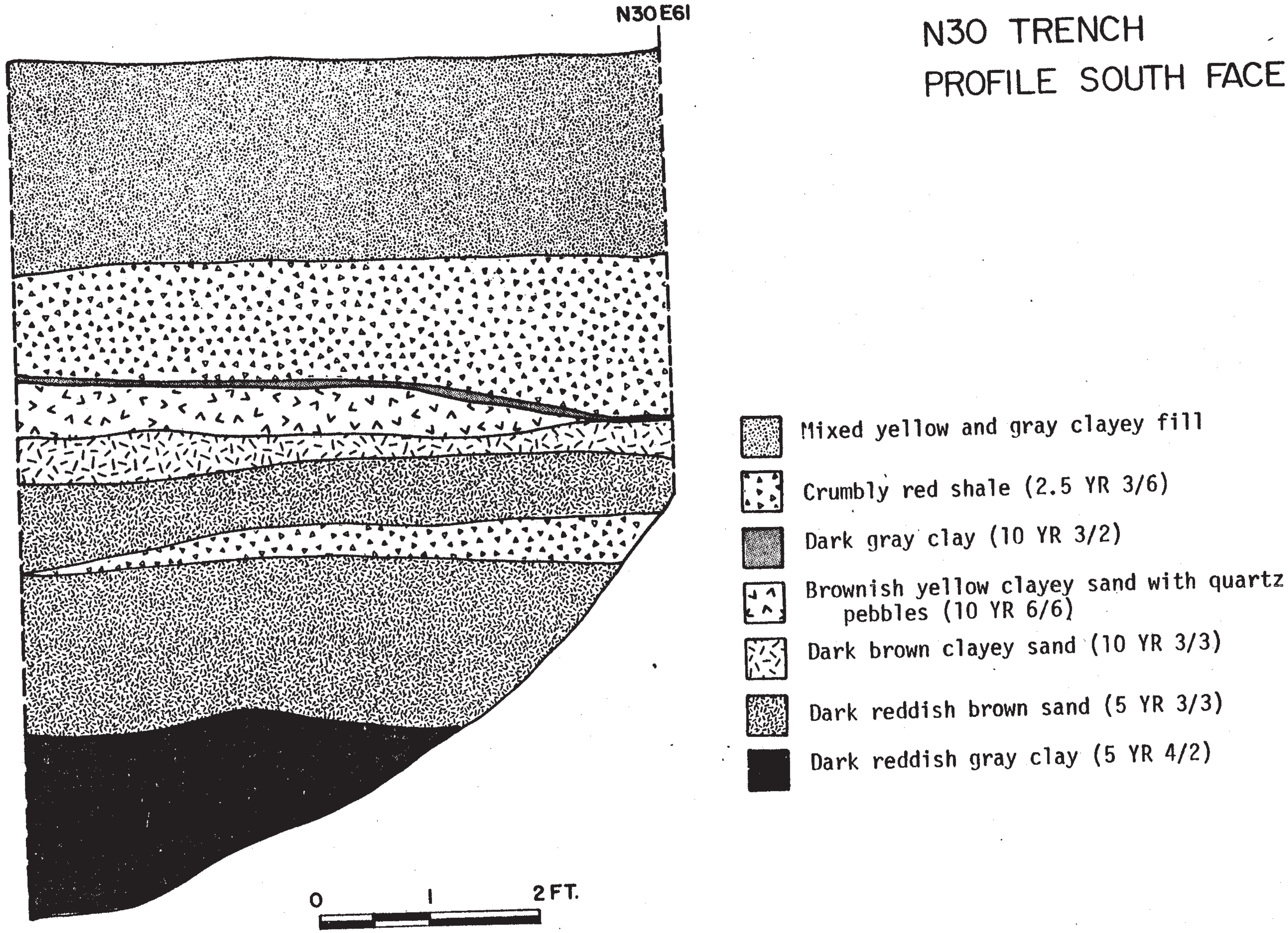
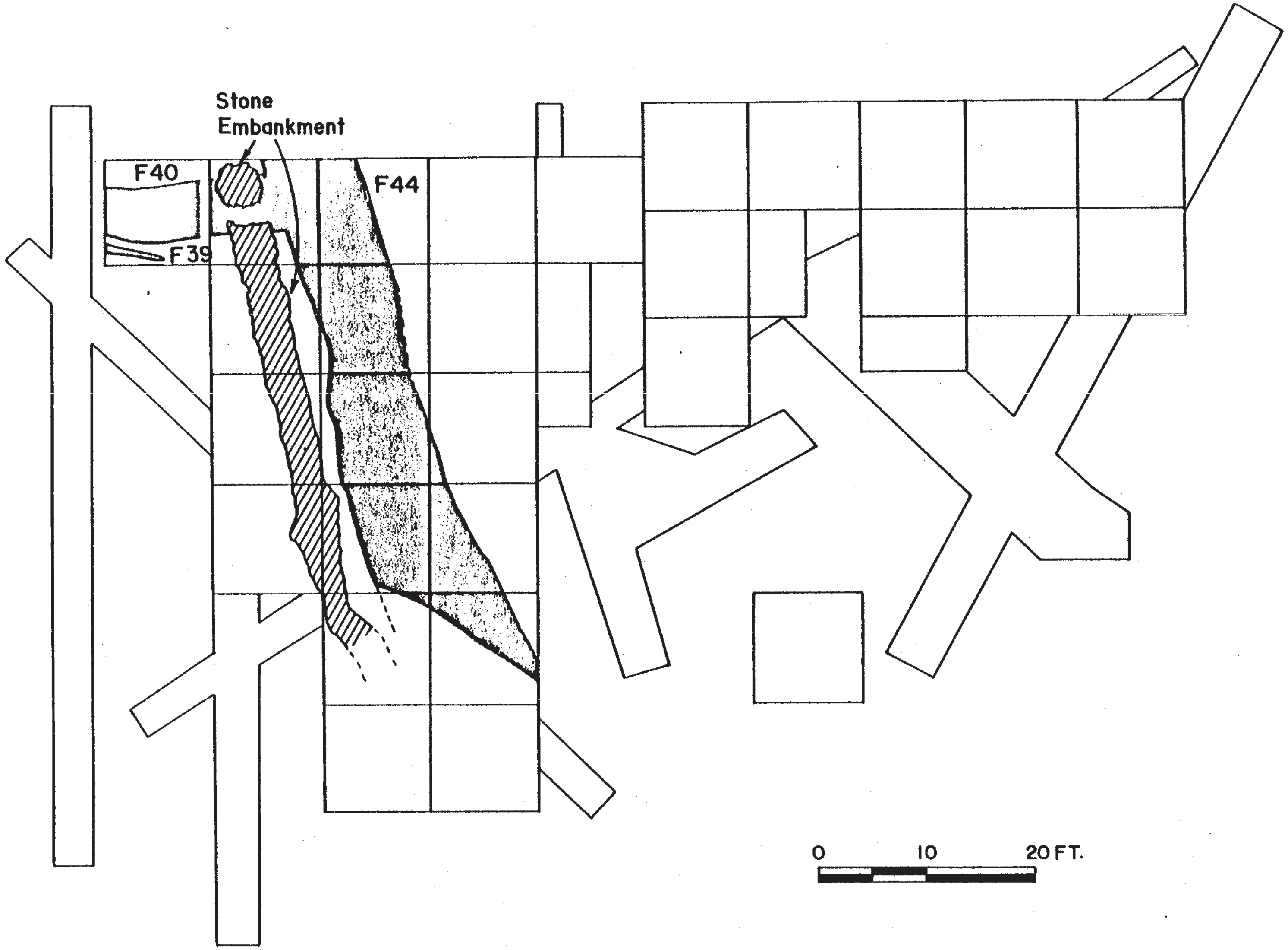
