Final Report

Phase III Archaeological Investigations at the Leetsdale Site (36AL480) Area 3–South, Leetsdale, Pennsylvania

Written by

David A. Anderson, Ph.D., Paula Bienenfeld, Ph.D., Elizabeth Fauber, Jonathan Glenn, M.A., Hope Leininger, and Timothy McAndrews, Ph.D.

With contributions from

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ABSTRACT

Phase III archaeological data recovery excavations and analyses were conducted for Area 3-South of Site 36AL480 (the Leetsdale Site), located in Leetsdale, Allegheny County, Pennsylvania. The project was undertaken on behalf of the US Army Corps of Engineers, Pittsburgh District, in partial fulfillment of requirements set forth in section 106 of the National Historic Preservation Act of 1966 as amended, and a 1992 Programmatic Agreement in place for the Locks and Dams 2, 3, and 4 Monongahela River Project. Fieldwork took place between June 2001 and December 2001 and was carried out under the supervision of government and contractor principal investigators and representatives from the project geomorphology team.

Site 36AL480 is a stratified multicomponent site. The Area 3-South excavation block was 200 square meters (2,153 square feet) in size and focused on prehistoric components. Excavations were conducted primarily by hand with mechanical support in removing historic overburden, safety-related stepping/set-backs, layers of culturally sterile sediments, and deep testing. Hand excavations extended to a maximum depth of approximately 6 meters (20 feet) below modern ground surface, with mechanical excavations and deep testing continuing to a depth of approximately 8.5 meters (28 feet) below ground surface. Nine of the excavated archaeological strata produced cultural materials including the uppermost historic fill and remnant Ap horizons that contained mixed prehistoric, historic, and modern artifacts, and the lowest stratum (8AC horizon) where a single flake was recovered during mechanical deep testing at a depth of 8 meters below modern ground surface. Given the depth and use of mechanical equipment, however, this flake may have been introduced to that depth by the excavations.

Area 3-South consists of remains dating from the Terminal Middle Archaic/Early Late Archaic Period through the Early Woodland Period, with some scant evidence for the Middle Woodland Period. This conclusion is based on geoarchaeological studies, radiocarbon (^{14}C) dating results, and analysis of diagnostic pottery and projectile point/knives. Six geological soil horizons were identified: the AB horizon, affiliated with the Early Woodland Period, the 2BC horizon, affiliated with the Terminal Late Archaic Period, the 3Ab1 horizon, affiliated with the Later, Late Archaic (1) Period, the 3Ab2 horizon, affiliated with the Later, Late Archaic (2) Period, the 3BW horizon, affiliated with the Earlier, Late Archaic Period, and the 4BW horizon, affiliated with the Terminal Middle Archaic/Late Archaic.

Laboratory work included artifact analyses, detailed study and documentation of projectile points and ceramics, mass analysis and detailed analyses for the debitage, a use-wear study on selected flakes and tools, a lithic sourcing study, paleobotanical and paleozoological studies, spatial and statistical analyses of artifacts and features, and radiocarbon dating.

Seventy-eight definitively cultural features and 35,359 artifacts were found. Features include hearths, unidentified pits, post molds, and nut processing pits. Charcoal samples from 13 features across five soil horizons were submitted for radiocarbon dating; resulting dates ranged from 1760 ± 60 B.P. (calibrated A.D. 120 to 415, from Feature 243) to 4730 ± 40 B.P. (AMS) (calibrated to 3460 to 3370 B.C. to 3640 to 3490 B.C.; Feature 244). Artifact recovery includes ceramics, flaked stone tools, groundstone/roughstone tools, debitage, small quantities of steatite and other “exotic” lithic material, fire-cracked rock, paleobotanical remains (wood,

nuts, seeds, and other plants), and a small quantity of highly fragmented faunal remains (deer and rabbit were tentatively identified). Diagnostic ceramics include Early Woodland Adena Plain, Half-Moon Cord Marked, Watson Cord-Marked, and McKees Rocks Plain sherds. A single sherd of Middle and Late Woodland period Mahoning Cord-Marked ware was also recovered. Diagnostic projectile point/knife recovery includes Manker Corner-notched, Adena Ovate, Forest Notched, Merom-Trimble, Genesee, Lehigh Broad, Steubenville Lanceolate, Bottleneck, and Brewerton Side-notched types. The majority of lithic material recovered was Onondaga chert, primarily derived from cobble cores. Groundstone tools include net weights, nutting stones, hammerstones, and anvils. Floral remains include a broad range of woods; walnut, hickory, butternut, hazelnut, and acorn shell and meat; and seeds associated with the Eastern Woodland agricultural complex—goosefoot (*Chenopodium spp.*) and erect knotweed (*Polygonum erectum*).

The arrangement and utilization of Area 3-South somewhat fluctuates by horizon; however, overall the site appears to have been consistently used by small groups for medium to short term visits involving stone tool manufacture and the processing of nut and plant remains. The artifact data and feature types seemingly show a continuum of similar activities and lithic reduction strategies across the temporal periods.

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A. INTRODUCTION

Project Overview

This document serves as a report on Phase III data recovery investigation of Site 36AL480, Area 3-South (Area 3-South), located in Leetsdale, Allegheny County, Pennsylvania. This work was conducted on behalf of the Pittsburgh District, U.S. Army Corps of Engineers (District) under contract number GS-10F-0268K by Tetra Tech, Inc. (Tetra Tech), Michael Baker Jr. Inc. (Baker), GAI Consultants, Inc. (GAI), and a team of additional subcontractors and consultants. The project partially fulfilled requirements set forth in Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and a 1992 Programmatic Agreement in place for the District's Locks and Dams 2, 3, and 4, Monongahela River Project (Lower Mon Project).

Site 36AL480 was determined eligible for the National Register of Historic Places (NRHP) and the current Phase III study (along with other investigations) serves to mitigate the adverse effects to the site resulting from construction of the new dam segments at the Leetsdale Casting Facility. The site was determined to be NRHP eligible at a meeting between the Pennsylvania Historical and Museum Commission (PHMC) and the District that took place in 2000; however, no formal letter was written regarding eligibility (Fenicle 2003). Construction took place during the Area 3-South data recovery project, but outside of the area reserved for archaeological investigations. At the conclusion of Lower Mon Project construction and archaeological work, the site reverted back to industrial use.

Site 36AL480 is a 12-acre archaeological site located approximately 15 miles downstream of Pittsburgh on the east bank of the Ohio River in the Leetsdale Industrial Park (Figures 8.1 and 8.2). It is situated approximately 168 meters (m) (550 feet [ft]) from the current river channel and 70 m (230 ft) from the relic river channel. It runs lengthwise along the approximate center line of a T_3 terrace.

The subject of this document is data recovery work that occurred at Area 3-South, a component to the overall 12-acre 36AL480 site. Other portions of the site include Area 1, Area 2, and the Casting Basin—all discussed in other chapters of the overall data recovery report for 36AL480. The Area 3-South excavation block was 200 square meters (2,153 square feet) in size and was located in the southern portion of Site 36AL480 as originally identified by Christine Davis Consultants (Fenicle 2003). At the start of excavations, Area 3-South was enclosed by a chain-link fence and overgrown with weeds (Figure 8.3). In this portion of the site, the archaeological deposits were capped by an undulating surface layer of industrially-deposited and disturbed soils (Figure 8.4).

Fieldwork for the Area 3-South data recovery was conducted between June and December 2001. Associated laboratory work and analyses began in June 2001 and continued through 2009. The District provided Ms. Lori Frye, who served as Government Principal Investigator (GPI); a Scope of Work based on the District's Effect Report and Recommended Data Recovery Plan, Site 36AL480, Leetsdale, Allegheny County, Pennsylvania (2000) (DRP); a prehistoric context study (prepared by Gray and Pape Inc.,

under subcontract to David Miller and Associates, Inc.); and geomorphological support (Dr. Joseph Schuldenrein of Geoarcheology Research Associates and Dr. Frank Vento of Clarion University of Pennsylvania).

Upon project completion, the archive including field notes, artifacts, photographic documentation and other project records will be transferred to the PHMC facility for long term curation.

Contractor contributions include Dr. David A. Anderson who served as the project Principal Investigator (PI). Dr. Paula Bienenfeld directed lithic analyses. Dr. William Johnson examined the projectile point/knives (pp/k). Dr. Thomas W. Neumann conducted lithic microwear studies. Mr. Michael Kagelmacher completed the lithic material sourcing studies. Dr. William Johnson analyzed the ceramics. Faunal materials were analyzed by Dr. Lucretia Kelly. Ms. Sissel Johannessen analyzed the paleobotanical remains. Dr. Timothy McAndrews completed spatial analyses. Dr. Margaret Neumann completed residue analyses on selected artifacts. Dr. John Jones of the Pollen Laboratory at Texas A&M University, Department of Anthropology, completed pollen studies for the site as part of the geomorphological investigation (Schuldenrein et al. 2003). Mr. Michael Morton of Tetra Tech served as Project Engineer. The Independent Technical Review was completed by Lawrence Abbott, Jr. and Eric Dohner.

A list of field and laboratory personnel is provided in Appendix A. Appendix B provides a list of site volunteers. The resumes of key personnel are provided in Appendix C. The Independent Technical Review is provided as Appendix D.

Research Goals

Excavations at Area 3-South were conducted with the intent of addressing specific research questions developed by the District (U.S. Army Corps of Engineers, Pittsburgh District 2000). Obtaining data useful in answering these research questions was the focus of the excavations and subsequent analyses identified in the Scope of Work (SOW) (Appendix E). Research goals involve five themes—site settlement patterns, subsistence and seasonality studies, cultural chronology, artifact assemblage and lithic technology, and environmental context. Each is briefly discussed below.

Site Settlement Patterns

Prior to excavation, it was expected that identification of intrasite and intersite settlement patterns could address internal site arrangement, as well as the patterning of relationships between sites. It was proposed that an understanding of the distribution of sites across the landscape and their functional relationships would be a focus for intersite settlement patterns and that determining the function of the occupations represented would be important for understanding the components of the settlement systems.

Subsistence and Seasonality Studies

The DRP recognized that undisturbed occupations may yield important subsistence data and that flotation of samples from features might recover plant and other food remains, thereby allowing conclusions to be made regarding paleo-diet, seasonality, and site activities.

The DRP stated that discussing the types of food resources in the context of the local environment would add to the information gained from this site and that recovery of subsistence remains would permit comparisons with other similar sites in the Appalachian Plateau Province and Upper Ohio Valley.

Cultural Chronology

The DRP proposed that reconstructing the site chronology would provide critical baseline data for the area, as many other studies are dependent on the identification of temporal relationships. Chronological information is needed in order to produce site-specific reconstructions and to make appropriate regional (Upper Ohio Valley and Appalachian Physiographic Province) site comparisons. It is important to determine what time periods are represented at the site, particularly within each occupation layer. Mixing of occupations is problematic where the living surface was stable for longer periods of time. Single occupation surfaces enable researchers to eliminate much of the noise/confusion and focus the research more effectively. Such narrowly defined date ranges for occupation layers may be critical in order to identify subtle diachronic changes in Archaic Period site usage. Site chronology is also important when discussing these occupations in terms of environmental variables.

