2007 ARCHAEOLOGICAL INVESTIGATIONS AT TOWN CREEK INDIAN MOUND STATE HISTORIC SITE

by

R. P. Stephen Davis, Jr.

Research Report No. 28
Research Laboratories of Archaeology
University of North Carolina at Chapel Hill

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ABSTRACT

Archaeological investigations were conducted at Town Creek Indian Mound State Historic Site in Montgomery County, North Carolina, between October 12 and October 14, 2007. These investigations were sponsored by the North Carolina Archaeological Society, the Friends of Town Creek, and the Research Laboratories of Archaeology, and were conducted under ARPA permit # 79. The project was scheduled to coincide with the fall meeting of the North Carolina Archaeological Society at Town Creek on October 13, 2007, which permitted participation by Society members and the interested public.

This project was a continuation of fieldwork conducted at Town Creek in October, 2006, under ARPA permit #75, which began a long-term process of re-acquiring missing photographs for the Town Creek Photographic Mosaic. The goal of the 2007 fieldwork was to re-excavate and photograph three to five 10x10-ft units for which mosaic photographs were missing.

ACKNOWLEDGMENTS

This project was initially conceived by the Executive Board of the North Carolina Archaeological Society as a volunteer-oriented field project for Society members at its 2006 fall meeting. Because of that project's success, the Society's board, along with the Research Laboratories of Archaeology and Friends of Town Creek, decided to continue the project during the Society's 2007 fall meeting.

I am grateful to the many Society members and other volunteers who participated in the fieldwork. All contributed to the project's overall success. I wish, in particular, to thank the following individuals for providing expertise and supervision: Tony Boudreaux, Linda Carnes-McNaughton, Mary Beth Fitts, Theresa McReynolds, Matt Mirarchi, Joe Herbert, Jeff Irwin, Brian Overton, Shawn Patch, Brett Riggs, Terri Russ, and Archie Smith. Finally, I want to extend my appreciation to Rich Thompson and the staff at Town Creek Indian Mound State Historic Site for facilitating this project. This project could not have taken place without their support.

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BACKGROUND

The following summary of previous archaeological research at Town Creek and the importance of the site photographic mosaic is taken from the final report on the 2006 archaeological investigations (Davis 2006:2-4). Town Creek Indian Mound (31Mg2 and 31Mg3) is a South Appalachian Mississippian single-mound center located on Little River in southern Montgomery County, North Carolina (Figure 1). Archaeological evidence at the site indicates it was occupied successively during the Archaic, Woodland,

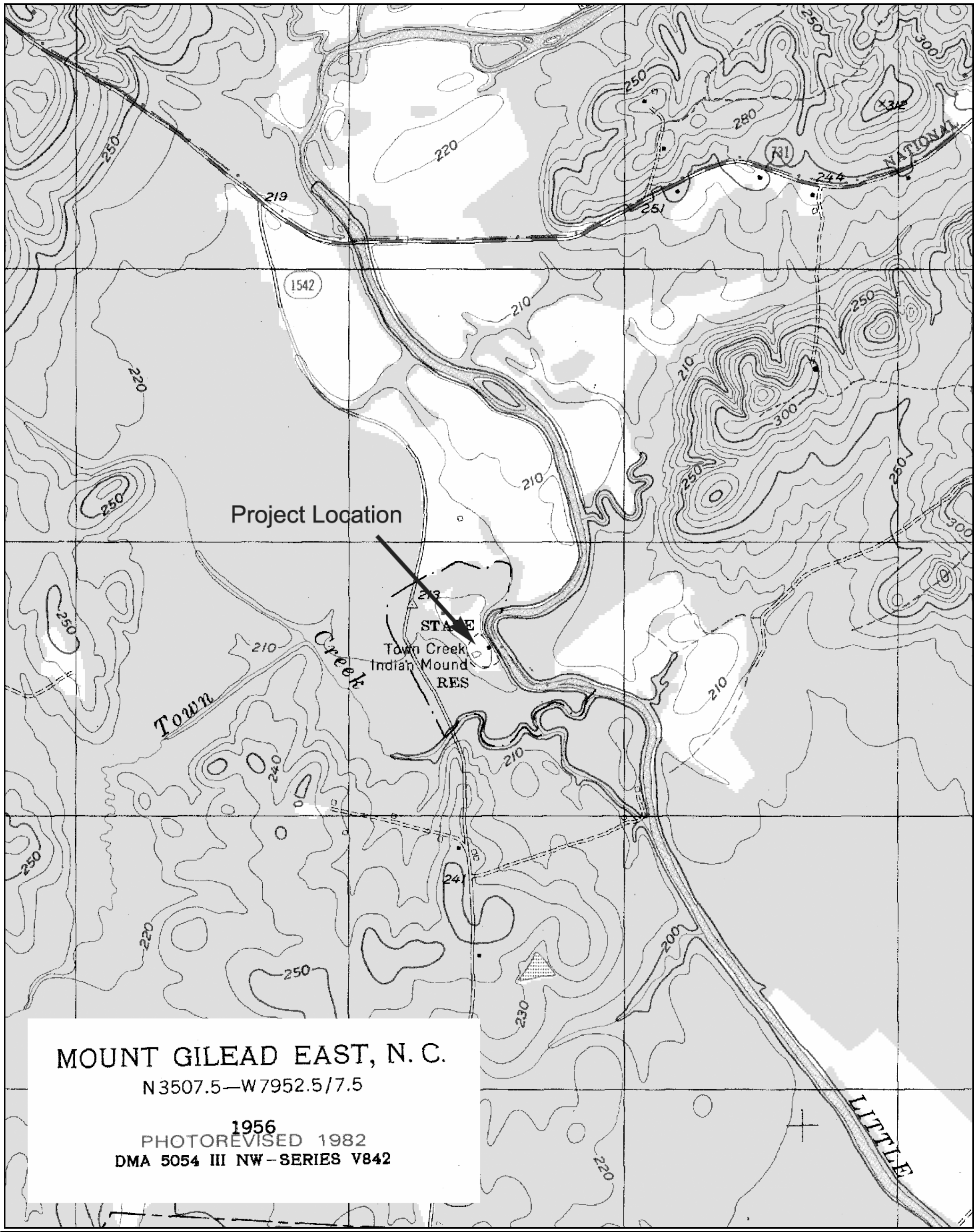

Figure 1. Portion of Mount Gilead East 7.5-minute quadrangle, showing the location of Town Creek Indian Mound in southern Montgomery County, North Carolina.

and Mississippian periods, with the most intensive occupation occurring between about A.D. 1200 and 1500 (Boudreaux 2005; Coe 1995; Ward and Davis 1999). The archaeological complex representing this latter period of site use was originally termed the "Pee Dee culture" (Coe 1952).

Investigation of the site, under the overall direction of Joffre Coe, began in 1937 with the exploration of the mound (designated 31Mg2); by 1940 excavations also had begun within the adjacent village area (designated 31Mg3). These investigations were supported largely by Federal work programs, including the National Youth Administration (NYA), Civilian Conservation Corps (CCC), and Works Progress Administration (WPA), and continued until early 1942 when mobilization for the Second World War brought about their termination. Excavations resumed in 1949, following Coe's completion of military service and his Master's degree at the University of Michigan, and continued largely uninterrupted until the early 1970s. Sporadic investigations continued until the mid-1980s.

From the mid-1950s onward, archaeological research at Town Creek was accompanied by efforts to stabilize and partially reconstruct the "Pee Dee" village for public interpretation. These efforts were initiated in the 1950s with the reconstruction of the mound. Later, using evidence gained through archaeological excavation, two wattle-and-daub structures with thatched roofs were constructed atop the mound and across the plaza from the mound. Additional interpretative constructions include a wattle-and-daub and thatch mortuary house and a surrounding palisade. A permanent museum was constructed in the early 1960s, and today Town Creek is the only historic site administered by the North Carolina Department of Cultural Resources which is dedicated to interpreting the prehistory and history of the State's first peoples.

Because of the length and duration of archaeological research at Town Creek, it stands as one of the most extensively investigated prehistoric sites in the southeastern United States. Unlike many large-scale excavations which have relied on heavy machinery to expose underlying archaeological features and deposits, Town Creek was excavated methodically by hand in 10x10-ft units, and all excavated soil was screened. By this process and using mostly small work crews, almost 900 contiguous excavation units were dug to top of subsoil, photographed, and mapped. While some underlying features (mostly burials and postholes) were subsequently excavated, most were not and remain available for future scientific study.

Perhaps the most creative and innovative procedure employed during these excavations was the systematic preparation of each excavated unit prior to photographing and mapping, and the use of a wooden tower to obtain precise vertical photographs of each unit. This technique reflected Coe's deep commitment to the value of photographic images in archaeological documentation and interpretation, and was inspired by the U.S. Soil Conservation Service's program of systematic aerial photography which began in the late 1930s. Showing considerable foresight, Coe's development and implementation of this technique permitted the collection of a consistent visual record of each excavated unit over a period of several decades, during which numerous archaeological supervisors worked at Town Creek. In fact, the resulting photographs provide a consistency in documentation not provided by the accompanying scale drawings of excavated surfaces (Davis and Boudreaux 2002).