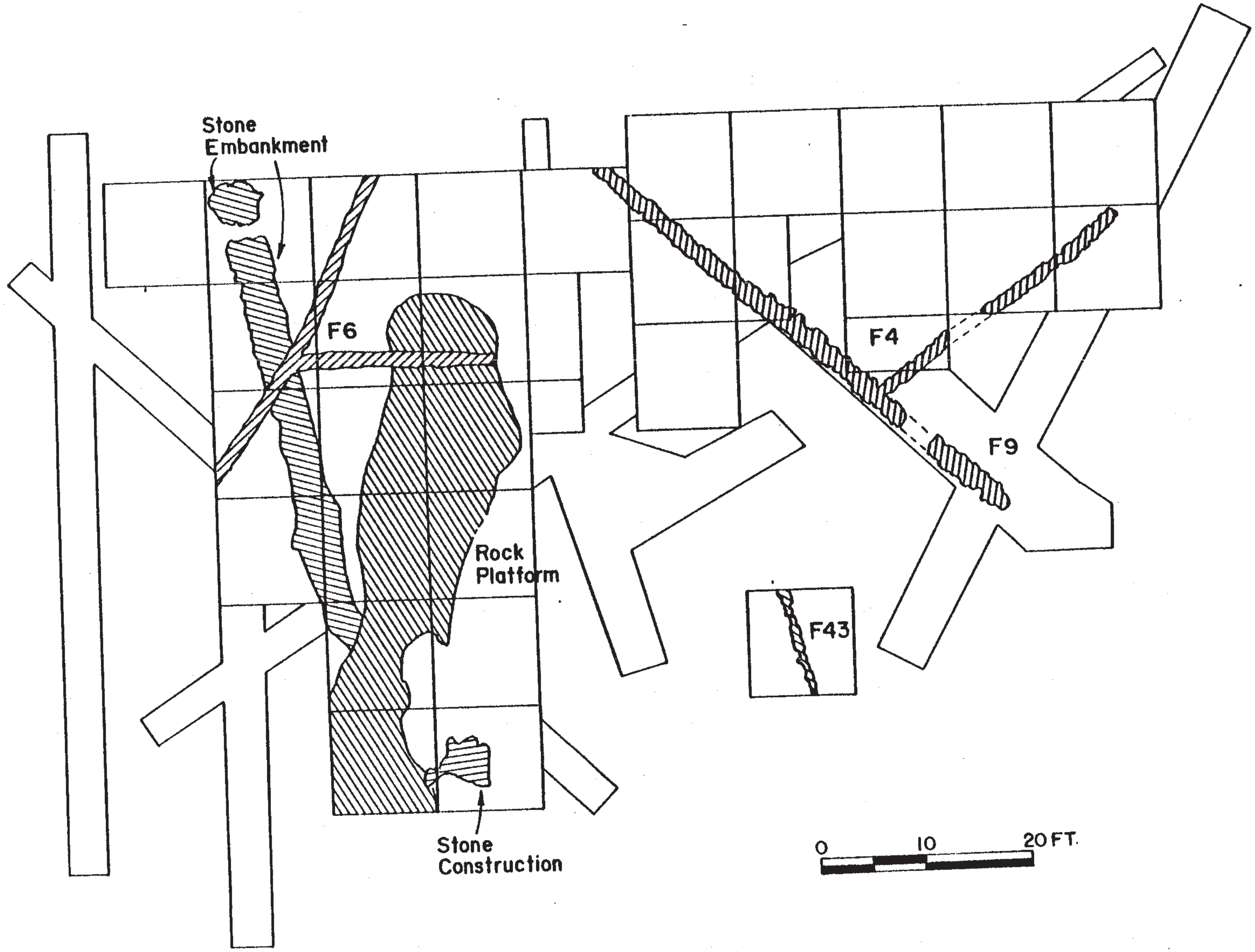