Artifact Assemblages and Lithic Technologies

Typically, lithics represent the vast majority of the archaeological material recovered from prehistoric sites. At this site, it was suggested in the DRP that lithic analysis could contribute to the understanding of technology, group mobility, and activities at the site. Differences between lithic assemblages from the different occupation layers were suggested to have the potential to shed light on site usage and lithic reduction strategies through much of the Holocene.

Environmental Context

According to the DRP, to date, there has not been an in-depth study of the environmental and depositional history of the Upper Ohio River Valley in an archaeological context. Understanding the environmental and depositional histories of the Upper Ohio River Valley is important for interpretation of cultural change in the region. A major focus of the overall site data recovery effort was to involve environmental reconstruction of the site vicinity during the Archaic Period. It was proposed in the DRP that the study could also help predict the potential location and depth of archaeological sites. Lines of evidence included understanding the range of resources available to the prehistoric inhabitants and how the availability of these resources changed during the Holocene. The DRP also suggested that the environmental reconstruction of Area 3-South could have the potential to serve as a reference site for future archaeological studies, and that it would be important to compare the information gained from data recovery activities associated with the excavation of Area 3-South with the information available from other site excavations within various regions (southwestern Pennsylvania, Upper Ohio Valley, Appalachian Plateau, Pennsylvania, and Eastern United States). Much of the depositional processes of the T_3 terrace landform on which Area 3-South is located had already been examined but needed to be refined during the data recovery fieldwork.

Report Organization and Format

This report is organized into five sections and formatted consistently with District-provided guidance. Chapter 8 is the full report on Area-3 South data recovery works and is divided into five main sections as follows:

Section A. Introduction

This section presents a project overview, including a research theme summary, and outlines the report contents and organization.

Section B. Methods

The methods section describes methods and techniques used to conduct the field and laboratory studies. The Field Methods section includes a discussion of the District's SOW, specific techniques used to excavate the site, record data, and manage the assemblage and project archive. Detailed information on how excavations proceeded for each soil horizon is provided, as is a discussion of where actual excavations and field requirements differed from SOW requirements or the Technical Proposal (Appendix 8F). The Laboratory Methods section includes a description of how material remains were processed and analyzed. Methods for lithic (tools and debitage, sourcing, use-wear, and refit), ceramic, faunal, floral, and spatial analyses, and radiocarbon dating are presented.

Section C. Results

The results section is divided into three main parts.

- Site Stratigraphy and Chronology presents a discussion of observed soil horizons from both archaeological and geomorphological perspectives, and the associated diagnostic artifacts and radiocarbon dates. It establishes the framework for the discussion of results by soil horizon also included in the Results Section.

- Overview of Artifact Recovery and Features characterizes the overall site and summarizes artifact recovery by type and stratum. A similar discussion of features is included. It is designed to provide the reader with an overall generalized picture of the project and results.

- Results by Soil Horizon is broken into the stratigraphic packages outlined in Site Stratigraphy and Chronology—Ap, AB. 2BC, 3Ab1, 3Ab2, 3Bw, 4Bw, 5Bw, 5BC, 6AC, 6BC, 7AC, 7CB, 8AC. For each of these horizons, the overall results are summarized. The summary is then followed by a detailed discussion of artifacts (flaked stone tools, debitage, ground and pecked stone tools, other stone, fire-cracked rock, ceramics, faunal, and floral remains). Feature information is then provided. Finally the spatial analyses study and results are presented. Text for each horizon is supported by data summary tables, figures (Appendix 8G), and appendices.

Section D. Discussion

This is the interpretive section of the report and links the results to the research questions posed in the DRP and summarized in Section A. Section D is broken into separate discussions on inter and intrasite settlement patterns; subsistence and seasonality practices; cultural chronology; artifacts and lithic technologies; and environmental context and reconstruction subsections.

Section E. Summary and Conclusions

This section presents summary information organized by cultural affiliation.

The main body of the report is followed by a Bibliography consisting of a list of references cited.

This report includes Appendices as follows:

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B. METHODOLOGY

Specific field and laboratory methods were identified and used during the Area 3-South Phase III data recovery project. The overall goal was to efficiently, safely, and responsibly collect and analyze data responsive to research objectives outlined in the District's DRP. The excavation approach and basic field and laboratory requirements are outlined in the District's SOW provided as Appendix 8E. The Technical Proposal for Area 3-South data recovery work presenting a plan conforming to the District's approach and requirements is Appendix 8F to this report.

Area 3-South excavations revealed stratigraphy, cultural horizons, artifacts, and features more complex and diverse than envisaged in the SOW or Technical Proposal. In order to maintain compliance with the overall project goals, flexibility was required. There were some deviations from the SOW during field excavations, and in fact the scope increased repeatedly. All excavations and modifications to approach and methods were carried out

under the supervision and direction of the PI and GPI, in consultation with other contractor and District representatives.

The Methodology section is subdivided into Field and Laboratory Methods. Each part provides a framework of methods and techniques used to collect and analyze data associated with the archaeological deposits at Area 3-South.

Field Methods

The Field Methods section of the report is divided into three parts. First, fieldwork requirements and excavation approach as outlined in the District's SOW are summarized. This is followed by a summary of field techniques employed during data recovery excavations. These are also discussed in detail in Volume 1 of the Technical Proposal for the project which is included as Appendix 8F. Field techniques used in the data recovery fieldwork were consistent with those presented in the proposal. This is followed by a discussion of actual data recovery excavations by depth and soil horizon. Cases where methods used in the field differed from envisaged in the SOW are indicated in this part of the document.

Scope of Work Fieldwork Requirements and Excavation Approach

The SOW prepared by the District is included as Appendix 8E. Six "Tasks" were identified and are summarized below.

Task 1: Establish a 5-meter (m) interval grid across the project area using hubs placed in the area by District surveyors.

Task 2: Excavate shovel test pits (STPs) across the project area at 5-m intervals to test the depth of fill and/or disturbed soils across the project area and to check for the presence of prehistoric artifacts.

Task 3: Using data obtained during Task 2, use mechanical equipment to remove the historic fill and disturbed soils and/or natural layers found during STP excavation to contain no prehistoric materials. Conduct archaeological monitoring during stripping.

Task 4: Reestablish the Task 1 grid over the stripped surface to create a 200 m^2 excavation block. Excavate approximately 14 1-m^2 control units to a depth of 1 m within the excavation block at 5-m intervals. Excavate the 1 m^2 control units in arbitrary 10-centimeter (cm) levels within natural strata. The purpose of control unit excavation was to assess project area stratigraphy, and the nature and depth of any cultural deposits present. In addition, a 2-m^2 block was to be excavated in 5-cm levels. This unit was to serve as a control for spatial analysis studies. Further, constant volume samples were to be taken from each 5-cm level within the 2-m^2 block.

Excavate and document any features identified during this process as separate entities with feature numbering to start at 100. Take flotation samples and samples for radiocarbon dating from each feature when possible.

All excavations were to be documented through notes, drawings, and photography.

Task 5: Use data obtained in Task 4 excavations to identify the vertical and horizontal locations of cultural horizons in the project area.

Excavate east-west oriented trenches at 5-m intervals to the top of the first cultural horizon and create at least one profile drawing with the project geomorphologist. Trenches were expected to involve 32 square meters of units requiring 100 percent hand removal. It was expected that 40 percent of this would be screened.

Excavate the remainder of the block to the top of the first cultural level. Mechanical excavations were approved for soils lying greater than 12 cm from archaeological deposits. Hand removal was required for other soils. Only those soils immediately above, containing, and immediately below cultural horizons were to be screened.

Excavate, with screening, the uppermost cultural horizon identified as a result of Task 4 excavations and exposed via Task 5.

Repeat Task 5 until the block reaches a depth of 1 m.

It was expected that Task 5 excavation would involve 150 square meters of excavations, 20 percent of which would be removed mechanically and the remaining 80 percent to be removed by hand. Screening was anticipated for two cultural horizons, each 20-cm thick or 40 percent of the 150 square meters. The other 40 percent was to be removed by hand and not screened.

Task 6. Use mechanical equipment to step back the excavation block in compliance with government safety requirements for deep excavations. Then using the same grid, repeat the process outlined in Task 4 by starting with the excavation of approximately 10 additional control units to an additional 1 m in depth (bringing the archaeological excavations to a maximum depth of 2 m below the stripped surface).

Data Recovery Field Techniques

Field methods were developed in order to recover the maximum amount of information in a scientifically responsible manner within budget and time constraints. In order to accomplish this task, a combination of mechanical and manual excavation techniques was employed.

Mechanical Excavations

Mechanical equipment was used for four tasks at Area 3-South: initial site preparation, removal of non-cultural deposits from the excavation block, stepping of the excavation block for conformance with project safety requirements, and deep testing where hand testing was not possible due to safety constraints. Additionally, spoil management was supported by heavy equipment at times.

The historic period overburden fill was removed using mechanical excavation equipment consisting of a track excavator with a smooth-edged bucket, a front-end loader, and a bulldozer. All removal of the fill was monitored by archaeological staff, with mechanical removal being halted within 5 cm to 10 cm of the underlying deposits. The upper 0.61 m of the fill deposits was previously determined to have a potential for lead contamination and was removed to a specially-designated spoils area, which was underlain and covered by geomembrane to prevent the migration of contaminated materials. The remaining spoil was stockpiled with later hand-excavated soils.

Mechanical excavation was also employed throughout the project to remove bulk soil packages that were determined to be culturally sterile, or contain minimal cultural remains after sampling. When such methods were to be employed, a 3-inch (in.) bucket auger was used to auger holes at known locations both within and outside of the excavation block. These holes were augered to a depth equal to that which was to be mechanically removed and then the bottom 10 cm was filled with clean powdered lime. This 10 cm of lime provided a visual indication to the machine operator and the archaeologists monitoring the procedure that excavations were approaching the desired depth. From that point onward, depths of removal were monitored by taking elevation readings with the Digital Total Station. Once removal was within 3 cm to 5 cm of the desired depth, mechanical removal was halted, and the remaining deposits were hand removed using flat shovels and wheelbarrows. This system allowed for maintaining very tight vertical control, even during mechanical stripping.

Mechanical equipment was also used to "step back" the excavation area in order to comply with Occupational Safety and Health Administration (OSHA) safe excavation standards (29 CFR 1926, Subpart P). Archaeological monitoring was carried out during step back excavations. Features identified as a result were quickly documented through plan mapping and photography. A sample of features found during mechanical step backs were also excavated and drawn in profile.

Finally, a track excavator was employed to test the deepest deposits overlying the basal gravel.

Hand Excavations

Hand excavations during the data recovery effort in Area 3-South were conducted in a basic excavation unit of 1 square meter (1 m^2) in size identified by unique coordinates at the southwest corner of the unit. Coordinates were based on distance and direction from the District's previously established datum. Various configurations of these 1 m^2 units were utilized for testing, and excavations at different depths are specifically discussed below. In general, 1 m^2 excavation units were hand excavated in arbitrary 10-cm (3.9-in) levels within defined natural strata. Except as noted, all excavated materials were screened through 6.4-millimeter (mm) (0.25-in) hardware cloth to maximize artifact recovery. Hand excavation was accomplished through a combination of flat shovel "skimming" and trowel excavation.