2007 INVESTIGATIONS

On October 8, 2007, Brett Riggs and Steve Davis of the Research Laboratories of Archaeology re-established the excavation grid by relocating grid points set in during the 2006 investigations. Corner pins were then placed for five 10x10-ft excavation units (Sqs. -200L60, -200L50, -200L40, -200L30, and -200L20). These units, located at the southern edge of the site near the reconstructed palisade, are contiguous with two of the units (Sqs. -200L80 and -200L70) re-excavated in 2006.

Two additional points, at -193.164L80.459 (Station #1) and -189.043L114.724 (Station #2), were established in order to permit total-station mapping of the excavated units.

Remote Sensing

While not part of the original research design, additional remote sensing was conducted on October 13, 2007, by Shawn Patch of New South Associates, Greensboro, NC. Mr. Patch and his assistants examined a 20x20-meter block using ground penetrating radar in order to evaluate how this non-invasive technique might be used to identify subsurface archaeological features in unexcavated areas of the site. The remote sensing block, with corners at -180L4.38 (SE), -180L70 (SW), -114.38L70 (NW), and -114.38L4.38 (NE), was located southeast of the mound and within the reconstructed palisade, in an area which had been previously excavated (though pits and postholes were not excavated) (Figures 2, 3, 4, 5, and 6). This block was examined in 2006 by Gerald Schroedl using a gradiometer and a soil resistivity instrument (see Davis 2006:23-30).

Re-Excavation of Units for Photography

Three 10x10-ft units (Sqs. -200L60, -200L50, and -200L40) were re-excavated for the purpose of re-acquiring mosaic photographs (Figure 2). These units were located along an east-west trench that was originally excavated by Barton Wright in April, 1950. Several dozen individuals participated in the excavations and include volunteers from Fort Bragg, NC DOT, UNC-Chapel Hill, Environmental Services, Inc., the North Carolina Archaeological Society, and Town Creek Indian Mound State Historic Site.

As with the 2006 investigations, the procedure used to excavate and document these units was as follows. First, a string was pulled between the corner pins to outline the unit. Next, the sod was carefully removed and placed in a pile adjacent to the unit. Following this, the topsoil (i.e., old backfill) was dug with shovels and hand-sifted through ¼-inch mesh. (In 2006, only a portion of the backdirt was re-screened.) When the excavators reached a depth about 0.2 ft above the top of subsoil (and the tops of unexcavated pits and postholes), they began flatshoveling the remaining soil until subsoil was reached. The tops of pits and postholes were carefully cleaned with trowels, and artifacts protruding from the tops of those features were left in place (Figures 7 to 10).

In 2006, it was decided to sift the old backfill primarily to allow more volunteers to participate in the project (since the soil presumably had already been sifted). However, because of the large numbers of artifacts that were found, all fill from the 2007 units was screened. This permitted us to assess both the degree to which large (i.e., >1/2" in size) artifacts were overlooked during the earlier excavations and the density of smaller artifacts (1/4" to 1/2" in size) within the topsoil in this area of the site. As was the case in the 2006 investigations, numerous large artifacts which should have been collected

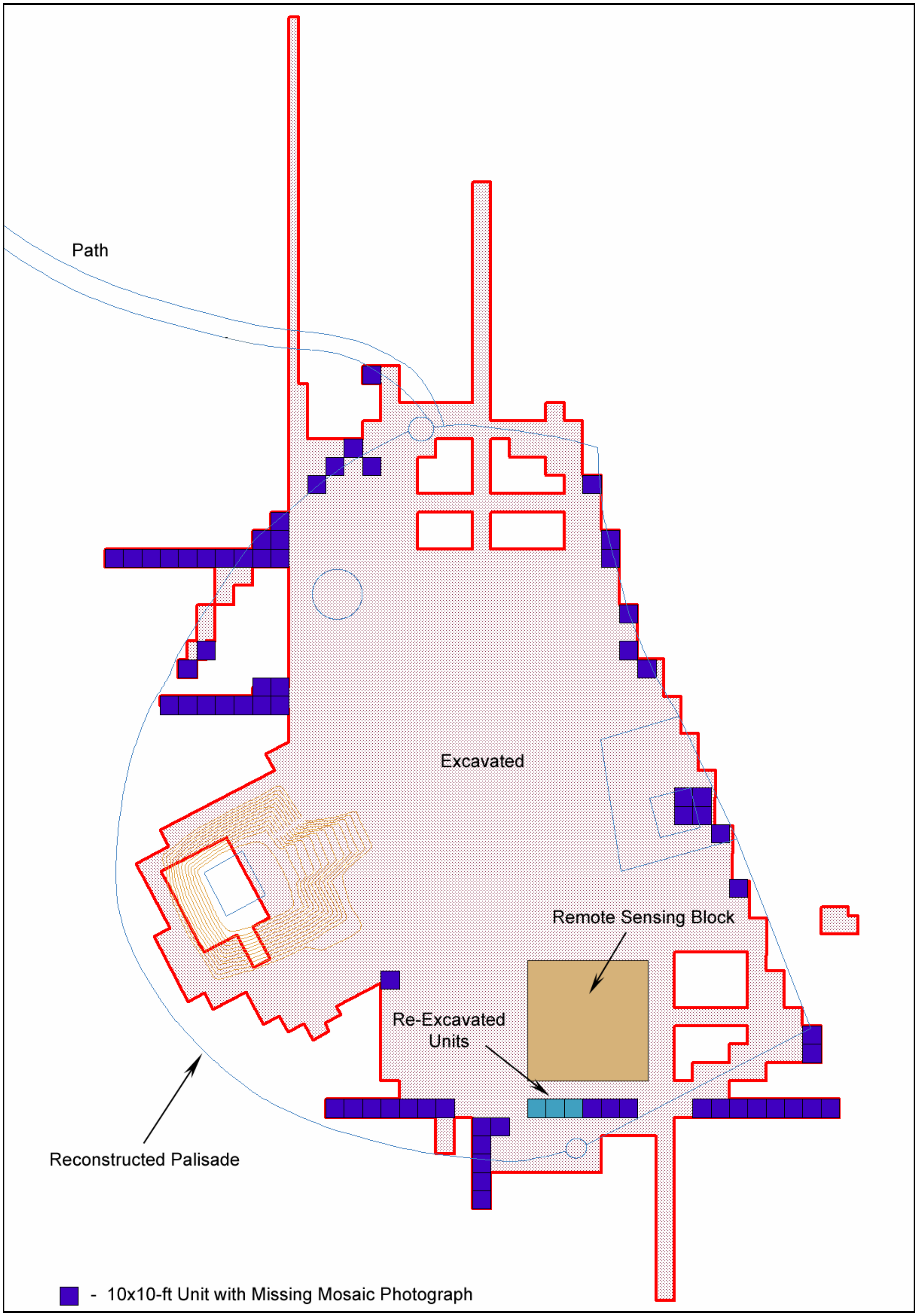

Figure 2. Map of Town Creek showing areas of 2007 investigations.

Figure 3. Testing the remote sensing block using ground penetrating radar.

Figure 4. Testing the remote sensing block using ground penetrating radar.

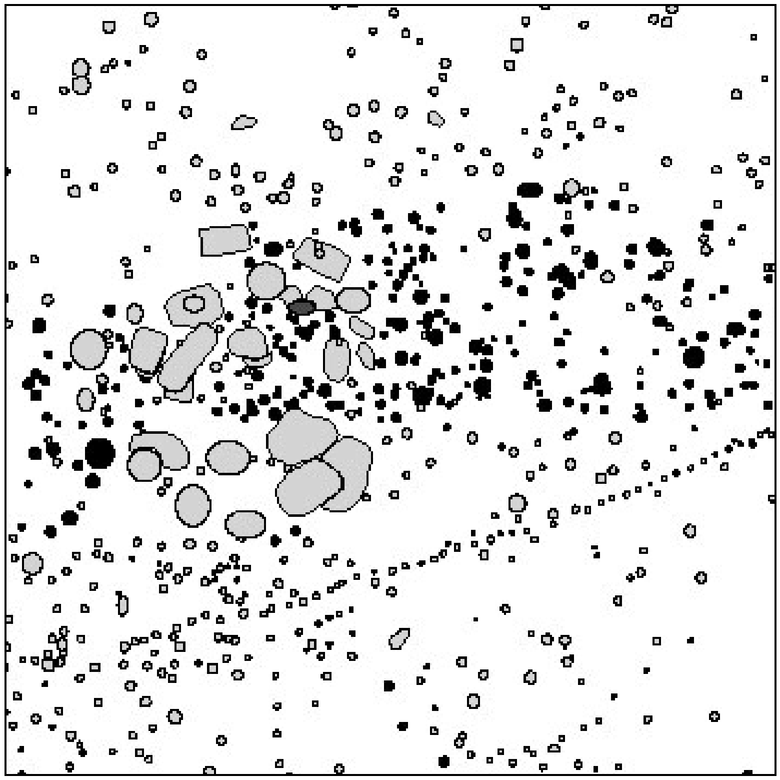

Figure 5. Excavation plan of the remote sensing block.