Figure 13



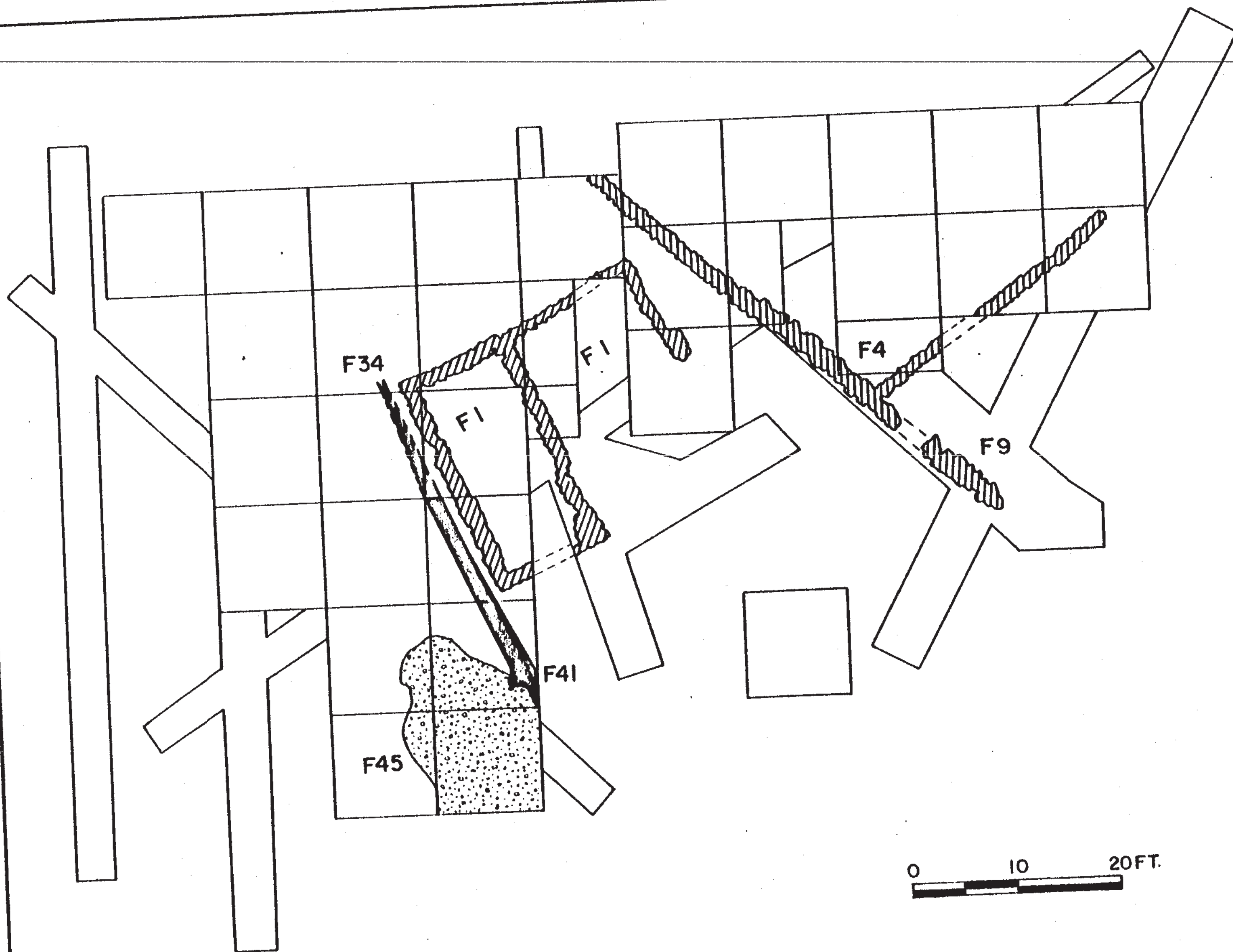
PHASE 1A

Figure 14



PHASES 2A AND 2B

Figure 15



PHASES 3A AND 3B