Hand excavations were concentrated in a 200 m^2 block area. Originally, the shape of this was to be rectangular, and aligned with the overall site grid, oriented to true north. However, in order to protect Area 3-South from construction activities prior to the data

recovery effort, a chain-link fence was erected around the area. This fence measured approximately 28 m x 110 m in size with its long axis oriented approximately 35º14'19" west of true north. Because of this orientation relative to the site grid, it was not possible to configure a rectangular excavation block encompassing 200 m^2 while still allowing for sufficient "step back" areas around the block to comply with OSHA regulations. Therefore, an irregular-shaped excavation block was configured that encompassed 200 m^2 while still allowing sufficient distance between the edge of the excavations and the surrounding fence (Figure 8.5).

Feature Excavations

Features encountered during excavation were exposed as fully as possible within the excavation block area. Each feature was then mapped on standard field forms and photographed in plan view. In cases where it was readily apparent that the feature was not cultural in origin, no additional work was conducted. All features of cultural origin or those of indeterminate origin were cross-sectioned, partially excavated, mapped and photographed in profile, and then fully excavated if determined to be of cultural origin. Features of cultural origin were assigned a unique feature number beginning with 151 and running consecutively. The original SOW indicated features were to be numbered from 100, but additional numbers were needed for other excavation areas prior to the initiation of this investigation. A variable percentage of feature fill, depending on the size and nature of the feature, was retained for flotation, and when possible charcoal samples were obtained for radiocarbon assay.

Documentation and Tracking Methods

Recording methods used at Area 3-South were consistent with methods used on similar Phase III data recovery excavations conducted in deeply stratified contexts in the Commonwealth of Pennsylvania. A series of standard field forms was used for recording information on excavation levels, plan and profile mapping, and feature excavation. Central to the field recording system was the use of the F-Number system.

The F-Number system involves assigning an arbitrary, consecutive, unique, F-number to any recognized soil unit or anomaly encountered during excavation. These soil units may be natural or cultural in origin and distinguished by their spatial location (horizontal or vertical), soil texture, color, and/or pedological structure. During the Area 3-South investigation each newly encountered, unique soil unit was assigned the next available F-number. F-numbers were assigned to such soil units as geological soil horizons, natural features, or anthropogenic features or horizons. By historical convention, F-numbers began with F3 as the first assigned number. Assigned numbers were recorded on a central log maintained by the field supervisor responsible for assigning these numbers. This log recorded information pertinent to the definition of soil unit such as soil color, texture, pedological structure, and any other information deemed necessary to allow for a clear definition. The Area 3-South F-Number Log is presented as Appendix 8H to this report.

Using this arbitrary system allowed designations to be assigned to soil units or anomalies without the predetermined definitions of 'stratum' or 'feature.' Such 'stratum' or 'feature' designations were assigned later following excavation or consultation with the project geomorphologists. This system also allowed for easily breaking out and tracking fine

distinctions that may or may not have been meaningful and that later could be collapsed or regrouped into geomorphological units once those had been established for Area 3-South. This was especially important, as the project geomorphologists were unavailable at the beginning of the data recovery excavations. Once these staff members became available, it was possible to examine the individual F-number entities and then collapse them according to the geomorphologically-based strata designations. As stated in the geomorphology report, "In nearly all cases the F designations were directly correlated with the geologically based strata." (Geoarcheology Research Associates 2003:4-11).

Vertical and Horizontal Control

Integral to the successful completion of a project the scale of the Area 3-South data recovery is maintaining vertical and horizontal control. All horizontal control was tied into the existing site grid oriented to true north and established during earlier phases of investigation at the site. Vertical control was maintained relative to elevation above NGVD, based on data provided by the District for permanent datum points established on the site during earlier investigations.

In the field, a Nikon D-50, and later a Nikon DTM-380, Digital Total Station was used to record all excavation level measurements and three-dimensional location data for piece-plotted artifacts. This allowed for the precise recording of excavation depths and artifact locations, and the information was immediately available to the excavators for recording on field forms. Additionally, the collection of information in digital form permitted rapid analysis of data, and facilitated the production of site maps and artifact distribution maps that enhanced recognition of artifact and feature patterns, even during excavation.

In addition to these tasks, the Digital Total Station was used to map identified features as polygonal outlines that were added to the daily evolving site map. Both horizontal and vertical feature locations were available to the project PIs on a daily basis, preventing the lag time associated with waiting for plan view drawings to be digitized and added to the site map. This information was used in conjunction with the computerized artifact tracking system described below to make decisions related to changes in excavation methodologies.

Information in the Total Station's data collector was checked against the paper excavation forms to ensure accuracy in the coding and designations used in the Total Station and to eliminate data entry errors. Further, the backsight and level of the Total Station instrument were checked throughout the daily course of excavation to ensure that the instrument had not been "knocked out" of alignment. In the event that the instrument was out-of-level or out-of-alignment, the instrument level and orientation were reestablished and data recorded since the previous instrument check was verified as applicable.

Standardized Paperwork for Units and Features

As described above, all excavations were conducted in 1 m^2 excavation units with soil removed by arbitrary levels within defined natural strata. For each arbitrary level excavated, a standardized Excavation Level Form was completed. These forms recorded such

information as unit coordinates, F-number being excavated, arbitrary level within that stratum, opening and closing elevations, method of excavation, type of screening used, cultural materials recovered, photographs taken, etc. When features or other anomalies were encountered during excavation, plan view maps were created using standardized plan view sheets consisting of a graph paper area and an area of form blanks to record information about location, elevation, etc.

For certain excavation units, especially the "control" or "test" units used during each meter of excavation, representative profile maps were drawn. These maps depicted the profile, as observed and recorded information about elevation and nature of the deposits.

Features were documented using a combination of standard Archaeological Feature Record Forms. These forms recorded information including the shape and dimensions of the feature in plan and profile, location in both horizontal and vertical space, description of the feature matrix, presence and nature of any internal stratigraphy or reuse episodes, cultural materials recovered, samples collected, and any other relevant information. Additionally, plan and profile maps were drawn to scale on standard forms and tied into the vertical and horizontal control for the site. Each feature was also recorded in both plan and profile through photographic means as described below. Feature numbers (separate from F-numbers) were assigned to cultural features consecutively starting with number 151. This is not consistent with the original SOW and was necessary because additional numbers were needed by consultants preparing a report on excavations of the historic brick works located in Site 36AL480, Area 1 (Area 1).

Photographic Documentation

In addition to standard field forms, excavations were also documented using 35-mm black-and-white film, color slide film, and high-resolution digital photography. Photographic records were maintained through the use of standard paper photographic logs in the field. Separate logs were maintained for each roll of traditional photographic film as well as a daily log for digital photography. Each roll of film was assigned a unique roll number with separate sequences of roll numbers used for each film medium (black-and-white print and color slide). Photographic logs recorded specific information about each exposure including, but not limited to, subject of photograph, date of exposure, direction of view, and photographer. Following development, each roll of film was processed by using archival quality ink to write the unique photograph number and subject matter on the back of black-and-white prints and on the slide mount of each slide. Each digital photograph file was renamed using a trinomial sequential, unique numbering scheme that reflected the project, date of exposure, and exposure number on that day. For example, the twenty-third digital photograph on June 6, 2001, received the file name 'Leetsdale-Area3S-060601-023.jpg'. File names were modified using the commercially available renaming software package RenameWiz, version 3.4.2. Excavation progress was also recorded on videotape with footage being shot throughout each week. Resulting videotape was submitted to the District on a weekly basis during fieldwork.

Artifact Tracking System

A central computerized tracking system was used in the field to record artifact recovery and sample collection and monitor the location of artifact bags and samples. This system relied upon assigning unique field specimen (FS) numbers immediately in the field to any collected artifacts or samples. This FS number, assigned at the level of individual artifact bag, was based on the smallest provenience designation. Following completion of excavation of a particular provenience unit (e.g., Field Designation F5, Level 1, 15 cm to 20 cm) predetermined artifact classifications (e.g., lithic debitage, fire-cracked rock (FCR), ceramics, projectile point/knife [pp/k] fragments, bifaces, other tools, etc.) were counted and bagged separately. Each bag was then assigned a unique FS number, which was written on the artifact bag tag as well as any accompanying forms and unit summary sheets. A unique record for each bag was then entered into the computerized database, including the FS number, provenience information, and the counts of the various artifact categories.

In addition to providing immediate field counts, this system allowed each individual artifact or sample bag to be tracked through processing and analysis. During each stage (washing, cataloging, numbering, photographing, etc.), the individual FS number data record was updated to reflect the appropriate activity, including the date of processing and individual responsible. Thus, at any time, it was possible to know the location and status of any particular bag of artifacts or sample collected. This system permitted efficient and timely compilation of weekly reports enumerating the quantities of collected, processed, and analyzed artifacts.

This computerized FS log was uploaded to a central server on a daily basis, and each day's entries were maintained as an archival copy on both the server system as well as CD ROM. The daily database also was maintained on the field computer hard drive. This ensured that even if one system failed, at least three copies of the database still existed.

Site Geographical Information System (GIS)

A project-specific Geographical Information System (GIS) was developed for use in the field. This system combined spatial mapping data and artifact yield data to produce thematic maps showing the locations of cultural features and artifact densities in three-dimensional space. Using a series of programs, the locations and polygonal outlines of cultural features were imported into ArcView 3.2, along with information including feature numbers and functions. Also imported into the GIS were polygonal outlines of all excavation units with unique provenience tags. These unique tags and the feature numbers allowed these graphical entities to be connected directly to the relational database of the FS log described above. Using this combination of graphic and numeric data, it was possible to create "real time" maps of the excavation areas showing artifact density distributions in relation to cultural features. This system allowed the PI and GPI to quickly make more accurate decisions in the field, and modify excavation methodologies and testing strategies to "best fit" individual situations dictated by the nature of the deposits being excavated.

Actual Data Recovery Excavations by Depth and Soil Horizon

The following is a discussion of the actual scope of work revised and implemented as excavations progressed. Methods employed in Area 3-South were subjected to constant scrutiny during fieldwork by the project PIs to ensure that appropriate methods were being used as each new unique archaeological situation presented itself. Modifications were made, in consultation with the GPI, to achieve the best methods while meeting the scientific goals of the overall project. These modifications were accomplished in a way that would provide the maximum amount of information while minimizing cost and time.

Occupational Safety and Health Administration standards for excavation allowed only a maximum of one vertical meter of excavation without "setting back" or stepping the excavation outward to prevent trench collapse. Therefore, methodologies and testing strategies were developed in reference to one meter of excavation. Within each vertical meter of excavation, or Lift, methodologies were further revised or modified as required for each designated soil/cultural horizon. In its most basic form, the methodology employed for each Lift consisted of a series of 1 m^2 test units being excavated one meter in depth. Information relative to artifact distributions and densities, both horizontally and vertically, was then examined, and a strategy was developed for excavation placement and volume to be excavated and screened. These excavation units or levels were then excavated, and the resulting data were evaluated to ensure that a proper level of recovery of significant information was attained prior to moving on to the next Lift. If needed, additional units or levels were excavated. In cases where no or minimal cultural materials were recovered, a plan for the mechanical removal of all or a portion of the Lift was developed and implemented. The process was then repeated for the next meter-thick Lift. Specific methodologies and testing strategies utilized for each vertical meter are discussed in the following sections.