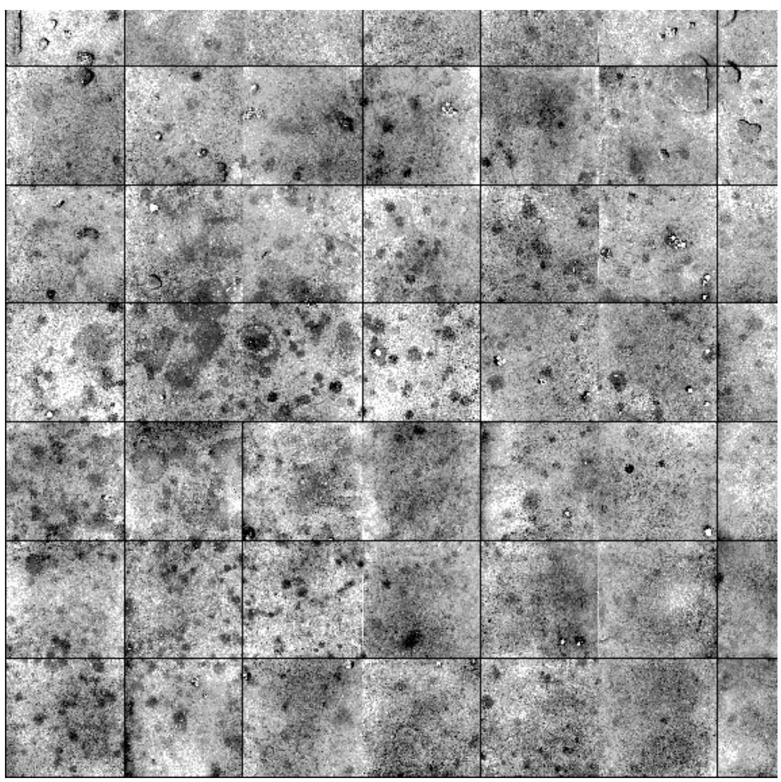

Figure 6. Photographic mosaic of the remote sensing block.

Figure 7. Removing sod from Sq. -200L60 (view to west).

Figure 8. Beginning excavation of Sq. -200L60 (view to northeast).

Figure 9. Excavating Squares -200L60 and -200L50 (view to east).

Figure 10. Screening fill from Squares -200L60 and -200L50 (view to east).

previously, including large flakes, large potsherds, and projectile points, were found. A high density of smaller artifacts also was observed. A catalog of recovered artifacts is presented in Appendix 1.

Once all topsoil had been removed from a unit, an additional 0.5-ft margin was excavated in the manner just described. In doing this, care was taken to precisely relocate the corner pins at the top of subsoil. This additional margin was necessary in order to obtain photographs of the unit's entire excavated surface without shadows from the adjacent excavation walls. Additional pins also were placed midway between the corner pins and at the center of the unit to provide photographic registration points for 5x5-ft quarter-units. Finally, the entire excavated surface was uniformly trowelled to produce a crisp, clean surface. Just prior to photographing, this surface was sprayed with a fine water mist to enhance the soil-color differences between the darker pits and postholes and the lighter, brownish-tan subsoil (Figures 11 to 14).

Multiple vertical photographs were taken of each of the four quarter-units in each 10x10-ft excavation unit. This was accomplished using a Canon Digital Rebel SLR camera (6 megapixels) with a 17mm lens. Photographs were taken from an 8-ft aluminum ladder straddling the 5x5-ft quadrant, which placed the photographer approximately 8–9 ft above the excavation surface. The ladder was positioned so that it and the photographer would not cast a shadow onto the excavation. Each of the three excavated units was photographed in this manner (Figures 15 to 22).

Once photographed, each unit was mapped using a total station. Pits and posthole outlines were etched with the point of a trowel, and these outlines were plotted with the surveying instrument. Unit plots were constructed later on the computer using CAD software (Figures 23, 24, and 25).

Before backfilling, all reference pins were removed except those marking the units' corners. Backfilling and re-sodding was performed by local prison laborers under the close supervision of Andy Greene of the Town Creek staff.

Processing of the digital photographs was done in Photoshop 6.0 and followed a procedure similar to that used to construct the digital photographic mosaic from earlier excavation photos. First, a blank image file measuring 4000x4000 pixels was created. Next, a black box (with a line width of 3 pixels) measuring 3000x3000 pixels and

Figure 11. Troweling top of subsoil in Squares -200L60 and -200L50 (view to east).

Figure 12. Completing troweling in Squares -200L60 and -200L50 (view to east).

Figure 13. Preparing Sq. -200L40 for photography and mapping (view to north).

Figure 14. Outlining postmold stains in Sq. -200L40 in prior to mapping (view to north).

Figure 15. Color mosaic photograph for Sq. -200L60.

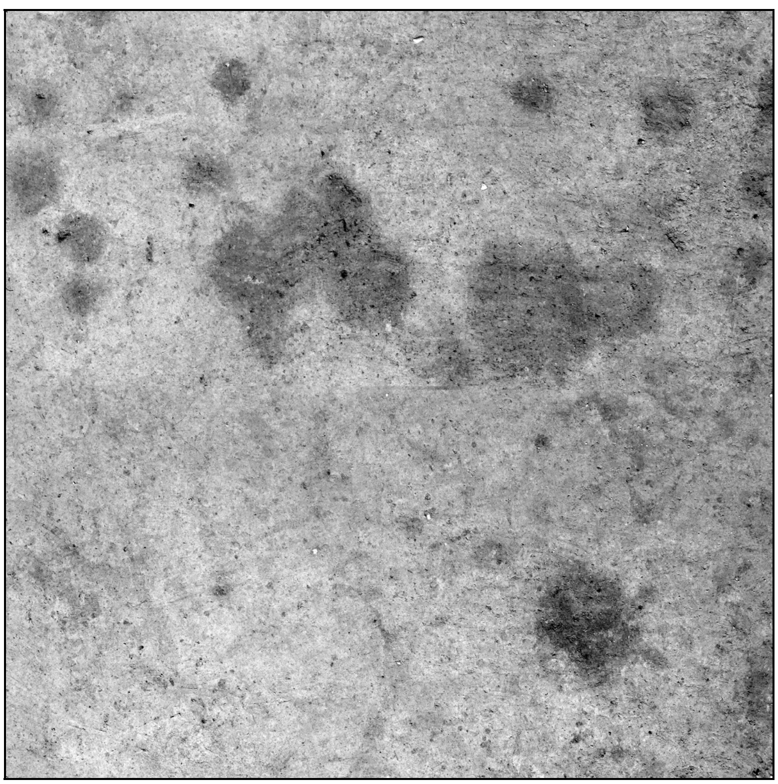

Figure 16. Black-and-white mosaic photograph for Sq. -200L60.