Figure 16

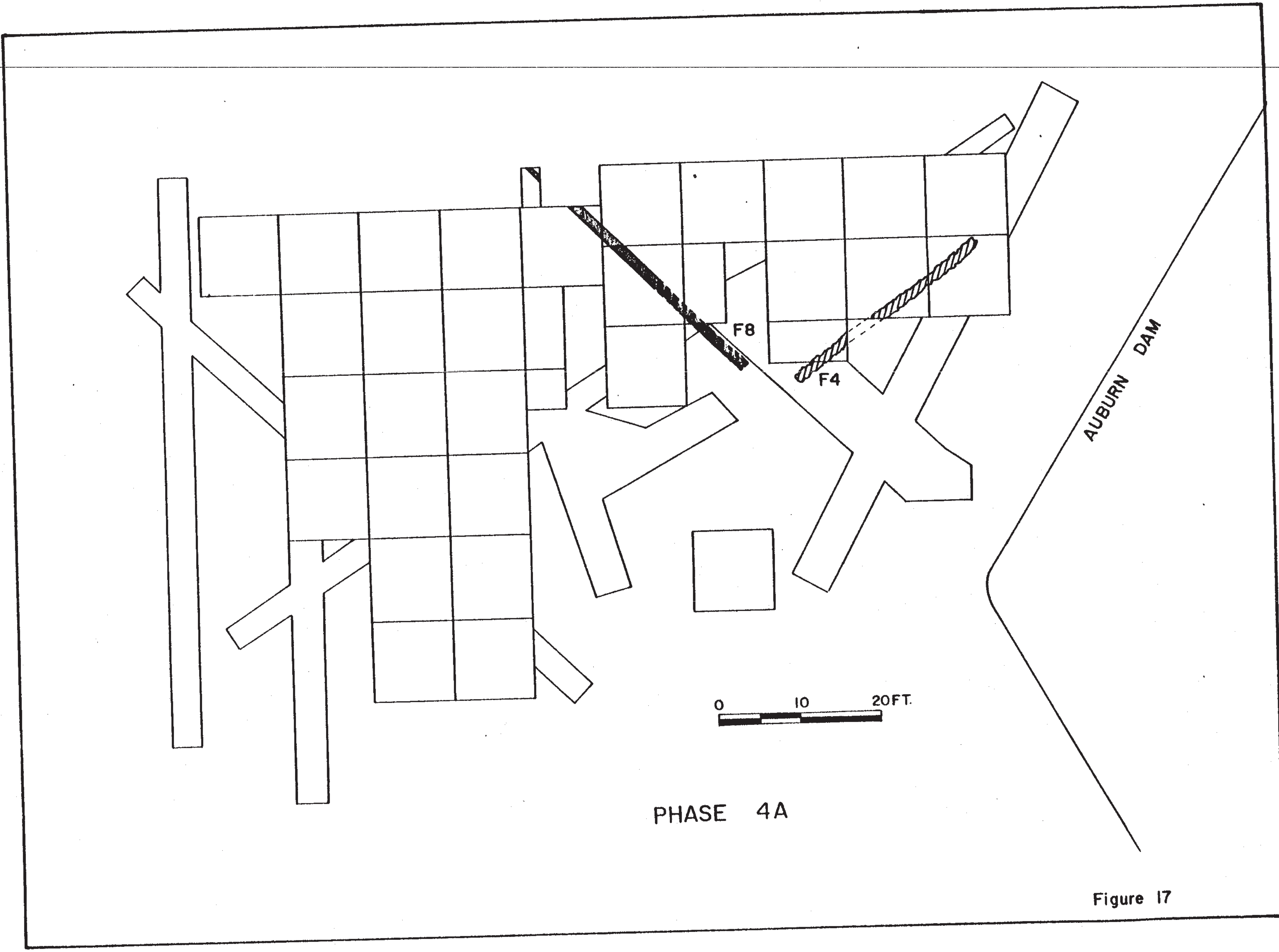
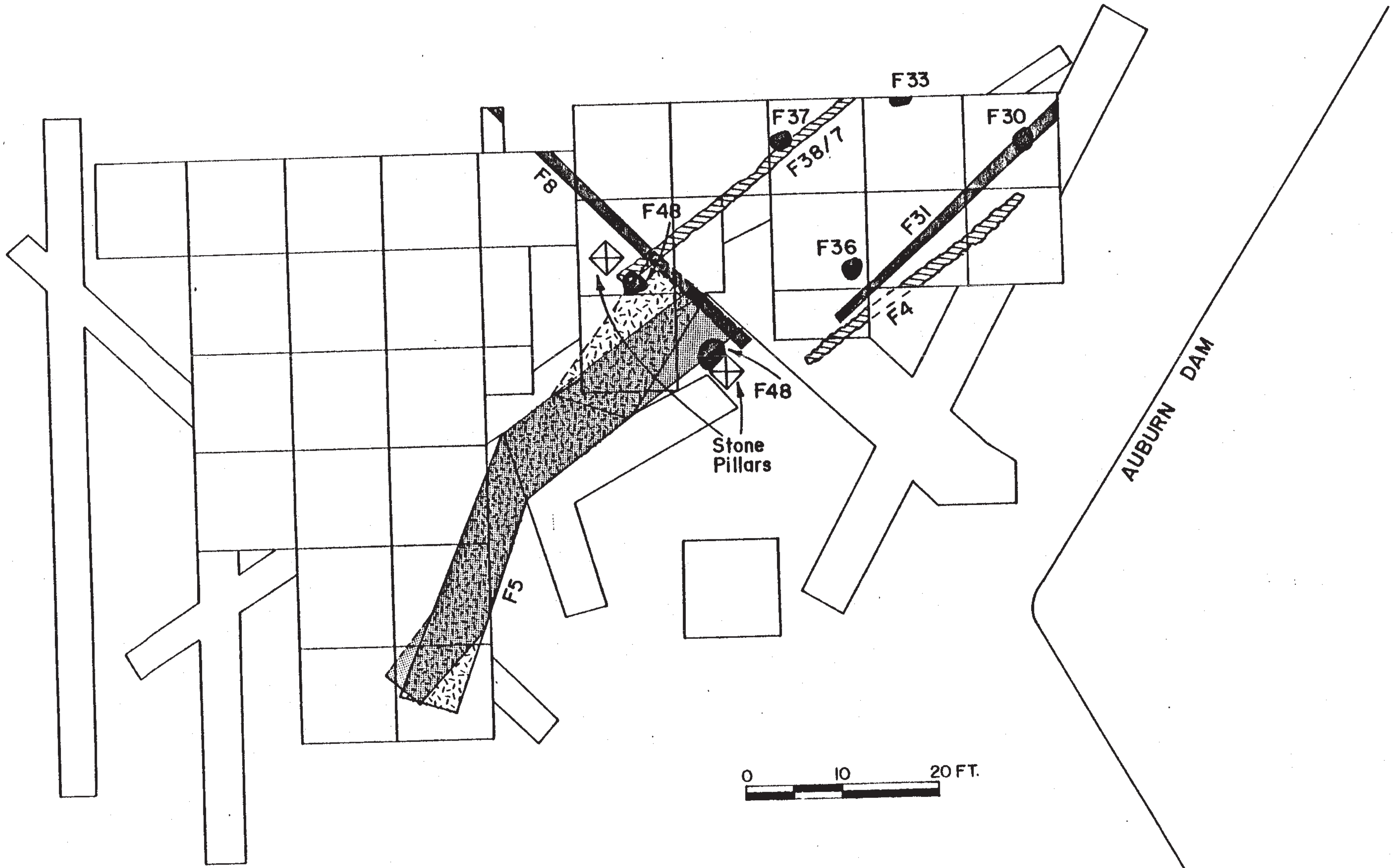
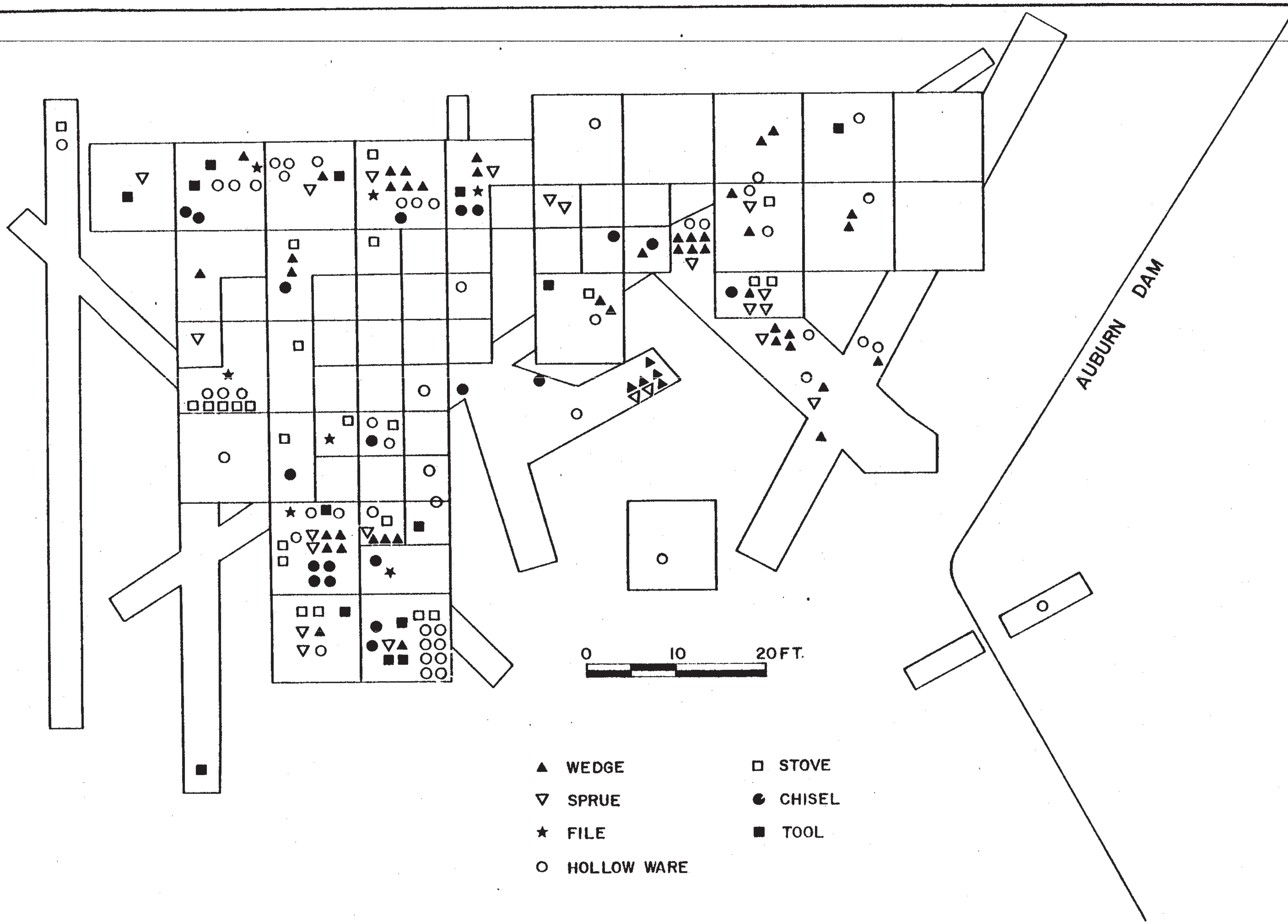