Excavation of Depths Ground Surface to 0.8 Meters

Prior to archaeological excavations the Area 3-South archaeological set-aside had to be broken into discreet sections for spoil storage, the field lab, and excavation areas (Figure 8.5). Site preparation followed.

The portion of Area 3-South to be excavated was covered by a thick vegetative cover consisting of small tree saplings and herbaceous shrubs and weeds. This vegetation was removed using power rotary cutting equipment, with the resulting cut materials removed by hand and disposed of north of what was to become the block and volunteer excavations (Figure 8.6). After removal of the vegetation, a topographic survey was conducted in order to obtain elevation data for control and to create a contour map of the existing ground conditions. Vegetation removal and disposal was not considered in the initial SOW.

Following the topographic survey, the historic period overburden fill was mechanically removed. As discussed, the original SOW called for the excavation of a series of STPs at 5-m intervals within the area to become the block excavation. However, prior to the initiation of fieldwork in Area 3-South, it was determined that the historic fill deposits contained too many large fragments of brick, concrete, and rock within the matrix to allow

for hand excavation. Therefore, an exposed profile from an earlier excavation test trench was examined, and it was determined that the character of the historic fill deposit was sufficiently different from that of the underlying intact deposits to reliably mechanically remove the fill without impact to the underlying deposits. Thus, no STPs were excavated prior to the mechanical removal of the historic fill.

The historic period overburden fill was very distinctive in nature and consisted of coarse and fine cinders, slag, concrete, and brick fragments in a loose matrix of black soil, readily distinguished from the underlying intact deposits. This fill was mechanically removed under archaeological supervision (Figure 8.7) to within 5 cm to 10 cm of the underlying deposits. Following mechanical removal, remaining fill was hand removed using flat shovels in the excavation block and volunteer areas. An average of 0.81 m of overlying fill and disturbed deposits was removed across approximately 1,062 m^2 prior to the initiation of controlled hand excavations within the block and volunteer areas. Spoil was stockpiled in the northeast portion of the fenced archaeological set aside area. Contaminated spoil was placed on and covered by protective geomembrane liner.

Excavation of Depths 0.8 to 1.8 Meters

After removal of the historic fill deposits, a 5-m interval grid was established across the stripped area, and the 200 m^2 excavation block was delineated using iron pins around which was wrapped surveyor's flagging tape so that the boundaries could be seen (Figure 8.8). Any remaining loose soil resulting from the mechanical removal of the fill deposits was then removed with flat shovels. Finally, each of the individual 1 m^2 excavation units within the 200-m^2 block was established using the Total Station and marked using iron spikes.

Excavations began as a series of 11, 1-m^2 excavation units positioned with their southwest corners located on the 5-m grid intersection points. In addition, two units were placed at N65 E239 and N70 E239 to provide full coverage of the irregular shaped excavation block, and one unit was arbitrarily placed at N78 E228 in order to fulfill the SOW requirement of 14 units being excavated at this stage of work. Finally, a 2-m x 2-m block, excavated as four 1-m^2 units by 5 cm vertical levels, was placed in the 5-m by 5-m grid block formed by the N70 and N75 and E225 and E230 grid lines (Figure 8.9). In total, the initial testing of the 0.8 to 1.8 m depth below ground surface comprised 18 1-m^2 units. These units were excavated to a maximum depth of one meter below the stripped surface, or 1.8 m below original ground surface. Excavation of these units followed the procedures described above.

From these initial 18 units, information was recovered concerning stratigraphic breaks as well as artifact distributions across the 200 m^2 excavation area. This information was examined by the project PIs and geomorphologists. Based on this information, it was determined that there were at least five geomorphological units present and at least four cultural occupations contained therein, two more than expected and planned for prior to beginning the excavations. Additionally, the nature of the stratigraphy was much more complex than was expected and planned for in the SOW. Therefore, in order to better understand the stratigraphy and obtain additional artifact distribution information, the original SOW was modified at this time.

Originally, the SOW called for excavating 1-m wide east-west trenches along the even 5 m northing lines of the site grid. Excavation of these trenches was to proceed by removing and screening soil from individual 1 m^2 units down to a depth of the bottom of the first geomorphological/cultural horizon, and then excavating the intermediate units between these trenches. Following this, excavations would then go back to the trenches and remove the next horizon and then the intermediate units and so forth to a depth of one meter below the surface exposed by the initial stripping. However, it was agreed that initial unit excavations did not produce enough information about stratigraphy to reliably accomplish this task in this fashion. Therefore, it was decided that the east-west trenches located along the N70 and N75 grid lines would be excavated down to the one meter depth below the stripped surface prior to initiating any excavations in the areas between the trenches. Once the stratigraphy was better understood, excavation would then proceed across the block.

Following trench excavation, obtained data were assessed by the project PIs and geomorphological team. It was decided at this time, that a specific excavation and sampling strategy for each of the delineated geomorphological horizons was needed. These are described in the following subsections by stratigraphic order from top to bottom.

AB Horizon (Field Designations F4/F9/F14)

Using information obtained from the initial test units and trench excavations, it was determined that this horizon represented a possible Early Woodland occupation of the site. Prior to the data recovery excavations, it was believed that no evidence of prehistoric occupation at the site after the Transitional Archaic period had survived the industrial use of the area. Therefore, it was decided that all 200 m^2 of this horizon within the excavation block needed to be hand excavated with 100-percent screening.

Excavation of the 200 m^2 block revealed a well-preserved occupational horizon dating to the Early Woodland period, and perhaps later. Within this horizon, numerous cultural features were uncovered, including possible post molds that might have been associated with a structure. Therefore, given the importance of these remains, it was decided to excavate an additional 54 m^2 outside the boundaries of the 200 m^2 block excavation prior to mechanically removing these deposits as part of OSHA-dictated safety step back. The placement of these additional 54 units was determined based on a combination of artifact densities as well as the location of features identified within the block. Unfortunately, the placement of additional units to the southwest and northeast of the block was prevented by the existence of Historic Period disturbances that had penetrated deeper than the AB horizon deposits. Additionally, placement of units along the eastern portion of the south end of the block was not possible because of disturbances associated with the earlier test trench. The final configuration of excavation units within the AB horizon can be seen in Figure 8.10.

C Horizon (Field Designation F6)

Initial test units and excavation of the east-west trenches revealed that this horizon most likely represented a single autogenic flood event. Further, artifact yields were minimal to non-existent from these test units. In order to confirm these results, an additional 13 units along the N60 and N65 east-west trench lines were excavated and screened, along with a four meter long north-south trench along the E237 grid line. A total of 55 units, or 27.5-percent

sample of this horizon was subjected to hand excavation and 100-percent screening. Based on the results of sampling, it was decided that this horizon did in fact represent a single autogenic flood event and did not contain significant cultural remains. Therefore, deposits from the C horizon within the remaining 145 m^2 of the 200-m^2 block excavation area were hand removed without being subjected to screening. Figure 8.11 shows the locations of all those units excavated and screened within the C horizon.

2BC Horizon (Field Designations F8 and F10)

Test excavations within the original 1-m x 1-m units, 2-m x 2-m block, and the N70 and N75 trenches suggested that this horizon did not have consistently dense cultural materials throughout its vertical extent. These initial units revealed that the 2BC horizon varied in thickness from a minimum of approximately 20 cm to a maximum of approximately 45 cm. Further, it appeared that in the thickest portions of the horizon, cultural materials were vertically limited to the upper 20 cm and the lower 5 cm to 10 cm where the 2BC horizon interfaced with the underlying 3Ab1 and 3Ab2 horizons. In order to verify these results, it was decided in consultation between the project PIs and the geomorphology team to select a sample of units in which the entire 2BC horizon package would be hand excavated and subjected to 100-percent screening. It was agreed among the members of the team that this sample would amount to 40 percent of the 200-m^2 block available. Since 28.5 percent (n = 57) of the units within the block had already been excavated as part of the initial test units and east-west trenches, it was decided to select the additional needed 11.5 percent (n = 23) randomly from the remaining unexcavated units in the block. This was accomplished by numbering each of the 143 unexcavated units sequentially in a west to east direction across each northing line of the grid and then proceed grid row to grid row in a north to south direction. Once each unit was numbered, 23 random numbers between 1 and 143 were selected from a random number table without replacement. Unexcavated units with numbers matching those randomly selected were then hand excavated with 100-percent screening.

Using information from the test units, trenches and randomly selected units, it was confirmed that cultural material was restricted to the upper 20 cm and lower 5 to 10 cm of the 2BC horizon. It was therefore decided to hand excavate and screen only the upper and lower portion of the horizon with the central zone being hand excavated without screening. This methodology was implemented in the field by determining the thickness of the 2BC horizon in each of the areas between the east-west trenches using profiles available in each of the trenches as well as the randomly selected units. If it was determined that the thickness was 25 cm or less in a particular area, then the entire vertical extent of the horizon was excavated and screened. If the package was greater than 25 cm in thickness, then the upper 20 cm and the lower 10 cm were excavated and screened. The central portion of the package was removed in each 1-m x 1-m unit by carefully flat shovel skimming the soil in the event that features were encountered. If such was the case, then the entire package of that unit was screened.

Figure 8.12 shows the location of all the units utilized in the 40 percent sample and subjected to one-hundred percent screening. All other units within the 200-m^2-excavation block were excavated according the methodology just described.

3Ab1 Horizon (Field Designation F15)

The 3Ab1 horizon was only present in the eastern portion of the block, covering an area of approximately 116 m^2 or 58 percent of the 200-m^2 excavation block (see Figure 8.13). Initial test units and trench units suggested that this horizon was culturally rich and potentially dated to the later portion of the Late Archaic or Transitional Archaic Periods. Given the density of both artifacts and cultural features within this horizon, it was decided that the entire depositional package within the 200-m^2 excavation block should be hand excavated and screened. Therefore, this horizon was excavated as 125, 1-m^2 units or portions of units. Figure 8.13 shows the locations in which the 3Ab1 horizon was present and the units excavated.

3Ab2 Horizon (Field Designation F11)

The 3Ab2 horizon was present across the entire 200-m^2 excavation block, underlying the 2BC horizon in the western portion of the block, and the 3Ab1 horizon in the eastern portion of the block. Initial testing of this horizon through the excavation of the test units and trench units suggested that only the upper 10 to 15 cm of the horizon contained cultural remains. Therefore, it was decided to subject this horizon to additional testing to confirm these results. The same randomly selected units as used for the 2BC horizon discussed above were excavated and screened, amounting to a total sample of 40 percent of the excavation block being hand excavated and 100 percent screened. The results of the 40 percent sample confirmed that cultural materials were only present in the upper 10 cm to 15 cm of the horizon. Therefore, in the remaining units between the trench lines only the upper 10 cm to 15 cm was excavated and screened. The remaining lower portions of the horizon were removed together with the upper portion of the underlying 3Bw horizon using mechanical equipment using the previously described methodology. The locations of the units utilized in the 40-percent sample for the 3Ab2 horizon are shown in Figure 8.14.