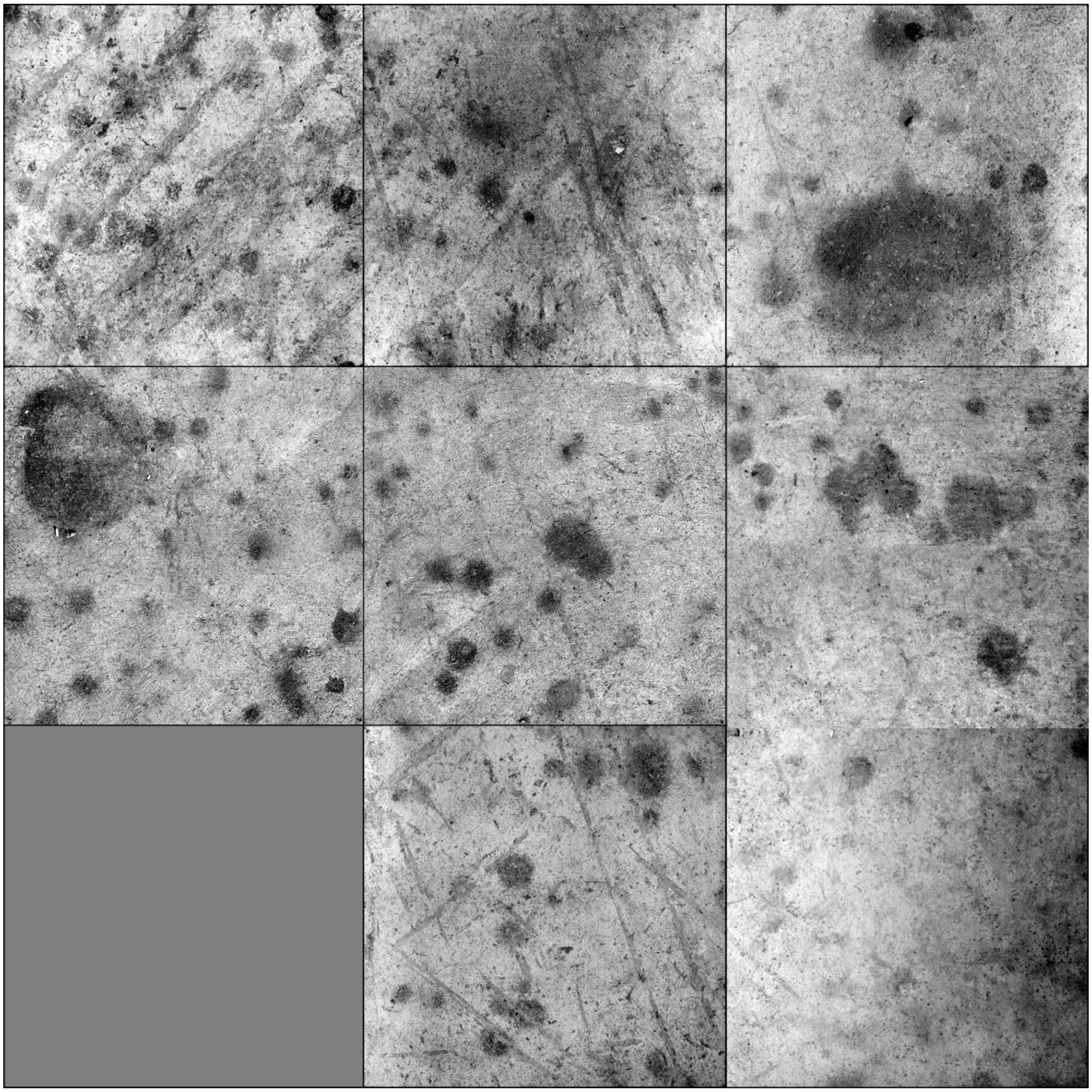

Figure 17. The -210L60 to -180L90 photographic mosaic block. The new photograph for Square -200L60 is at center right. Squares -200L80 and -200L70 (center left and center, respectively) were re-photographed in 2006. The unit at bottom left (in gray) has not yet been re-photographed.

Figure 18. Color mosaic photograph for Sq. -200L50.

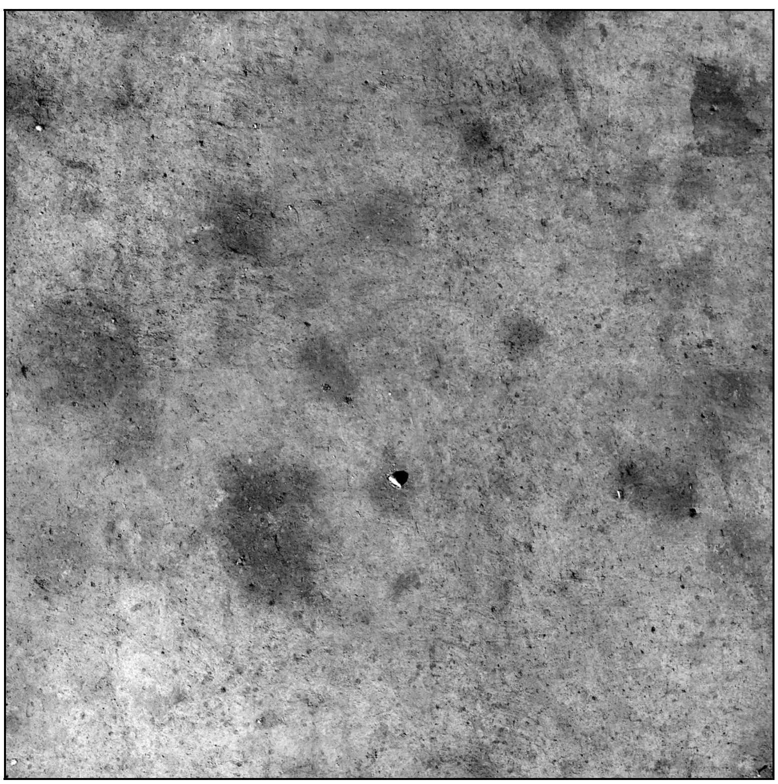

Figure 19. Black-and-white mosaic photograph for Sq. -200L50.

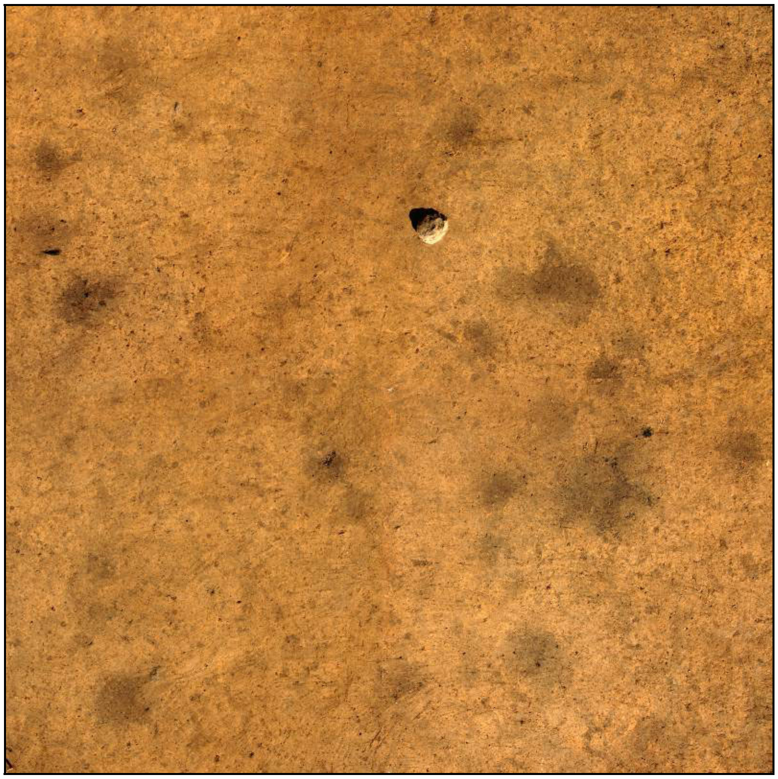

Figure 20. Color mosaic photograph for Sq. -200L40.

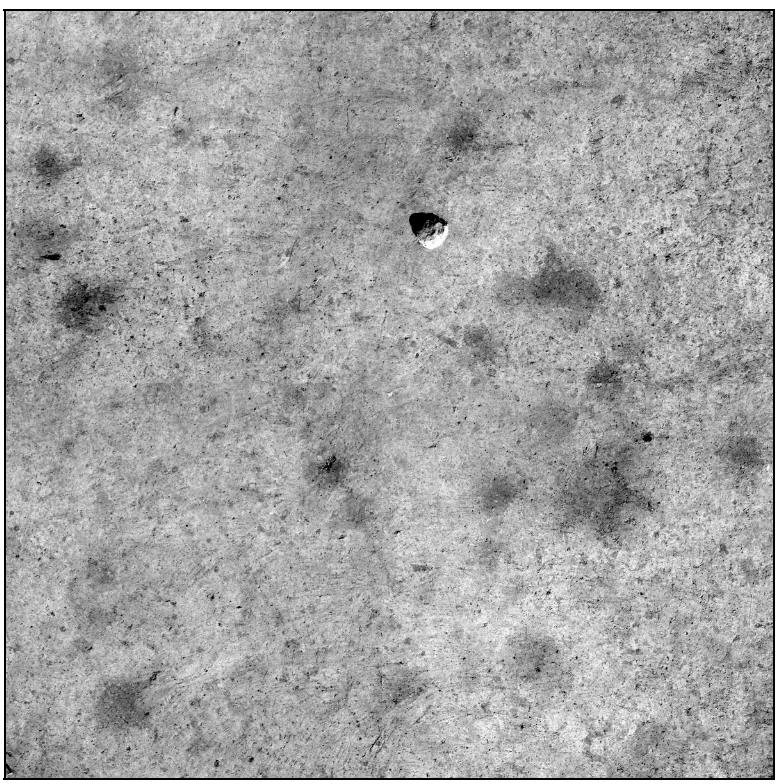

Figure 21. Black-and-white mosaic photograph for Sq. -200L40.