Figure 17



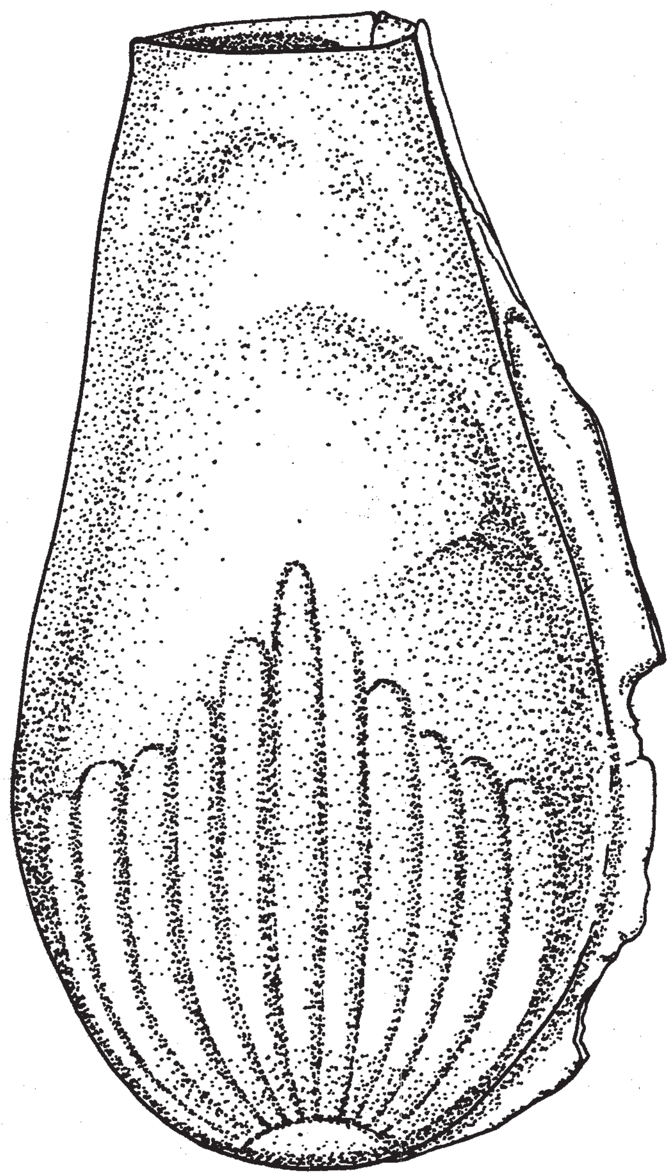
PHASES 5A AND 5B

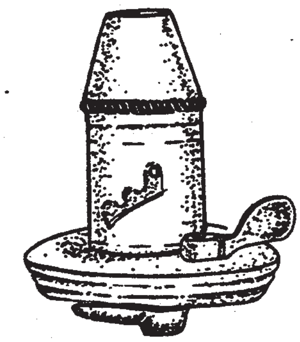
Figure 18



SPATIAL DISTRIBUTION OF DIAGNOSTIC ARTIFACTS

Figure 19





(Actual Size)

POWDER FLASK FOUND IN RACEWAY FILL

Figure 20

PLATES

Plate 1: View of F44 and the rock platform towards the end of the fieldwork season from grid squares N40W5 to N40E35. The stone embankment is on the left. The rock platform has been partially excavated through. The stone construction is in the foreground. The camera is facing west.

Plate 2: Grid square N40E25 with the camera facing west. In the foreground is the gap in the rock platform with the hard gray clay with many pieces of wood.

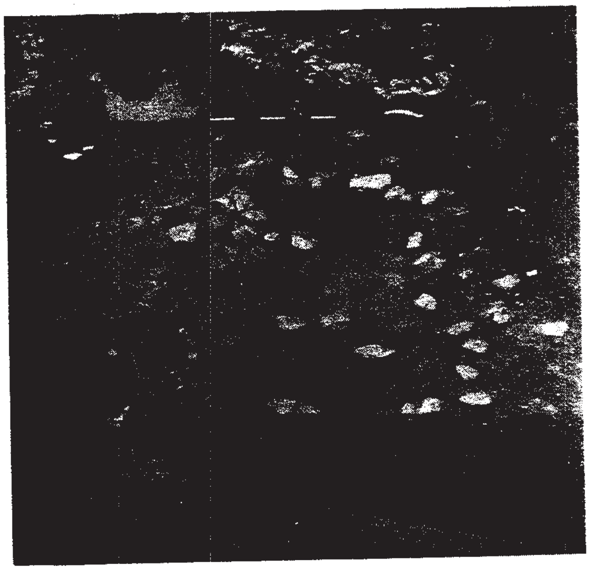


Plate 3: F45 in grid square N55E45. The plank of wood can be seen in the middle of the photograph. The camera is facing west and the scale is five feet.

Plate 4: Grid square N40E15 showing the "edging" of wood along the hard-packed slag surface of the rock platform. The red gravel has been excavated out of the depression running through the square. In the foreground is the stone embankment in grid square N30E15. The camera is facing north and the scale is five feet.