3Bw Horizon (Field Designation F13)

Only the upper 10 cm to 30 cm of the 3Bw horizon were present within the first meter below the stripped surface. These deposits were tested for the presence of cultural materials using the initial 1-m x-1-m test units and the units located in the east-west trenches. In total, 57 m^2 or 28.5 percent, of the 200 m^2 excavation block were excavated within the upper portion of the 3Bw horizon and subjected to 100 percent screening. As a result of this sample, it was determined that these deposits did not contain significant cultural materials and therefore could be removed without screening using mechanical equipment. This upper portion of the 3Bw horizon was mechanically removed along with the lower portion of the 3Ab2 horizon with mechanical excavation terminating at a depth of 1.8 m below the original ground surface.

<u>Excavation of Depths 1.8 to 2.8 Meters</u>

Deposits located between 1.8 m and 2.8 m below the original ground surface were assessed for the presence of significant cultural deposits by the hand excavation of 12, 1-m x 2-m test units, one meter deep with 100 percent screening (Figure 8.15). These test units amounted to 24 m^2 or a 12 percent sample of the deposits within the 200- m^2 excavation block. Ten of the 12 1-m x 2-m units were oriented with their long axis running north-south,

while the remaining two 1-m x 2-m units were oriented with their long axis running east west. The placement of these test units is shown in Figure 8.16.

Initial test units confirmed the lack of a significant density of cultural materials within the upper 30 cm of the 3Bw horizon (Field Designation F13, Levels 1 to 3). However, these units showed a distinct increase in artifact density within a 30-cm zone below this level (Field Designation F13, Levels 4 to 6). Additionally, a slight artifact density was also noted in the upper 20 cm of the underlying 4Bw horizon (Field Designation F13, Levels 7 to 8). In both cases, these increases in artifact counts were in the northeastern corner of the 200-m^2 excavation block. In order to further investigate these concentrations, additional units were excavated.

The uppermost concentration, Levels 4 to 6 of Field Designation F13, was investigated through the excavation of an additional 57, 1-m x 1-m units in the area of, and surrounding, the northeast corner of the 200-m^2 excavation block. Of these 57 units, 19 were excavated outside the 200-m^2 excavation block (Figure 8.17). Any 3Bw deposits above these levels were removed by hand excavation without screening. In combination with the original 1 x 2 m test units excavated in the northeastern portion of the 200 m^2 block, the additional effort amounted to a total 65 m^2 of excavation within the densest portion of the artifact concentration, and a total of 81 m^2 across the entire area of excavation.

The lower of these concentrations, the upper 20 cm of the 4Bw horizon (Field Designation F13, Levels 7 to 8) was investigated by the excavation of four (4) additional 1-m^2 units placed adjacent to the original 1-m x 2-m test units located in the northeastern most corner of the 200-m^2 excavation block (Figure 8.18). These additional units revealed only a very sparse artifact concentration with minimal number of artifacts recovered. In all, 28 m^2 were excavated within this 20-cm vertical zone, amounting to a 14 percent sample of the entire 200-m^2 excavation block.

The remaining areas of the excavation block were shown to contain no, or very minimal artifacts within the zone from 1.8 to 2.8 m below original ground surface. Therefore, following the investigation of the two concentrations just discussed, the remaining deposits within this vertical zone were removed from the excavation block along with surrounding materials to accommodate an OSHA safety step back using a track excavator and methods discussed above.

Excavation of Depths 2.8 to 3.8 Meters

Initial testing within the 2.8- to 3.8-m zone below original ground surface was conducted through the hand excavation of 15, 1 m^2 test units one meter deep with 100 percent screening (Figure 8.19). These units were placed at the intersection of the even 5-m grid lines (13 units) as well as two units placed advantageously (Figure 8.20). These 15 units amounted to a 7.5 percent sample of the deposits at these depths, and revealed culturally sterile horizons (primarily 5Bw, 5BC, and 6AC/C horizons). In order to obtain a detailed north-south and east-west geomorphological profile of this zone of deposits across the excavation block area, two trenches were mechanically excavated in a cruciform pattern, each trench measuring 1 m wide by 1 m deep. The east wall of the north-south trench (N60-

79 along the E233 meter line) and the north wall of the east-west trench (E225-240 along the N70 meter line) were drawn to scale. Following excavation and examination of the units and trenches, the remaining deposits between 2.8 and 3.8 m below original ground surface were removed from the 200-m^2 excavation block using a track excavator according to the methods described above.

Excavation of Depths 3.8 to 4.8 Meters

This vertical zone of excavation primarily encompasses the 6AC, 6C, 7AC, and 7BC horizons. Because of OSHA safety regulations and spatial constraints caused by these requirements, it was necessary to test the upper 50 cm (3.8 to 4.3 m below original ground surface) and lower 50 cm (4.3 to 4.8 m) in differing quantities and configurations. The upper 50 cm were investigated through the hand excavation of 40, 1-m^2 units configured in a 5-m x 8-m block with its southwest corner located at N65 E231 and oriented with its long axis running north-south (Figure 8.21; Figure 8.22). In total, this amounted to a 20 percent sample of the 200-m^2 excavation block within this vertical zone. These 40 units were excavated to a maximum depth of 50 cm and a north-south profile was recorded along the western edge of the block, while east-west profiles were recorded for the southern and northern edges as well as along the N70 east-west grid line (Figure 8.23).

The lower 50 cm of the 3.8 to 4.8 m zone below original ground surface was tested by the excavation of 18, 1-m^2 units excavated as a 3-m x 6-m block in the center of the 5-m x 8-m block used in the upper 50 cm of this zone (Figure 8.24). This amounted to a total sample of nine percent of the 200-m^2 excavation block. These 18 units were hand excavated a total of 50 cm in depth with 100 percent screening of the removed soil matrix (Figure 8.25). A north-south profile was recorded along the western edge of the block, while east-west profiles were recorded for the southern and northern edges as well as along the N70 east-west grid line (Figure 8.26).

No cultural materials were recovered during the testing of the 3.8- to 4.8-m zone. Because of the space constraints, no additional deposits within this vertical zone were removed.

Excavation of Depths 4.8 to 6.1 Meters

Deposits in the 4.8-m to 6.1-m vertical zone below original ground surface could only be minimally tested through hand excavation because of space constraints resulting from OSHA required safety steps. Testing consisted of the excavation of both 1-m x 1-m units and 57-cm diameter test probes. Four 1-m^2 units were excavated 50 cm deep as a 1-m x 4-m trench located in the central portion of the 3-m x 6-m block described above for the lower 50 cm of the 3.8-m to 4.8-m zone (Figure 8.27). These units were hand excavated with 100 percent of the soil matrix screened. No cultural materials were recovered from this portion of the 7CB and 8AC horizons.

The lower 80 cm of this vertical zone was investigated through the excavation of four (4), 57 cm diameter shovel test probes. These probes were positioned in the center of each of the units in the 1-m x 4-m trench just described (Figure 8.28, Figure 8.29). All soils were

hand excavated in 10-cm arbitrary levels and 100 percent of the removed soil was screened. No cultural materials were recovered from this portion of the 8AC horizon.

Excavation of Depths 6.1 Meters to Basal Gravels

Once excavations reached the level of 5.3 m below original ground surface, there was no longer sufficient room to expand the excavation area for safety compliance in order to allow for continued hand excavation, aside from that conducted with the shovel test probes discussed above. For this reason, it was decided that the remaining approximately 2.5 m of deposits below the base of the shovel test probes overlying the basal gravels would need to be tested using heavy equipment. In consultation between the project PIs, geomorphology team members, and the equipment operator, a methodology was devised whereby the tracked excavator would excavate a deep trench, 1 m wide in the same horizontal location as the 1-m x 4-m trench tested in the 4.8- to 6.1-m vertical zone. The three northernmost units were excavated without attention to depth, while in the southernmost unit the operator removed a series of stacked, controlled 50-cm thick packages, which were screened to determine the presence of cultural materials. Therefore, these final deposits were tested in arbitrary 50-cm excavation levels, without respect to natural stratigraphy (Figure 8.30).

This testing proceeded until basal gravels were encountered at an approximate elevation of 207.0 m NGVD, or 8.5 m below ground surface. All of the soil removed from this lowermost vertical zone above the basal gravels was defined as within the 8AC Horizon. Unfortunately, because of the very loose sandy nature of these final deposits, the trench collapsed within moments of the final bucket being removed from above the gravels and before a photograph could be taken of the profile. A single lithic flake was recovered when screening the 7.6 to 8.1 m package. Although the artifact appeared to be encased in appropriate soil for that depth, it is possible that the flake was dragged down by the tracked excavator from a higher elevation.

Laboratory Methods

This section is divided into two parts. The first part describes methods used to process artifacts and flotation samples. The second part is a discussion of specific methods used in conducting specialized analyses associated with the Area 3-South data recovery project. The order in which the special analyses are presented is consistent with the order in which the data are presented in the results section. Definitions of artifact and feature types are provided in the special analyses section.

Processing

Artifacts

Artifacts and collected samples were transferred to the lab from the field on a daily basis, and all information on the artifact bags and/or tags was checked against the information entered in the computerized field specimen log received along with the artifacts. Any data entry errors made in the field were corrected at this time and reported back to the field lab manager who was responsible for the field specimen log. Any discrepancies were checked against the paper field forms as well. The computerized FS log essentially served as the initial foundation for the Microsoft Access database that was used during the analysis

stages of the project. Provenience data, the date, excavators' initials, bag numbers, and field artifact counts were entered into the database in the field. As formal laboratory processing and analysis was completed, additional information and clarification was added to each entry that was created in the field.

Processing of the artifacts consisted of them being gently washed, allowed to dry, and placed into archivally stable, 4-millimeter thick, zip-closure plastic bags. A sample of retouched artifacts was left unwashed in anticipation of later microwear and blood-residue analysis. Items were then initially sorted according to artifact category (debitage, tool, ceramic, etc.) and then provenience information was transferred to the exterior of each bag. In addition, acid-free paper tags bearing the same provenience information were placed into each bag. Proveniences were then assigned unique numbers, and each bag, tag, and individual artifacts one inch or greater in size were then marked with the site number and this unique number. All materials were processed and packaged in accordance with curation guidelines in Cultural Resource Management in Pennsylvania: Guidelines for Archaeological Investigations (Bureau for Historic Preservation 2001) and Revised Curation Guidelines (Warfel 2002).

As discussed, analysis began with sorting of materials by artifact provenience and category. Artifacts were then counted by these divisions and distributed to each of the specialty analysts. Analysis results were recorded using paper analysis forms developed by each analyst, or were entered directly into computerized analysis entry forms created in the project database. All artifact information was entered into an Access 2000 database file.

Flotation

Prior to being processed, the provenience and volume (in liters) of each soil flotation sample was recorded on a Flotation Sample Log Sheet. Two flotation systems were used, although they are similar and should not result in variable results. Thirty-five of the samples were floated by Baker's Cultural Resources Section, while 16 samples were floated by Johannessen in a hand flotation system. Both systems float off the light fractions into a fine mesh (< 0.5 mm) cloth while the soil sample is being agitated, while the heavy fractions are collected on window screen (< 1.8 mm) after the soil is washed away.