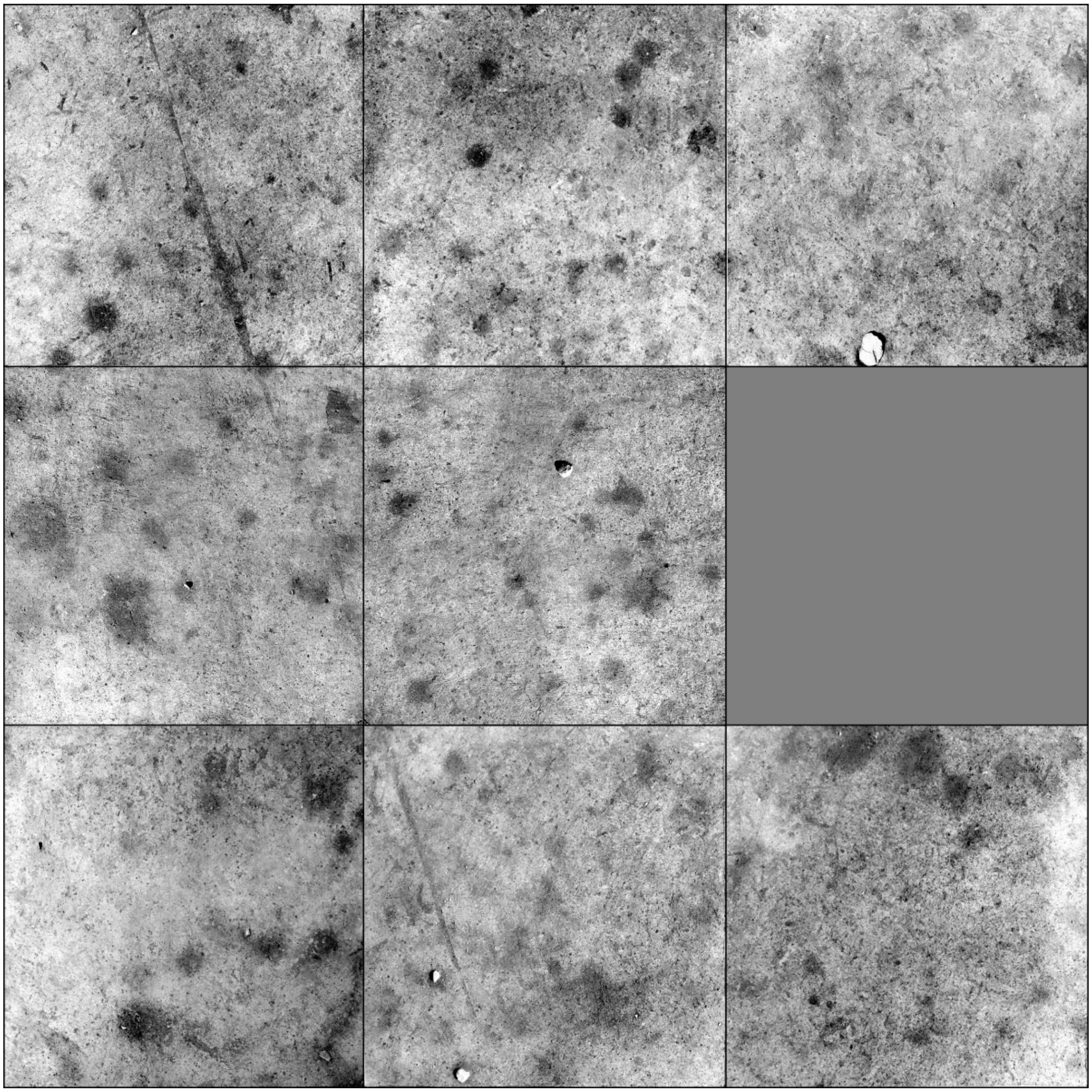

Figure 22. The -210L30 to -180L60 photographic mosaic block. The new photographs for Squares -200L50 and -200L40 are at center left and center, respectively. The unit at center right (in gray) has not yet been re-photographed.

Figure 23. Mapping pit and postmold outlines using a total station (view to south).

Figure 24. Tracing pit and postmold outlines with a prism rod (view to southeast).

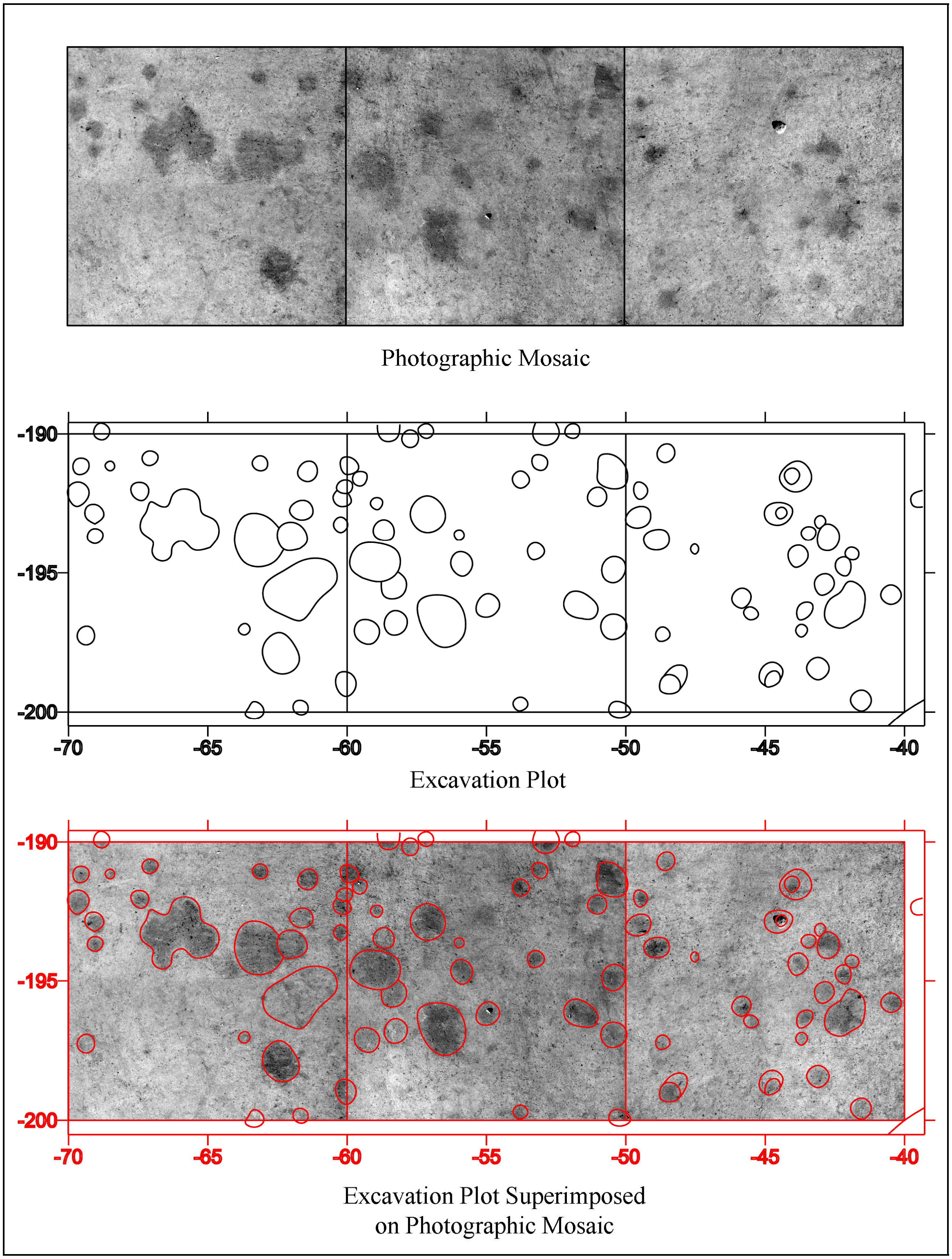

Figure 25. Mapping of Squares -200L60 (left), -200L50 (center), and -200L40 (right) following re-excavation.

representing the edge of an excavation unit was drawn in the center. This box was then divided into four quadrants measuring 1500x1500 pixels each. (This only had to be done once since the same grid file could be used multiple times.) The four quadrant photographs were then added, with each defined as a separate layer. Using the *Edit | Transform | Skew* function, each photograph was properly aligned by matching the registration pins in the photograph to the corners of the appropriate quadrant. Once properly registered, the edges of each quadrant photograph were trimmed. Finally, contrast and brightness were adjusted for each photograph until the four adjacent quadrants appeared as a single image. At this point, and after saving the file in Photoshop's proprietary format (*.psd) in case later editing was necessary, the image was converted to black-and-white and added to the Town Creek Photographic Mosaic. In each case, the new mosaic photo blended well with the adjacent, existing mosaic photographs (see Figures 19 and 24).

CONCLUSIONS

As with the initial effort in 2006, the 2007 re-excavation project was a success. The 2007 investigations at Town Creek Indian Mound recovered photographic information and artifact samples for three previously excavated 10x10-ft units, following excavation, photographic, and mapping protocols established in 2006. Additional survey using ground penetrating radar, while not part of the original research plan, also promises to add to the growing body of information about the applicability of remote sensing techniques at Town Creek.