Plate 5: The western grid squares showing F6 in the foreground, crossing F44 and intersecting with F1 in the background. The west end of the rock platform is also visible and the stone embankment is in the foreground. The camera is facing north and the scale is five feet.

Plate 6: Grid squares N70E0 and N70E10. In the middle ground is the north wall of F1 (north) pedestalled above the dark reddish-brown silty clay. In the background are a tree stump and the base of the southwest Auburn Mansion pillar. To the right is F4. The camera is facing west and the scale is five feet.

Plate 7: Grid square N100W10 showing the north/south branch of F4. In the foreground is 1979 T-6B. F31 is to the left of F4. The camera is facing southeast.

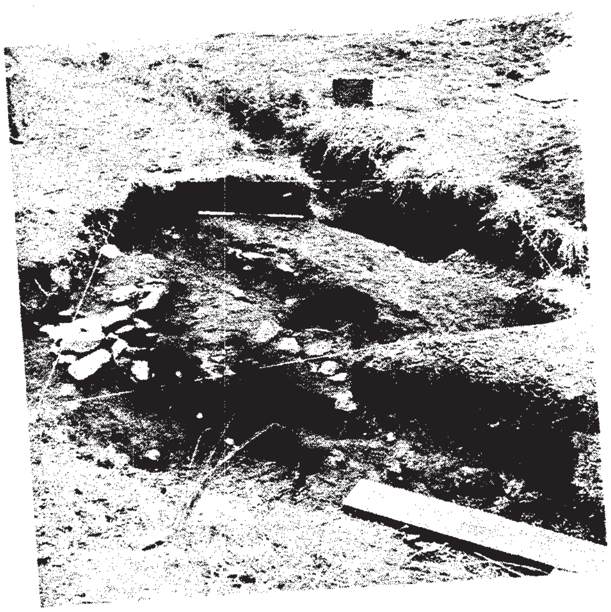


Plate 8: Grid square N110W10. F30 and F31 are visible. The stones to the left are probably from F4 as disturbed in the excavation of T-6B in the foreground. The camera is facing south and the scale is three feet.

Plate 9: Excavation of machine trench through the Auburn Dam. Camera is facing northeast.

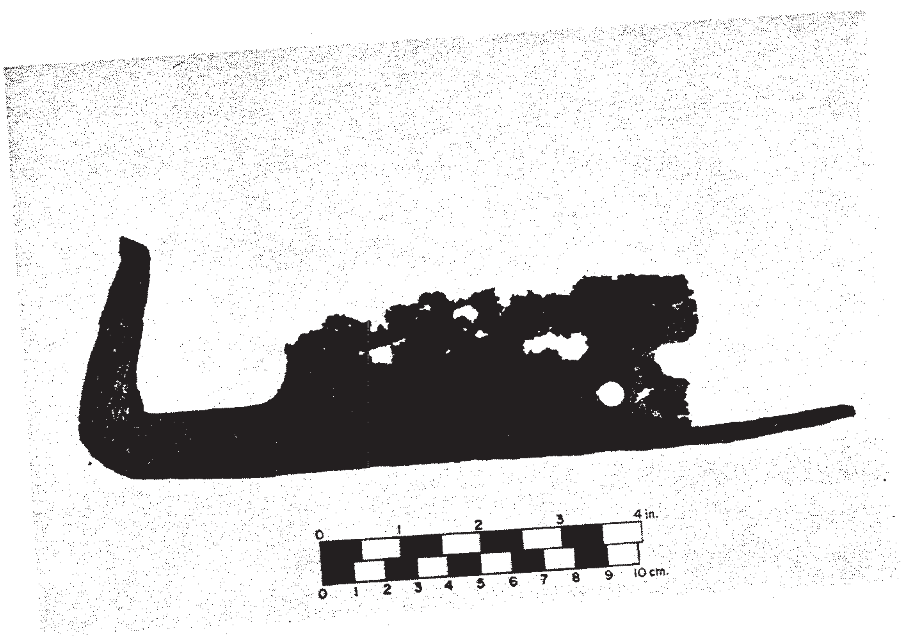


Plate 10: Wrought iron drawknife, excavated in N30 trench, lot 2.