At Baker, a modified SMAP (Shell Mound Archaeological Project) style flotation device (Pearsall 2000) was used to collect the floated samples. The device consists of a 55-gallon plastic drum with a plastic pipe arrangement mounted approximately two-thirds from the bottom on the side of the drum. A spigot attached on the outside of the pipe arrangement allows the inflow of water into the drum through the pipe arrangement. The pipe arrangement contains holes on the topside of the pipes that allow water to flow into the tank providing agitation to the soils being processed after the tank is filled. A metal rack held by brackets sits above the pipe arrangement. Common plastic window screen mesh (1 mm by 1.8 mm) is placed into the tank resting on the metal rack and reaching out over the rim of the drum, and is attached to the rim with metal clamps to prevent slippage back into the tank. An approximately 12-inch wide aluminum outflow spout is attached to an area approximately 2 inches below the rim of the tank. This outflow spout allows the passage of light fraction materials that are caught in a square piece of micro-mesh material sitting in a colander

supported by a heavy gage wire frame. The light fraction mesh ranges in size from 0.1 mm by 0.1 mm to 0.3 mm by 0.3 mm. After the tank was set up and all meshes were in place, the tank was filled to the level of the aluminum outflow spout. A single soil sample from one provenience was then placed into the flotation tank. The spigot was turned on, completely filling the tank with water and agitating the soil sample, and allowing the light fraction materials to flow through the outflow spout into the micro-mesh material and the heavy fraction to be left in the water on the window screen. Once all soil had been washed away, and no light fraction remained in the tank, the inflow of water to the tank was turned off and the light and heavy fractions were recovered from their respective meshes. Processed soil was collected in the bottom of the tank for disposal at the end of the flotation process. Light and heavy fractions were placed on paper-lined trays and allowed to dry completely. (The drying stage was usually overnight but sometimes took longer depending on the bulk of the fraction and humidity.) After drying, each fraction was placed into an archival quality 4-mm plastic bag with an acid-free tag containing the catalog number for the sample. The catalog number was also written on the front of the bags containing the light and heavy fractions. The light and heavy fractions were bagged together in an archival quality 2-mm or 4-mm plastic bag, which was also labeled with the appropriate catalog numbers. Flotation fractions were then sorted for artifacts, botanical, and faunal remains.

Specialized Analyses

Historic Artifact Analysis

In general, historic artifacts were assessed for their function, material type, and diagnostic attributes. Materials were sorted into broad functional categories: industrial waste and by-products, table or kitchen wares, and architectural debris. Artifacts were sorted by material type and diagnostic attributes recorded. For example, glass was recorded and described by function, method of manufacture, form, segment, color, surface treatment, and decoration. Ceramics were categorized first by function (drain pipe, bowl, and brick for example) and then further by paste, glaze, vessel form, and surface decoration.

Lithic Analyses

Lithic artifact recovery included flaked stone tools, debitage, groundstone tools, other stone, and FCR. The Area 3-South Lithic Analysis Plan is included in Appendix 8F as a component to the Technical Proposal. Information in this section is refined to reflect the actual recovered assemblage.

Flaked Stone Tool Analysis

This category includes all retouched tools and tool fragments that are the result of percussion technology. Tool categories include projectile points/knives (pp/k), bifaces, expedient tools, and cores.

Analysis protocols for formal flaked stone tool categories varied depending upon the artifact type. Those attributes most useful in determining tool function and temporal affiliation were recorded in a standardized fashion. All artifacts were visually examined by the unaided eye. If an artifact appeared to have use-wear or retouch, it was examined under a magnifying glass (10X) or a Fisher Scientific Stereo Master 10-30X light microscope. Tools

were coded by catalog number, techno-morphological type, raw material type, and source (e.g., cobble, tabular fragment). Length, width, thickness, and weight were coded and additional specialized data were recorded depending on artifact type or parent form.

Projectile Points/Knives

Projectile points/knives are bifacially flaked, bilaterally symmetrical, chipped stone artifacts displaying a point of juncture on one end (distal) and some notching/constriction for hafting on the opposite (proximal) end. While the term projectile point "is a morphological term that does not convey any particular functional interpretation" (Ahler and McMillan 1976:165), these artifacts are generally assumed to have been used as spear heads, dart tips, or arrow points. However, multiple functions for so-called 'projectile' points have been repeatedly documented (Ahler 1971). Accordingly, the more generalized term projectile point/knife (pp/k) is used here. For each incomplete specimen the missing portion of the pp/k was recorded or the portion represented by the extant fragment was recorded, depending on which was larger (e.g., tip missing, tip and midsection, midsection and base, base only, base fragment, etc.).

Given their importance in temporal affinity to cultural deposits, pp/ks were subjected to a data intensive examination and recording. Detailed information (including material type and characteristics, and other physical attributes and measurements) was recorded on a standardized pp/k analysis form and was used in assigning the pp/k to a recognized, previously defined type.

Projectile points/knives were analyzed first by recording a variety of metric attributes, including length, width, thickness, and weight. Additionally, characteristics of the raw material, morphology, and production/finishing were recorded. All of these data were put into a relational database and subsequent pp/k data forms. Final data forms showing metric, morphological, and chronological data, and a scaled photograph are included as Appendix 8K to this report. Point types, cultural associations, temporal associations, and date ranges were assigned based on a combination of the extensive past experiences of the analyst, Dr. William Johnson, and a comparison of metric and morphological data from other published literature (Ahler 1971; Ahler 1976; Bebrich 1968; Bowen 1987; Bradbury 1992; Bressler 1989; Calkin et al. 1977; Cochran et al. 1985; Coe 1964; Cook 1976; Cowin 1991; Dragoo 1963; Duerksen and Doershuk 1998; Fitting 1972; Funk 1976; Funk and Rippeteau 1977; Funk et al. 1971; George 1998; George and Davis 1986; Hoffman 1988; Hughes and Kerr 1990; Hughes et al. 1991; Justice 1987; Kennedy 1967; Kinsey 1975; Kraft 1970, 1972; McElrath et al. 1984; Phillips and Gladfelter 1983; Prufer and Sofsky 1965; Mayer-Oakes 1955; Michels 1967; Mouer 1990; Mounier 1974; Munson 1966, 1971, 1982; Munson and Hall 1966; Ozker 1982; Painter 1988; Perino 1968; Riggs 1986; Ritchie 1969, 1971a, 1971b, 1973; Robinson and Smith 1979; Rutherford et al. 1979; Shott 1990; Seeman 1975; Speth 1972; Staats 1986; Stafford and Stafford 1992; Theiler 1980; Vargo and Vargo 1986; Vickery 1980; Witthoft 1953; Wilkins 1977, 1978, 1985; Winters 1976, 1969; Youse 1992). When a particular type was suspected, but no literature published for comparison, verbal consultation with the person(s) who defined that type was pursued.

Bifaces

A biface is an artifact with negative flake scars on its dorsal and ventral surfaces that originate from the medial edge of the biface. Bifaces do not have hafting modifications. The category "biface" has four subgroups: Stage 2, Stage 3, Stage 4, and unidentified. The stage typology employed follows that of Callahan (1979). Stage 2 bifaces show initial edging around the medial edge. Flake scars approach the biface midline but do not cross to the opposite side. This stage produces a lateral edge from which nearly all later flakes are removed. Stage 3 marks the removal of primary thinning flakes. The terminal ends of these flakes approach and cross the midline. During this stage the biface's width to thickness ratio decreases. Stage 4 results in the removal of secondary thinning flakes and further reduces the width to thickness ratio. Additionally, potential reason for discard is recorded for each biface. These reasons include:

- Incipient fracture. A fracture that follows a flaw within the raw material and removes a significant portion of the biface.

- Lateral fracture. A fracture that travels from one edge, crosses the midline, and terminates at the opposite edge.

- Overshot. A biface damaged by the removal of an outre-passé flake. An outre-passé flake has its platform originating on one edge of the biface and its distal termination consists of a significant portion of the opposite edge.

- Stack. A biface discarded because too many flakes terminated with hinge or step fractures in one section of the biface and could not be removed by subsequent knapping.

- Thermal damage. A biface discarded because of excessive thermal crenulation, cracking, crazing, or potlidding.

- Transverse fracture. A fracture that somewhat parallels the midline and removes a lateral section of the biface.

Cultural and behavioral implications of bifaces are limited. Often it is impossible to tell if a biface was deliberately manufactured to a task-specific form and then used, broken, and/or discarded, or if it was a pp/k that failed or was abandoned in the manufacturing process and then opportunistically used. Indeed some physical characteristics observed on bifaces may be the result of edge preparation in the manufacturing process or use-wear.

Expedient Tools

For the purposes of this analysis, expedient tools include those flakes that evidence retouch or sharpening. If use-wear on an unsharpened edge was evident, then they typically were classified as utilized flakes. An expedient tool is the simplest of stone tools consisting of a single flake utilized for its sharp edges. Normally, these tools were used for a short time and then discarded. The advantages of expedient tools were rapid tool production, low labor investment per tool, and the ability to produce tools from low-quality material. The presence

of expedient tools may indicate a readily available supply of flaked stone raw material, because the purposeful reduction of cores to create expedient flake tools tends to consume raw material at a more rapid pace than using bifaces which can be resharpened.

Cores

Cores are cobbles or blocks of raw material that have had one or more flakes detached but have not been shaped into tools or used extensively for tasks other than that of raw material from which flakes have been struck. Cores come in various shapes and sizes, depending upon their degree of reduction and the methods of reduction that were applied. Eight basic core types were identified.

- Spheroid Core. These are roughly globular with numerous flakes scars on all sides; typically an exhausted core resulting from flake production.

- Bifacial Core. These have flakes removed from all sides, but tend to be somewhat flattened rather than spheroid. These are similar to early-stage bifaces, and may simply be the earliest stage in the continuum from core to finished bifacial tool.

- Bipolar Core. These have a platform at both ends and were set upon an anvil and struck on the opposite end by a percussor. Battering or crushing may be evident on either or both ends.

- Cobble Core. This identifies a core that is derived from a cobble (as opposed to tabular or nodular) source. These do not exhibit formal preparation prior to flakes being removed.

- Sheared Cobble. These are cobble cores with shear fractures on the ventral surface.

- Split Cobble. These are cobbles split along the long axis in the widest plane to create two long spalls. Typically they exhibit battering or crushing on one end resulting from the preparation process, with no other modification evident.

- Core Fragment. These likely result from a failed attempt to create split cobbles, where the cobble core has broken into four pieces. Typically some battering or crushing on an exterior surface is evident.

- Tested Cobble. These are unmodified cobbles, blocks, or nodules that have had a few flakes detached to examine raw material quality, but their use does not appear to have progressed any further.

Debitage Analysis

Mass Analysis

As required by the SOW, a mass analysis was completed for all prehistoric debitage recovered at Area 3-South. In this report the term debitage encompasses all unutilized, sharp-edged, waste material left over from the making of a tool. This includes flakes, bipolar artifacts, and debris. Flakes are defined as all lithic material that has a striking platform. The

category has two subgroups: “whole flake” which includes flakes having both a striking platform and feather or hinge termination, and “proximal flake” which has a striking platform and a step termination or is missing the distal end. Bipolar artifacts result when a hammerstone strikes a lithic core resting on an anvil. Bipolar artifacts show signs of crushing at their proximal and distal ends, and they often have distinct conchoidal ripples on their dorsal and ventral surfaces. Finally, the debris category includes all artifacts that do not have a striking platform and are not formal or expedient tools or cores.