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Appendix A

Catalog of Artifacts Recovered During 2007 Investigations at Town Creek

Context N	Description
Square -200L60, Level 1 (Backfill)	
4	Projectile point fragments
1	Worked flake
1	Clay pipe fragment
227	Potsherds (>1/2”)
239	Potsherds (1/4” – 1/2”)
3	Creamware and pearlware sherds
133	Flakes (>1/2”)
1718	Flakes (1/4” – 1/2”)
10	Daub fragments
Square -200L50, Level 1 (Backfill)	
11	Projectile point fragments
3	Cores
1	Pecked stone fragment
2	Clay pipe fragments
1	Glass fragment
258	Potsherds (>1/2”)
115	Potsherds (1/4” – 1/2”)
5	Creamware and pearlware sherds
2	Animal bone
133	Flakes (>1/2”)
882	Flakes (1/4” – 1/2”)
14	Daub fragments
Square -200L40, Level 1 (Backfill)	
7	Projectile point fragments
1	Biface
255	Potsherds (>1/2”)
232	Potsherds (1/4” – 1/2”)
1	Pearlware sherd
9	Animal bone
160	Flakes (>1/2”)
2184	Flakes (1/4” – 1/2”)
20	Daub fragments

Appendix B

Ground Penetrating Radar Investigations at Town Creek Indian Mound State Historic Site, Montgomery County, North Carolina

by
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New South Associates
Greensboro, North Carolina 27401
November, 2007

INTRODUCTION

On October 13, 2007 New South Associates conducted a limited ground penetrating radar (GPR) survey at Town Creek Indian Mound. This work was conducted in conjunction with the 2007 meetings of the North Carolina Archaeological Society under and ARPA permit issued to R. P. Stephen Davis, Jr. of the Research Laboratories of Archaeology (RLA) at the University of North Carolina at Chapel Hill (UNC). Shawn Patch and Jonathan Flood conducted the survey for New South Associates.

The survey area included one 20 x 20 meter grid inside the palisade near the site's southern boundary. This area was previously investigated as part of the multi-year project conducted by the RLA from the 1930s-1980s. One benefit of these investigations was the incorporation of cultural feature data in the site's photo mosaic, which show incredible detail. Because the area was already mapped it served as an excellent test site for assessing the effectiveness of identifying medium-small prehistoric features using remote sensing techniques (in this case, GPR).

Field conditions were ideal; terrain is flat, grassed, and free of surface obstacles. Soil conditions are essentially plowzone and Piedmont clays, which can pose some problems for GPR signal attenuation.

METHODS

GPR is a geophysical method that involves transmission of high frequency radar pulses from a surface antenna into the ground (Conyers 2004:1). Measurements are collected from elapsed time between the pulse transmission and its reflection from buried materials and/or changes in sediments and soils. Collecting reflection profiles in a grid allows a user to construct a three dimensional map of sub-surface features. Although the technique has been around for a few decades, it is only within the last few years, with new developments in unit portability and software, that archaeologists have embraced it on a wider scale.

The premise for using GPR in archaeological applications is really quite simple: we generally want to know if there are buried features that might be of interest on a particular site. Because GPR is a remote sensing technique, it is non-invasive, non-destructive, relatively quick and efficient, and highly accurate when used in appropriate situations. One advantage to GPR is its ability to guide more focused, traditional excavations by targeting and/or eliminating certain areas.

The survey was conducted with a Geophysical Survey Systems, Inc. (GSSI) SIR 3000 control unit with an attached 400mhz antenna (Figure B1). There are several different antenna configurations depending on site-specific conditions, although the 400mhz is commonly used in archaeological applications. Prior to data collection, we pulled the unit randomly over the grid area to help calibrate the settings to local conditions. This method allows the user to get an average set of readings based on subtle changes in the relative dielectric permittivity (Conyers 2004).

The grid corners were marked by the RLA investigators. GPR transects were spaced at 50 centimeter intervals with the antenna pulled in the X direction beginning in the southwest corner.

All data were downloaded from the control unit to a laptop computer for post-processing. GSSI has developed a proprietary program, RADAN, for analyzing and processing data. The first step was to set time zero, which tells the software where in the profile the true ground surface was. This is critical to getting accurate target depth. The second step was to apply high and low pass filters, which essentially remove background noise above and below the frequencies of 800mhz and 200mhz, respectively. Essentially this removes horizontal banding that can result from a variety of sources and obscure smaller targets. The third and final step was to “migrate” the data. Migration allows the user to eliminate some of the distortion inherent in all reflection profiles and generate a more realistic view of the size, depth, and orientation of specific targets.

Figure B1. Jonathan Flood pulling the GPR unit.

With the data processing complete, it was then possible to examine the grid in a three dimensional viewer within RADAN. It is possible to rotate the grid, which appears as a block, in any direction; it can be viewed from above, in perspective, or from the *X* and *Y* axes. This is an exploratory technique and provides an overview of specific targets and possible patterning.

The next step involved "slicing" the data horizontally at specific depths. For example, a depth value can be entered (e.g., 20cm), then exported as a CSV file. The result is a depth "slice" of the entire grid at that point. In this case the thickness of the slice was approximately 16 centimeters, a default value selected by RADAN. The data from this grid were sliced at regular 10 centimeter intervals to produce a systematic map of the sub-surface. Not all of these were used in the final graphics because many were redundant or did not show specific targets.

Once the slices were complete, they were then imported to SURFER for color enhancement and easier manipulation. A grid file was then created for each CSV export using the "Inverse Square to a Power" method (Conyers). Kriging can also be used. The differences between the two gridding techniques are largely due to resolution and amplitude of specific targets. Inverse Square is visually more appealing, with higher resolution, but it tends to flatten or hide the peak amplitudes. Kriging is sometimes better at target identification but can appear pixilated and rough.

RESULTS

Figure B2 shows multiple color enhanced amplitude slice maps of the GPR grid (10, 30, 50, and 70 centimeters below surface). The color scale on the right shows high amplitude/reflectivity targets as red, pink, and white values. These are areas of high electrical contrast and are typically interpreted as individual targets or areas of interest. Colors near the blue values represent areas of no reflection and low contrast where the radar energy continued to propagate. To maximize interpretive value, no specific targets have been labeled on the slice maps, although they are discussed in the following text. These images were then compared to the photo mosaic and associated drawing of the remote sensing block taken from Davis' (2006) report (Figures B3 and B4).

Very few reflections are visible in the slices at 10 centimeters, which is not surprising because of the plowzone. At 30 centimeters there are two large areas with strong reflections (high amplitudes), but they are amorphous and do not correspond well with known features from the photo mosaic. These areas are probably related to horizontal changes in sub-surface stratigraphy. There are also several small targets that are almost certainly cultural, but they have lower reflectivity than expected and are difficult to pick out. Numerous large targets are visible beginning at approximately 50 centimeters, which appear to be patterned and correspond fairly well to some of the larger features from the excavated blocks.

Figure B5 shows the horizontal banding of sub-surface stratigraphy that is visible in the amplitude slice maps. These could be the result of either natural or cultural formation processes and may represent trapped water in the clay (Conyers 2004). The extent of these layers makes it more difficult to identify individual targets.