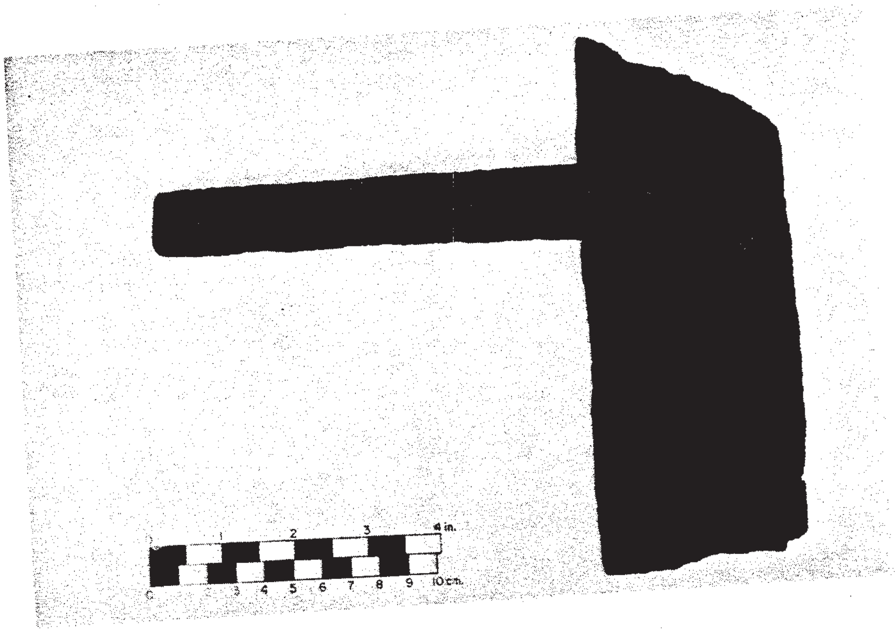


Plate 11: Composite cast and wrought iron artifact, excavated in N50E25, lot 8

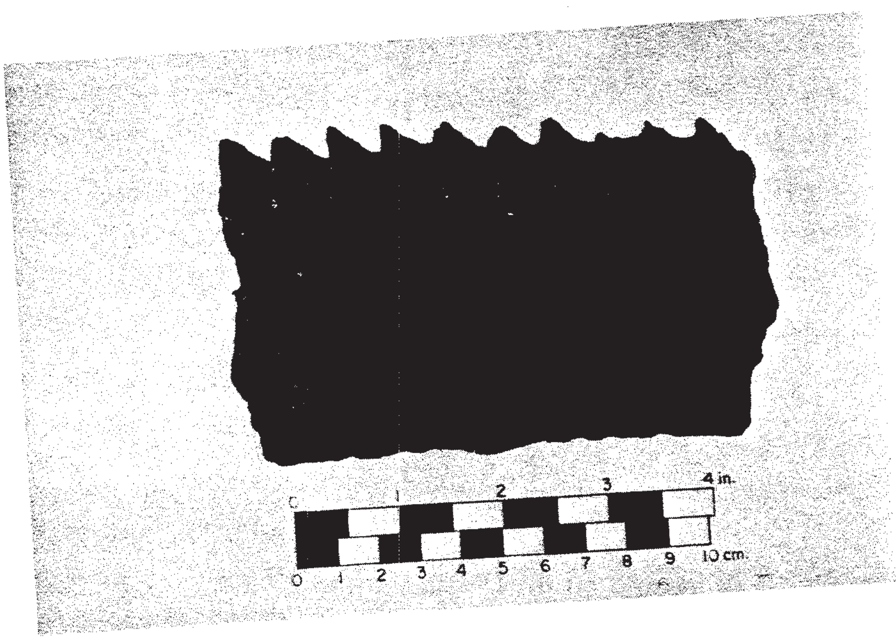


Plate 12: Cast iron gearing wheel fragment, excavated in N60E45, lot 37.

Plate 13: Cast iron wagon box, excavated in N60E45, lot 37.

Plate 14: Cast iron flask clamp, excavated in N50E45, lot 11.

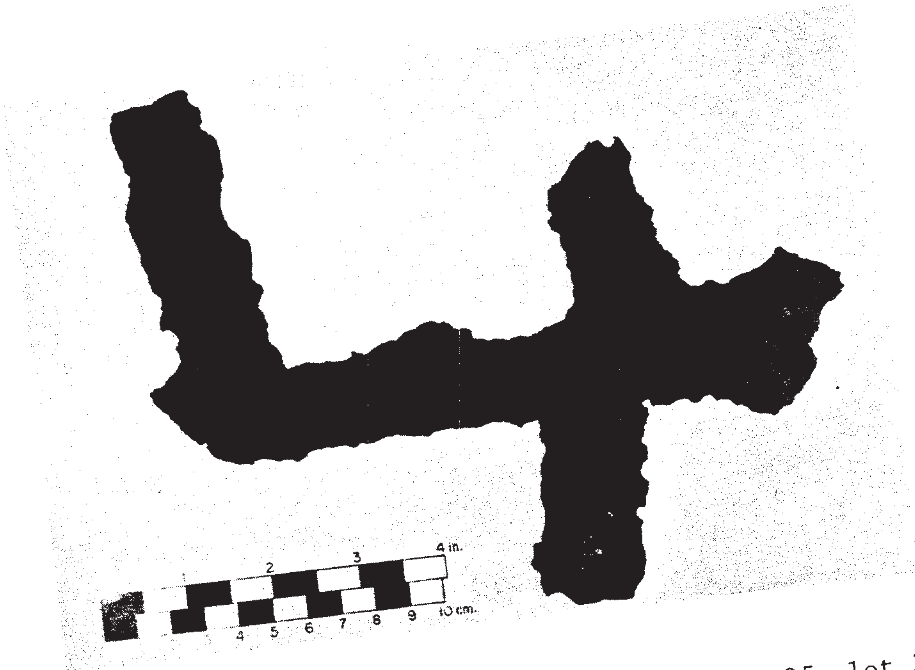


Plate 15: Cast iron runner, excavated in N80E35, lot 35.

Plate 16: Sample of ferrous slag, MASCA lab number 6. (Photograph courtesy of Nicholas Hartmann, MASCA)

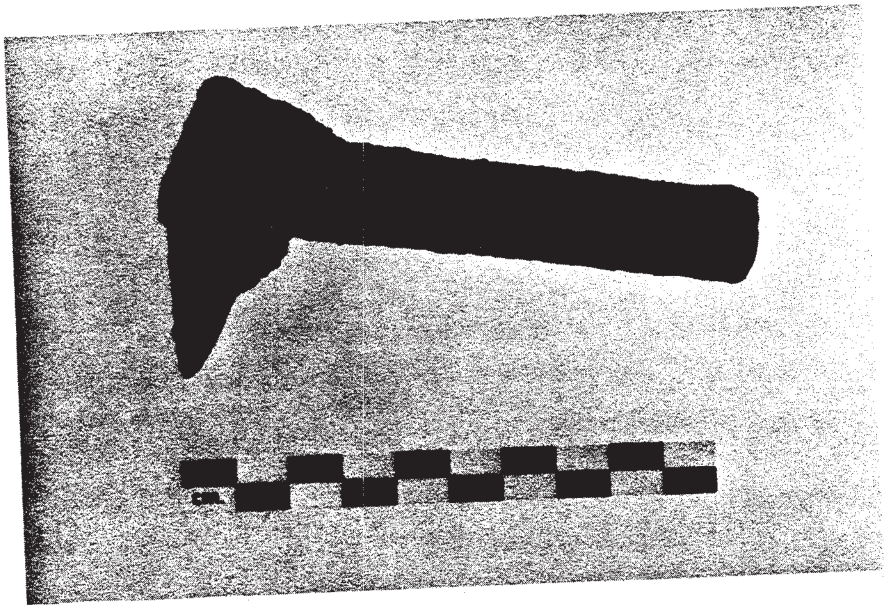


Plate 17: Cast iron sprue or riser, excavated in N40E35, lot 26, MASCA lab number 1. (Photograph courtesy of Nicholas Hartmann, MASCA)

Plate 18: Handle ear from cast iron vessel, excavated in N30E25, lot 6, MASCA lab number 3. (Photograph courtesy of Nicholas Hartmann, MASCA)

Plate 19: Fragment of cast iron pig, excavated in N30E25, lot 6, MASCA lab number 14. (Photograph courtesy of Nicholas Hartmann, MASCA)

Plate 20: Micrograph of gray cast iron (#1) as polished (not etched), showing Type A flake graphite of random orientation and uniform distribution (X100). (Photograph courtesy of Nicholas Hartmann, MASCA)