Mass analysis is a method of quickly identifying the types of flakes recovered in a large collection. It is based on the idea that the size of a flake will be a good indicator of its place in the reduction sequence (Ahler 1989). Mass analysis was discussed in detail by Ahler (1989) and is based on a shift from looking at individual flakes to completing what Ahler calls “flake aggregate analysis.” Based on known properties of manufacturing technology, this analysis identifies the upper size limit in the collection, as well as providing the average size distribution for the debitage recovered. In addition, size can reveal whether pressure flaking, percussion flaking, or a bipolar reduction technique was used to produce the resulting debitage and formal tools. Numerous experiments and analyses of archaeological collections provide data for these claims (Ahler 1989). The distribution of the flakes into mean sizes, combined with the attributes collected, provide evidence to reconstruct the reduction technology used by the people that lived at Area 3-South. The resulting quantitative data were used to develop a profile of the reduction technology used in the different cultural horizons at the site.

Mass analysis was completed for the entire debitage assemblage recovered from Area 3-South following the methodology proposed by Ahler (1989). All lithic debris from each recovery unit (i.e., level) and feature was size-graded using nested screens with decreasing mesh openings. All material was analyzed by provenience. This approach resulted in the mass sorting of the lithic assemblage into five size grades: (1) greater than or equal to 2 inches, (2) less than 2 inches and greater than or equal to 1 inch, (3) less than 1 inch and greater than or equal to 0.5 inch, (4) less than 0.5 inch and greater than or equal to 0.25 inch, and (5) less than 0.25 inch. For each of the size grades, and for each of the raw material types present within each size grade, the following data were recorded: quantity of cortical fragments, presence or absence of thermal alteration, and weight per size grade. In addition, possible use-wear or retouch was noted, and the quantity of whole flakes was recorded during this first stage of analysis.

Detailed Debitage Analysis

Detailed analysis was conducted on all whole flakes and proximal flakes recovered in the Late Archaic and Woodland Period soil horizons and features, except for the Terminal Middle/early Late Archaic Period (3Bw horizon) assemblage. A 20 percent random sample of all whole and proximal flakes was analyzed from that occupation period. All cores and retouched tools were also analyzed.

Whole flakes and proximal fragments were recorded as to the total quantity, weight, presence and type of cortex, and thermal alteration for each raw material type within provenience unit. In addition, for these flakes, the following characteristics were recorded:

- Presence or absence of bulb of percussion
- Platform shape (faceted, flat, cortical, or lipped)
- Platform size (thickness)
- Platform angle, in 5o increments
- Overall length, width and thickness

Platform shape and presence or absence of a bulb of percussion were used to help identify reduction method (i.e., hard hammer or soft hammer, respectively). Flat platforms usually result from removing a flake from a non-bifacial tool or a unidirectional core. Cortical platforms indicate the flake to be a primary, or initial flake removed from a cobble, or a secondary flake removed that has some cortex attached to the initial flake. Lipped platforms are usually interpreted as resulting from soft-hammer percussion, such as use of an antler or bone billet to detach the flake. Facetted platforms indicate the flake was removed from a prepared edge. These types of striking platforms most often result from detachment from a retouched edge such as occurs during biface preparation. Platform angle was measured as the angle between the striking platform and ventral face. An abundance of lower degree platform angles in an assemblage is suggestive of tool edging, probably late stage biface production and/or resharpening, while a tendency toward higher angles is suggestive of earlier stages of reduction with more of a focus on removal of larger amounts of material.

Once the data were collected, a series of standard statistics was used to identify any significant patterns that could be used to reconstruct the manufacturing methods used within each cultural occupation, and any similarities or differences among the different time periods. These statistics included calculation of means and standard error, and *t*-tests to examine significance.

Raw Material Sourcing Analysis

Flaked stone material analysis for this project was aimed at determining the original source of all raw materials types identified within the recovered assemblage. Initially, the lithic assemblage was sorted during the mass analysis, and each specimen was assigned to a numbered 'type' (e.g., Type I, Type II) based on readily visible macroscopic characteristics such as grain size, inclusions, color, and cortex. This was done with the goal of grouping different lithic raw material formations. Following sorting of the entire assemblage, a sample of specimens from each of the numbered 'types' was selected for more detailed raw material analysis. The sample comprised approximately two percent of the flaked stone assemblage and consisted of all of the formed tools and a selection of debitage, attempting to include the range of variation within each assigned numbered 'type.' The sampling strategy was established in the contracted Lithic Analysis Plan.

The specimens were first macroscopically compared to a variety of raw material samples previously collected by the analyst (Michael Kagelmacher) from known formations, and compared to samples housed at the Holland Lithic Laboratory in Buffalo, New York. Then, a microscopic comparison at both 20x and 40x magnification was conducted to examine characteristics (e.g., fossils) which distinguish between materials of similar general appearance but which derive from different sources. Following the detailed sourcing

analysis, the numbered 'types' were assigned a known chert type, if possible, and combined if it was determined that more than one numbered 'type' was in fact of the same lithic source. Finally, the analysis database was updated to reflect the newly assigned lithic raw materials. Conclusions concerning the location of the source material at the time of utilization by the inhabitants of the site were developed based on known geologic outcrops, past glacial activity, trends of human activity during the time periods represented at this site, and the condition of the analyzed material itself (e.g., weathering, cortex).

Microwear Analysis

Low-magnification use-wear analysis was conducted on a sample of 200 flakes and flaked-stone artifacts. This sample consisted of 33 projectile point/knife (pp/k) artifacts, 38 expedient tool and modified flake artifacts, and a random sample of 129 seemingly unmodified whole flakes and proximal flake fragments from across all of the six cultural horizons identified at the site.

This analysis was conducted using an Olympus VMT stereoscopic microscope and an AO Spencer stereoscopic brightfield-darkfield microscope, and consisted of examination of, at a minimum, the following attributes:

- Flakescars. Type of flakescar (denticulate, scalar, crushed), location on the tool, whether discreet or multiple, type of termination (e.g., feathered, hinged), and size in mm.
- Abrasion. Location of abrasion, qualitative identification of degree of wear (light, moderate, heavy), and size in mm.
- Striations. Location of striations, direction, qualitative assessment of degree of wear (light, moderate, heavy), and size in mm.
- Pitting. Location of pitting, size of wear, qualitative assessment of degree of wear (light, moderate, heavy), and size in mm.
- Polish. Location of polish, size of polish, qualitative assessment of degree of wear, and size in mm.

All data were recorded on a hardcopy form and in an electronic format for incorporation into the project database. The complete report for this analysis is provided in Appendix 8M.

Use-wear studies can be used to better identify particular activities that may have occurred at a site based on wear patterns on tools. The goal is not to further examine the methods by which the tool was manufactured, but rather how it was utilized and for what purpose. The processing of perishable materials, whether preparation of foodstuffs or manufacturing of tools, may be evidenced by microwear on stone tool edges, while the actual perishable items are often not preserved on archaeological sites.

Refit Analysis

Attempts at refitting stone debris focused on cores, core fragments, whole and proximal flakes, and lithic debitage exhibiting no diagnostic attributes. The refit investigation focused primarily on artifacts from the AB horizon (Early Woodland period),

the 2BC horizon (Terminal Archaic period), and the 3Bw (Earlier, Late Archaic time period). These horizons were chosen for refit analysis due to the fact that they contained the largest amounts of flaked stone artifacts. In addition, AB and 2BC horizons were excavated more fully than the other cultural horizons, and thus the formal spatial analysis focused on those two components. The results of that analysis therefore provided a convenient starting point from which to gather potential lithic artifacts for the refit analysis. The 3Bw horizon was also chosen for refit analysis due to its high concentration of lithic tools and cores, and due to the general impression of the individual analyzing the whole and proximal flake component that the horizon contained a large quantity of large flakes with shared characteristics.

Groundstone Artifact Analysis

Specifically, groundstone tools are prehistoric Native American implements formed from lithic raw materials at least partially by processes of pecking, grinding, and/or polishing. The sometimes separate but related artifact type called "roughstone" tools are lithic objects used as expedient tools in their natural form, or minimally modified. For the purposes of this study, both tool types were combined into a single analytical category, and are hereafter referred to as groundstone. Possible manuports, unmodified objects brought to the site through human activity, and thermally altered ("fire-cracked") rock were analyzed as a separate category and are discussed in the next section.

Groundstone tools were analyzed by first assigning artifacts to an analytical category based on techno-morphological attributes and implied function, where such function could be reasonably inferred from archaeological literature, ethnographic analogy, or macroscopic wear-pattern analysis. Abstract types were generally avoided in favor of more traditional "functional" terminology to allow comparison with previous investigations. Analytical categories for the Area 3-South data recovery include the following.

- Anvils. These are cobbles or blocks of stone that were used as a base on which to rest materials while they were struck with a hammer. Surfaces that are interpreted as anvils tend to possess shallow, coarse-textured depressions with amorphous outlines.

- Hammerstones. These are cobbles that show evidence of battering and crushing along their margins, indicating that they were intentionally used as percussors.

- Pitted Stones. These are cobbles or blocks of stone with at least one smooth depression. These depressions differ from anvil depressions in that they are smoother, often deeper, and tend to be circular or oval. These depressions are believed to be the result of processing perishable materials, as compared to anvil depressions, which are attributed to bipolar reduction of stone.

- Nutting Stones. These are simply pitted stones that have intuitively been assigned the function of processing nuts, based on the size and shape of the depressions.

- Net Weights. These are notched cobbles or slabs of stone. The notching is either ground grooves or crudely flaked notches. These items are believed to have been attached to nets, but some specimens could have functioned as bolas stones.

Complete specimens were coded as “whole.” In this context, “whole” refers to the completeness of the artifact as a tool and not necessarily that the parent form is intact. While some specimens may be formed from broken cobbles, their use-wear patterns and weathering may suggest that these fragments were selected and used after fracture. Accordingly, such artifacts were grouped with morphologically complete specimens. Only specimens that were obviously broken during or after utilization or modification were characterized as fragmentary, and the axis of the fracture(s) was recorded.

Tools were measured for length, width, and thickness. A standardized shape designation was assigned to each artifact with reference to each of three axes (plan view, profile, and cross-section), and the presence/absence of thermal alteration was noted. All specimens were weighed to the nearest 0.1 gram and assigned as to raw material. Additionally, culturally-produced modification or use-wear patterns (e.g., fractures, flaking, battering, pecking, grinding, striations, gouges, pits, polish) were identified and examined, where necessary using a Fisher Scientific Stereo Master 10X-30X light microscope, and recorded.

Fire-Cracked Rock

Fire-cracked rock (FCR) was washed to determine whether the cobbles had been used in a capacity beyond hearthstones. Evidence for use included presence of striations or pitting. Artifacts exhibiting indications of use prior to being placed in a pit or hearth were retained and analyzed as part the groundstone/roughstone tool assemblage described above. All other FCR was counted, collectively weighed, and recorded by provenience unit (e.g., feature number). It was not retained.