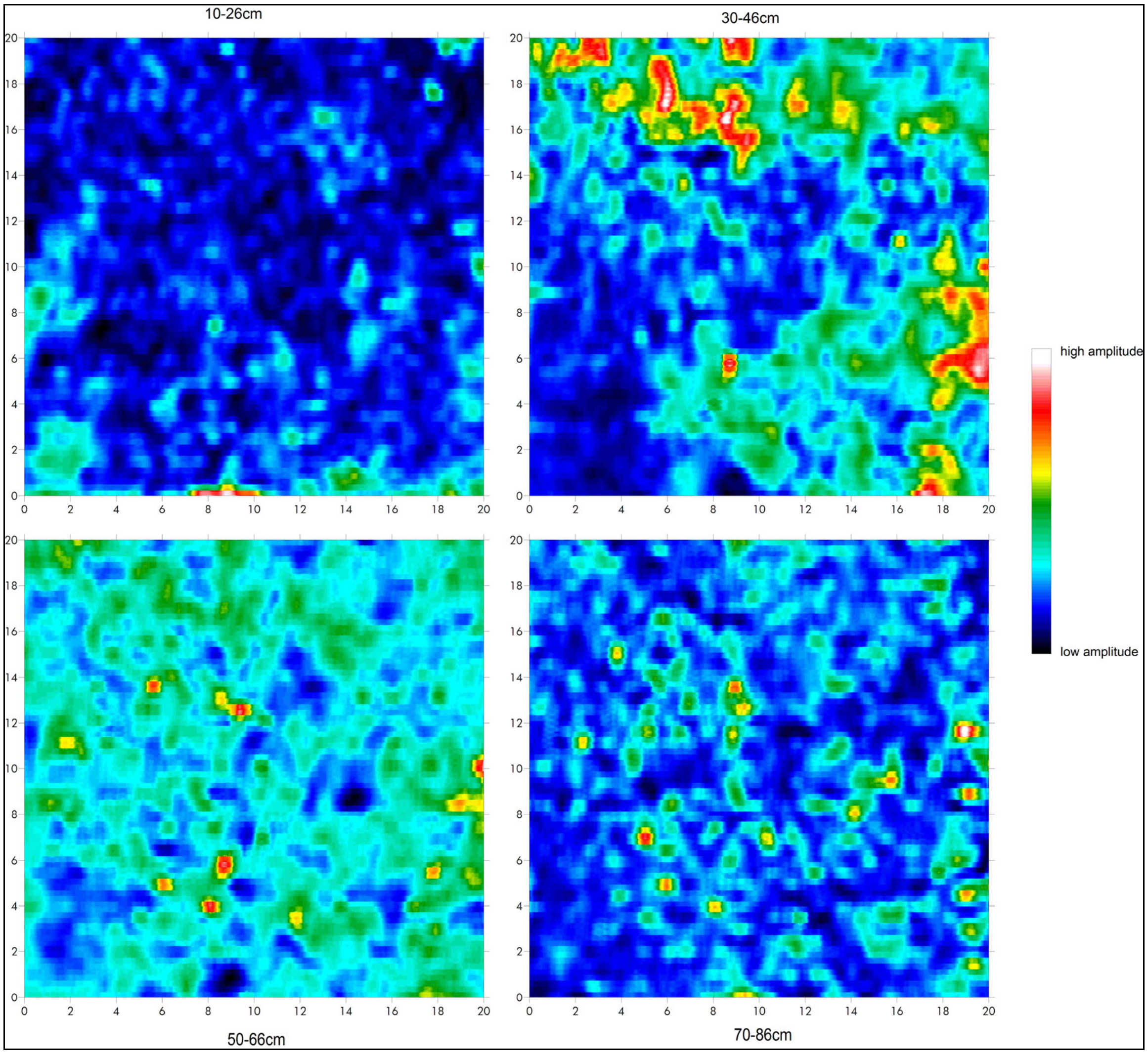

Figure B2. Amplitude slice map of GPR data for the remote sensing block.

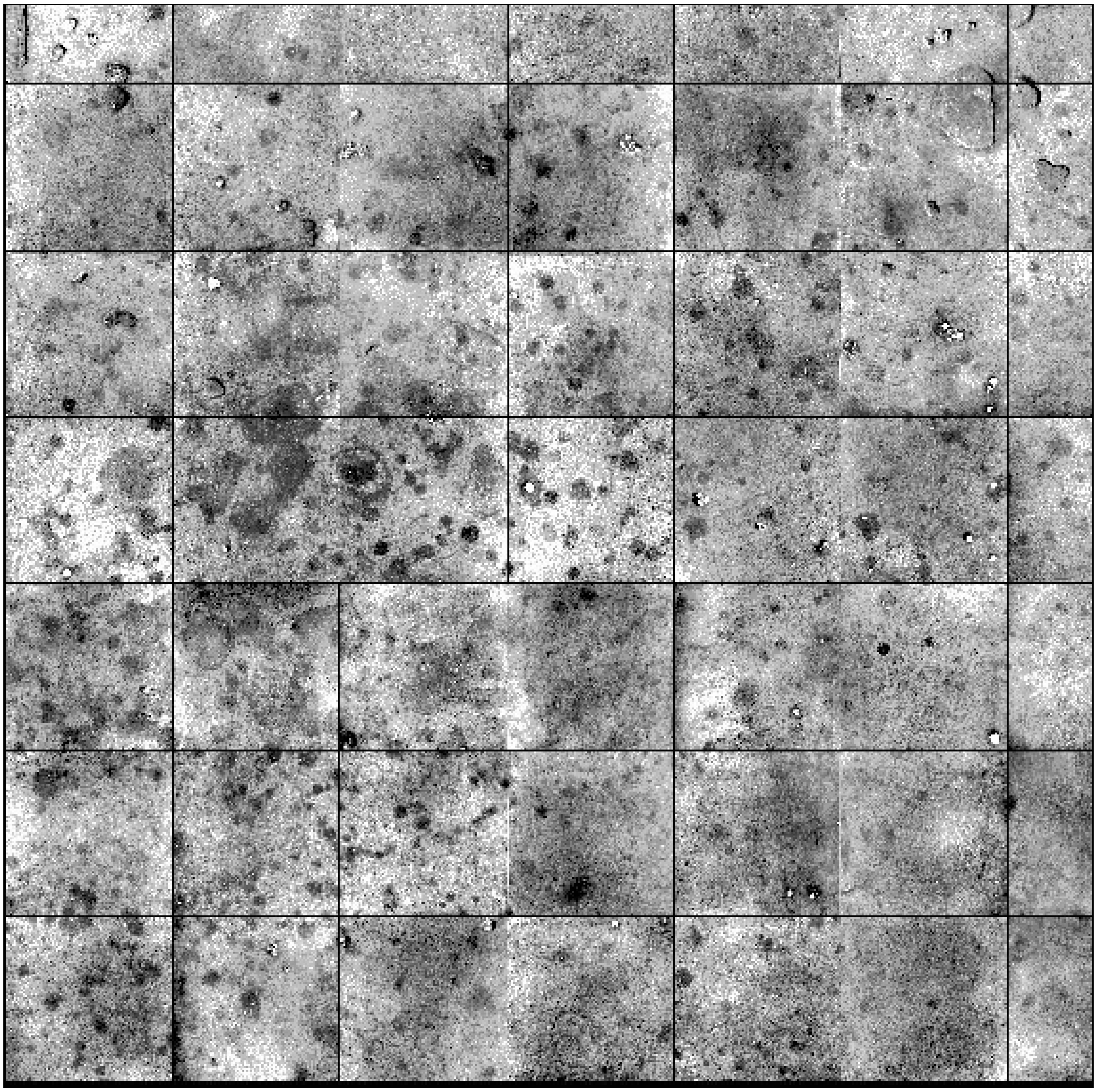

Figure B3. Photo mosaic of the remote sensing block (from Davis 2006).

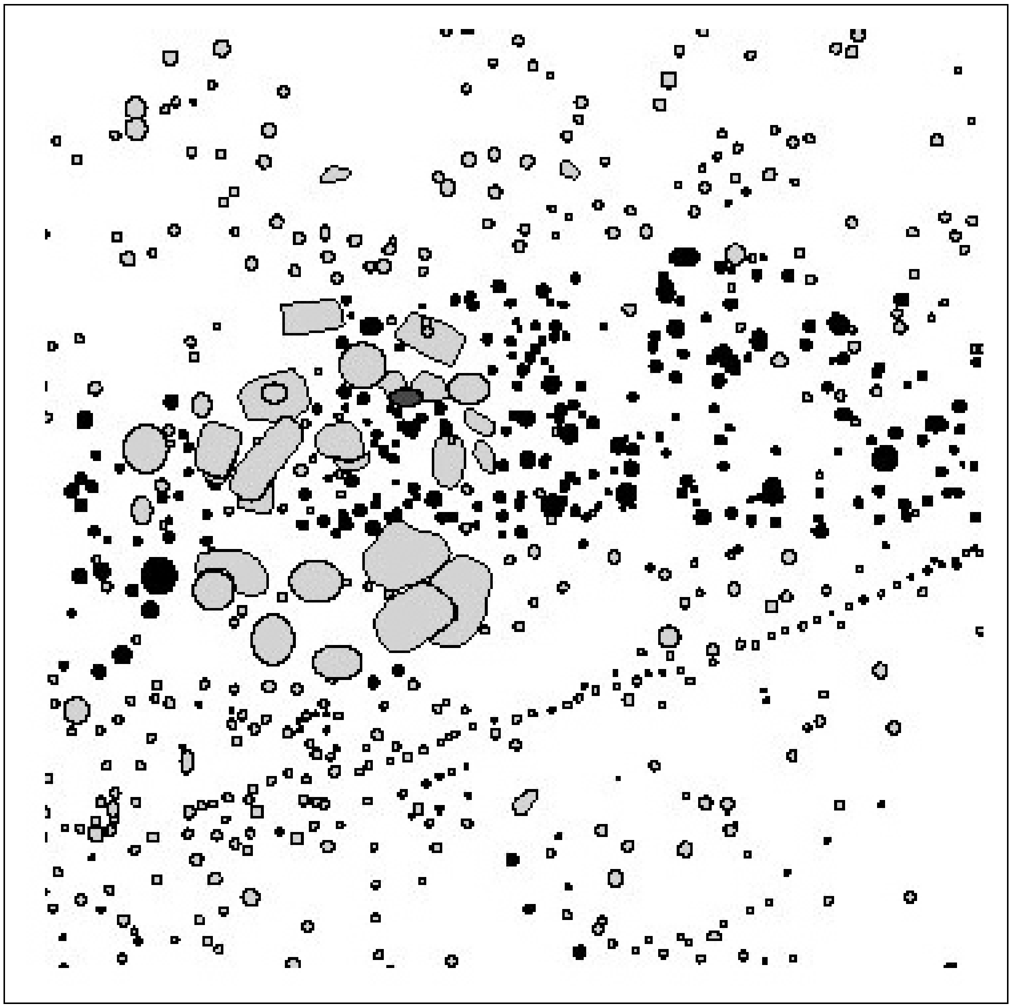

Figure B4. Drawing of individual features from the remote sensing block (from Davis 2006).