Plate 21: Scanning electron micrograph of pearlite around graphite rosette in white cast iron (#14), showing lamellae of iron carbide and ferrite; graphite flake extends across right side of field (X2000). (Photograph courtesy of Heidi Moyer, Lehigh University)

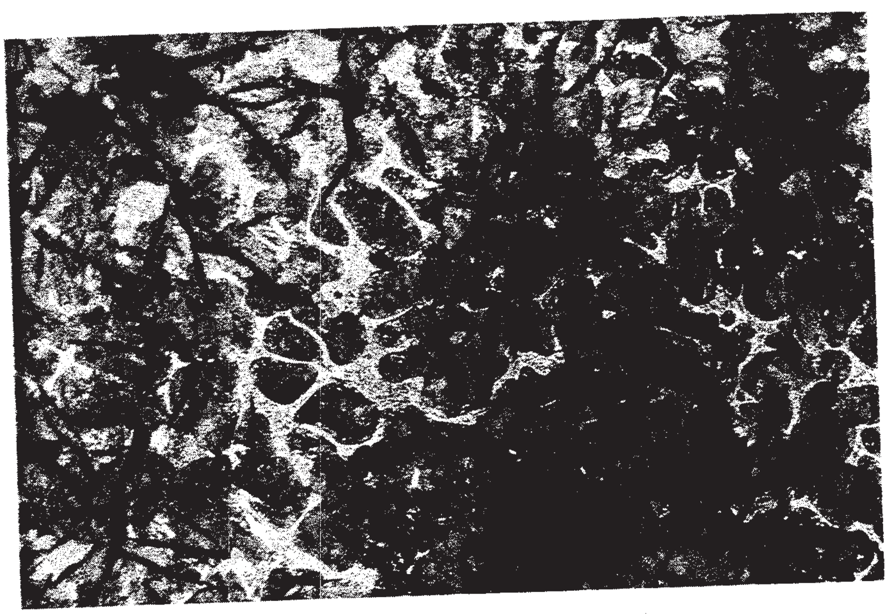


Plate 22: Micrograph of gray cast iron (#5), etched with 2 percent nital, showing phospide eutectic (white speckled), graphite flakes (black) and pearlite (gray) (X2000). (Photograph courtesy of Nicholas Hartmann, MASCA)

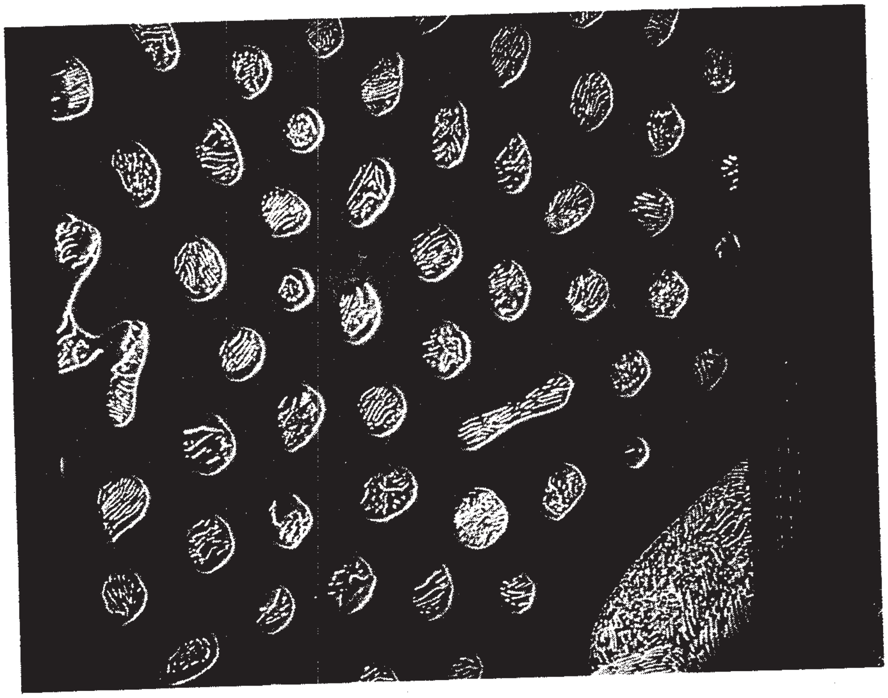


Plate 23: Scanning electron micrograph of white cast iron (#14), showing ledeburite eutectic resolved, iron carbide around nodules of pearlite (X2000). (Photograph courtesy of Heidi Moyer, Lehigh University)

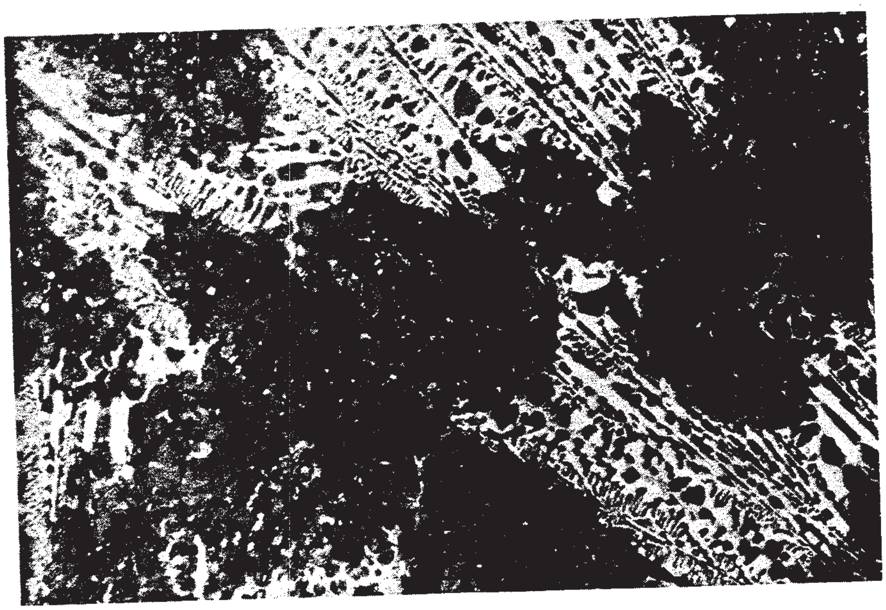


Plate 24: Micrograph of mottled cast iron (#3) etched with 2 percent nital, showing iron carbide (white) in matrix of pearlite (gray) and graphite nests (black) (X200). (Photograph courtesy of Nicholas Hartmann, MASCA)