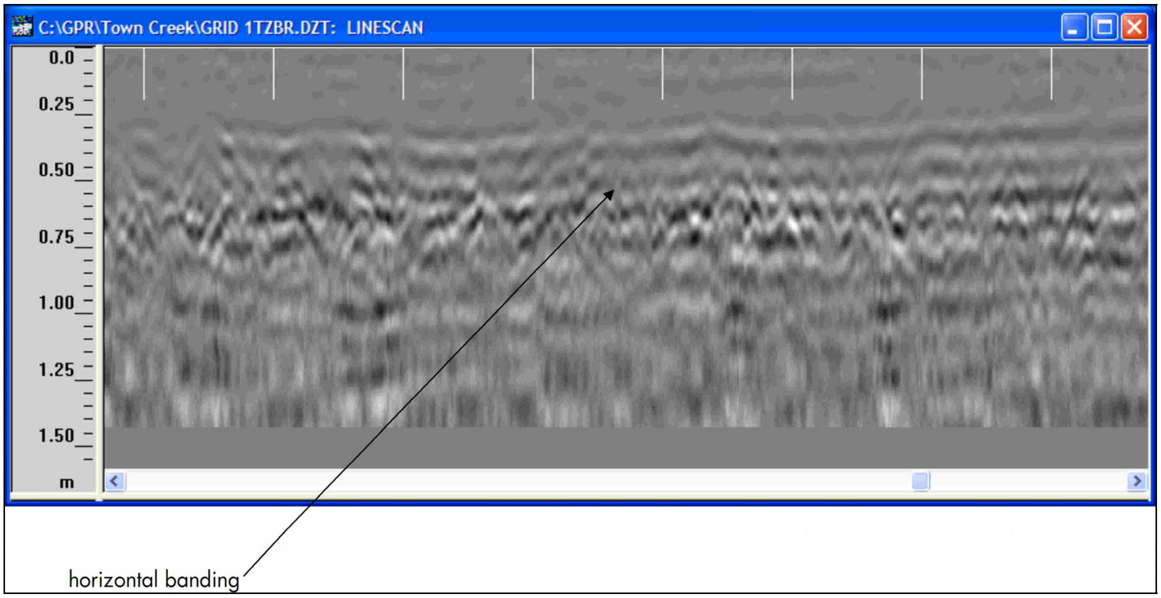

Figure B5. Linescan showing horizontal stratigraphic banding.

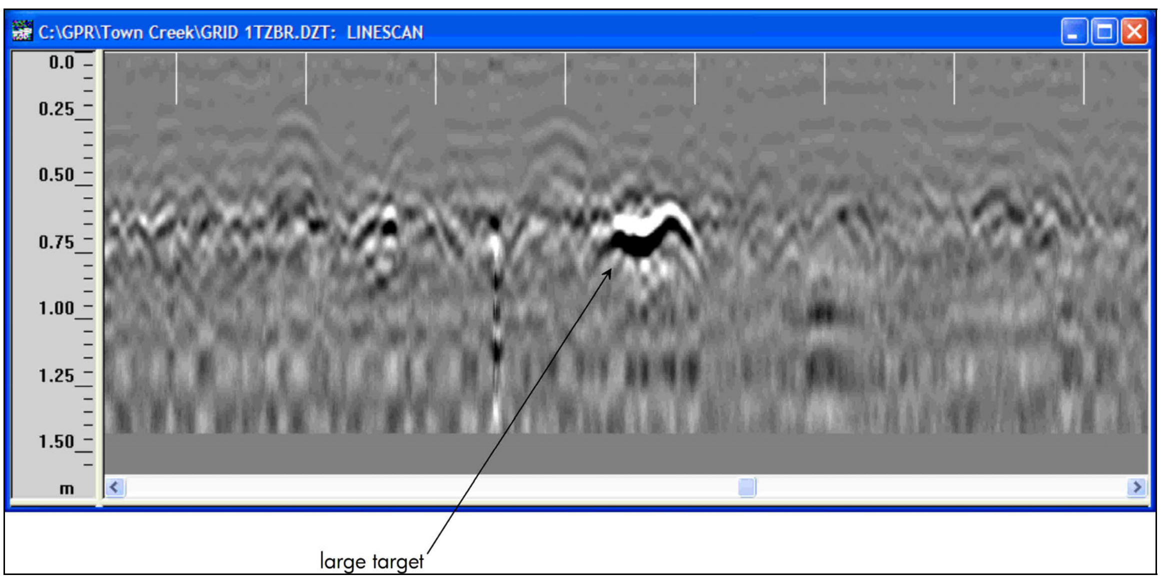

Figure B6. Linescan showing a large point target (non-hyperbola).

Figure B6 is a linescan showing a very strong individual target at approximately 50 centimeters (x=9.3, y=12.5). Typically, GPR targets appear as hyperbolas, which is a characteristic of how radar energy is propagated through soil. However, this target

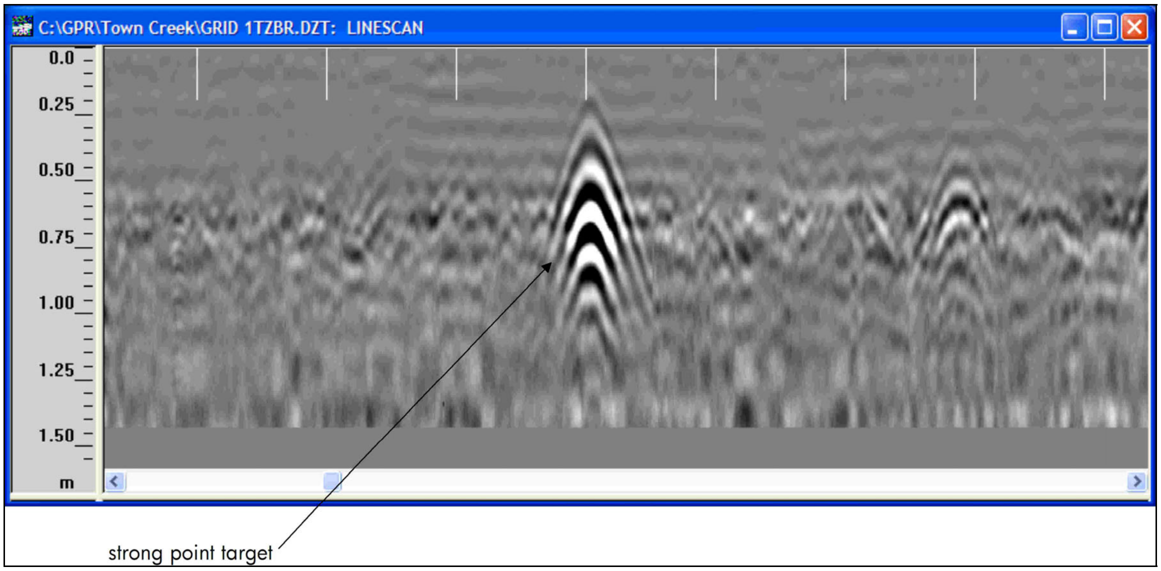

Figure B7. Linescan showing a strong point target.

appears more like a large, flat object with high contrast to the surrounding soil. It could possibly be a burial or large pit.

Figure B7 is a linescan showing a typical GPR target beginning at approximately 25 centimeters (x=8, y=4). It is of high contrast and easily distinguished from the surrounding matrix. Interpreting this anomaly is a bit more difficult. Although not linear, it has the appearance of a buried pipe or large metal object (not a nail) found in other GPR surveys. A prehistoric origin, however, cannot be ruled out.

This particular survey was not as effective as expected for identifying small, shallow prehistoric features. A number of factors contributed to the results. First, the antenna configuration (400mhz) was not the best choice for resolving the known features. Energy propagation from this antenna does not expand substantially until approximately 20 centimeters, meaning its ability to resolve anything shallower than that depth is severely limited. Future work with a GPR at this site should employ a 900mhz antenna, which has a much better chance of resolving small targets. Second, many of the features, in addition to being small, are "low contrast"; that is, there is little difference in the RDP values between feature fill and the surrounding matrix. This category would include posts and shallow basins. Despite being clearly visible with the plowzone removed, their electrical properties make them virtually indistinguishable. However, several of the larger, deeper features were identified and may represent pits, hearths, or burials.

Remote sensing is a viable technique for feature identification (Johnson 2006). However, its success on sites with small, shallow, and densely packed features (such as Town Creek) will depend on a variety of factors. First, multiple instruments should be used because they are complementary and tend to identify different types of anomalies. Second, a great deal of consideration should be given to the nature of the features themselves, including their size, depth, and contrast with the surrounding matrix. No single geophysical technique will identify all features. Third, sampling density and transect intervals should be designed to collect sufficient data to identify expected features. Finally, remote sensing methods, when used properly, can help guide more detailed, traditional, and expensive investigations if they are incorporated into a research design.

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