Other Stone Artifact Analysis

Many other stone items do not fit particularly well into the categories described above. A number of them are cobbles or pebbles that appear to be unmodified. These are considered ‘manuports’ or items carried onto the site by human inhabitants, but which show no apparent signs of use. Items such as this may have been recovered from the fill of cultural features and were thus considered to have been placed there by the people utilizing the feature. Other items may have been retained by archaeologists simply because the nature of the overall deposition at the site did not lend itself to natural transfer of larger stones, in which case their presence on the site was considered to be most likely the result of human activity. At this site, most of the recovered pebbles are waterworn or polished. Other items made of particular minerals, such as hematite/ochre, mica, and steatite, were retained because previous research shows they were utilized by prehistoric Native Americans. Hematite/ochre was used as a pigment and occurs naturally in this region; however, all of the specimens recovered here are small and show no signs use. Mica was used to make ornaments or other decorative/ceremonial items and also occurs naturally in this region; however, all of the specimens recovered here are small and extremely thin, and all appear to be unmodified. Steatite was used to make various items such as bowls, smoking pipes, gorgets, and banner stones. This raw material does not occur naturally in this area, and one of the recovered specimens appears to be a vessel fragment but is too small to determine the form.

Prehistoric Ceramic Analysis

The artifacts were first sorted by temper aplastic combinations and then by surface finish. The sherds were then counted and their gram weights were recorded by temper varieties and surface finish category. Relative frequencies of ware types based on tempering agents and surface finish were calculated for both raw count and gram weight. Percentages based on gram weight are considered to be more accurate indices of the actual ratios of particular temper types and surface finishes within a site than are those based on raw sherd counts. This approach is based on the observation that the various wares, particularly those that differ in temper, reflect different ceramic technologies, each of which potentially could have produced wares that differed in their friability (Chapman 1973:45-47; 1975:56-57; Dunnell et al. 1971:83-84). Such wares can differentially withstand damage from any of several agencies (e.g., weathering; freezing and thawing; modern plowing; and animal or human activity, both aboriginal and modern). Conversely, less resistant wares fragment into smaller sherds, giving the illusion of being relatively more numerous than more resilient ware sherds.

Further potential bias can be introduced into the archaeological record as the result of various aboriginal garbage disposal practices and by changes in intra-site location and intensity of occupation. Biases resulting from different manufacturing technologies can be partially corrected by utilizing temper and surface finish frequencies based upon gram weight. Ceramic comparisons based on sherd weight rather than raw sherd count also correct in part for any error in the actual ratio of ceramic types reckoned by temper and surface finish. This is an important consideration when comparing the modern plow zone of a site with, for example, undisturbed midden deposits or the fill of pits. Ceramic sherds in the tilth zone are subject to the destructive impact of the plow. This produces an artificially larger sherd count (of smaller fragments) for the same volume of ceramics within the tilth zone (Dunnell 1962:29). Similarly, ceramics in a village midden or rockshelter are subject to differential destruction depending on each sherd's relative depth below the effective floor of such sites and the spatial relationship that the sherds demonstrate to aboriginal human activity areas within these sites. Complete or nearly complete vessels excavated from refuse heaps or pit fill would be underrepresented disproportionately if assessed in percentages calculated on sherd count alone. The Early and Middle Woodland period ceramics in the Upper Ohio Valley are generally extremely friable and susceptible to spalling and erosion from flooding, weathering, freezing and thawing, and modern plowing and other disturbances.

Once the sherds were separated into ware groupings by the temper types or combinations exhibited, they were divided further into plain or smooth and cord-marked surface finish categories. The actual division between the smooth and cord-marked surface finish varieties was often subjective and based upon whether or not a distinct positive plasticine cordage impression could be obtained from individual sherds. Based on the degree of subsequent or secondary smoothing of the primary surface treatment, other classifiers might have consigned a greater or lesser percentage of the “cord-marked” sherds to the smooth category.

All body sherds that preserved both the interior and exterior surfaces were measured for wall thickness to the nearest tenth of a millimeter with digital calipers. The range and mean sherd thicknesses were recorded by temper and surface finish type. Where individual sherds displayed a thickness range of less than 0.6 mm, the extremes were averaged and the mean recorded. If the variability equaled or exceeded 0.6 mm, the minimum and maximum measurements were recorded. Thus, the total number of measurements generally exceeded the number of sherds measured. The standard deviation of each type was also calculated, as this statistic is considered to be an accurate gauge of the "range of variation" in wall thickness within each variety.

Latex casts and occasional plasticine positive impressions were taken of the exterior surfaces of some body sherds to more accurately document the twist direction—either final Z or final S-twist—of the cords employed to roughen the paddles utilized in malleating the walls of the vessels during the manufacturing process. Final cordage twist direction has been demonstrated to be a key diagnostic tool for identifying and delineating ethnic and cultural boundaries (see, e.g., Carr and Maslowski 1995; Johnson 1996, 2001, 2007; Johnson and Speedy 1992, 1993; Maslowski 1984, 1996; Petersen and Hamilton 1984; Petersen et al. 2001; Petersen and Wolford 2000). The casts were analyzed for initial spin, where discernible, and final twist direction, Z or S, as outlined in Maslowski (1973:4-6) and Hurley (1979:5-11). Initial spin and final twist direction were recorded as the cords would have appeared in the positive, which is the prevailing convention in North America, rather than as they appear in the negative on the sherd, the customary norm in Japan.

The relative hardness of sherds was not assessed because the validity and utility of this test is questionable (Phillips et al. 1951:49-50).

Munsell color readings were not recorded for any of the sherds recovered, because of the various factors affecting the color of a sherd's surface (Carlisle 1973; McPherron 1967:50).

Faunal Material Analysis

Identification of the faunal remains from Area 3-South was made to the most specific taxonomic level possible, given the completeness and portion of the bone present. All identifications were made by direct comparison to osteological reference collections.

As is common in zooarchaeology (Driver 1992; Reitz and Wing 1999; Uerpmann 1973), when a bone could not be identified to a taxon more specific than class, it was placed in a size category. Only two size classes were recognized for the Leetsdale bone, large and small mammal. Large mammal corresponds to animals like white-tailed deer, and small mammal corresponds to animals like rabbit and squirrel.

For each bone identifiable to the level of class or to a more specific taxon, the following information, when applicable, was recorded: FS number, provenience information, taxonomic identification, size, anatomical region, element name, side, portion, proportion, epiphyseal/symphyseal fusion, modification (e.g., cut/chop marks, burning, gnaw marks, root

etching), placement of modification, number of fragments, and weight. Additional information and observations were entered into a comments section, if necessary.

To quantify the faunal specimens NISP (Number of Identified Specimens) was used, and for taxa more specific than class, MNI (Minimum Number of Individuals) was also calculated. The use of either NISP or MNI has its drawbacks and can be affected by intensity of fragmentation and sample size. To partially offset the problems associated with these measures, both NISP and MNI were used, when applicable, for the taxa identified. As a general rule for NISP, if two or more fragments could be glued or fitted together, they were counted as one. There may have been some instances where a single bone had been broken into very many tiny pieces but it could not be determined with certainty if all the pieces belonged to a single bone. Given the uncertainty in these instances, the fragments were counted separately.

MNI was calculated using the feature as the unit of calculation. MNI was figured for each species by counting the most frequently occurring element after dividing it into lefts and rights (if applicable). Completeness and portion were taken into consideration.

Paleobotanical Analysis

Paleobotanical analysis was completed for all hand-collected botanical material and botanical materials collected from floated soil samples.

Hand-Collected Samples

These samples were collected by hand during excavation of features. After being received by the analyst, the samples were first placed in fine mesh (0.5 mm) bags and washed gently in plain water to remove the soil adhering to the plant remains and obscuring their diagnostic characteristics. When dry each sample was weighed and sorted into categories (nutshell, wood, seed, other) under a binocular microscope (9X-20X magnification), and each category was counted and weighed.

Flotation Samples

The dried samples were processed as follows. The heavy and light fractions (in many cases the resultant samples were so small that the heavy and light fractions were combined) were first passed through a 2 mm geological screen. The > 2 mm fractions were examined under a binocular microscope, and all charcoal fragments were removed for further analysis. The < 2 mm fractions were examined under at least 15X magnification, but only seeds and diagnostic plant parts were removed. Only charred material was considered to be part of the prehistoric record. All the charred plant parts pulled from the samples were first weighed and then sorted into general categories (wood, nutshell, seeds, and other), which were then each counted, weighed, and identified.

Identifications

Each fragment was identified to the finest possible taxon, based on the presence or absence of diagnostic features. Identification was attempted of all nutshells, seed and “other” fragments, while identification was attempted on a maximum of 20 wood fragments per sample. The wood taxa were identified on the basis of their internal structure. Material was

identified based on comparisons to specimens in a comparative collection and to standard texts on wood and seed morphology (Core et al. 1979; Martin and Barkley 1961; Montgomery 1977; Panshin and de Zeeuw 1970; U.S. Department of Agriculture 1948).

Feature Analysis and Function Determination

The question of how feature morphology can be interpreted, or classified into function has been discussed in the literature (Bursey 2001; Grantz 1986; Petraglia 2002). Typically features are classed as to function by dimension, profile, plan view, and artifacts recovered, with function inferred based on those attributes. Weed (2002) has described types of features found in the region using traditional functional terms.

A second method of feature classification and analysis is based on feature morphology and is exemplified by a study of the features from the Early Woodland period Crawford-Grist Site #2 (36FA262) (Grantz 1986). The site was identified as dating to the Adena Period, based on the presence of Half Moon Cord-marked and Adena Plain grit-tempered ceramics, and two ^{14}C dates (ca. 420-80 B.C.) and is therefore comparable in age to the AB horizon deposits investigated at Area 3-South. It was located in western Fayette County, Pennsylvania, along the Monongahela River, in the Allegheny Plateau. A total of 71 features and 17 post molds were identified at the site. The excavators divided them into nine types. As with Area 3-South, mechanical excavations caused some of the features at 36FA262 to be truncated. Based on plan and profile shape and dimensions, and artifacts within the feature fill, features were divided into shallow basins (three types), irregular basins, U-shaped pits, conical pits (two types), flat-bottomed pits, one burning incident, and post molds.

Bursey (2001) also examined feature forms in his analysis of storage and stored foods in the Northeast, particularly among the Iroquois. He examined the inferred function of pits as storage containers, based on ethnographic and paleobotanical evidence. In particular, large, straight-sided and flat-bottomed pits are usually identified as storage pits, although a case has also been made for them as burial pits and for their use to process nuts for oil. These pits were relatively large and lined with bark or other material as protection from animals and frost. While Bursey's study was concerned with the Iroquois, who lived in longhouses, and whose cuisine included dried domesticated corn, the functional interpretations employed could hold for the Woodland inhabitants of the Northeast as well. Bursey discussed the increasing social complexity and changes in social organization that may be read from the number and placement of these features. His thesis is that storing foodstuffs allows a population to overcome seasonal shortages. In addition, location of storage pits closer to remains of residences may be an indication of types of ownership or control of these surpluses. While at Area 3-South there is no apparent patterning of the location of the features interpreted as possible storage pits (see below), the increase in number of these pits in the Woodland Period indicates that storage of foodstuffs was on the increase.

In his analysis of features, Petraglia (2002) examined distribution of thermally altered stone, or FCR as used in this report. He began by examining the initial assumption archaeologists make–that the presence of these stones in features indicates that they are

remains of cooking hearths. He distinguished between two patterns of spatial distribution: evident and latent. Evident features are those that "retain form after use and site abandonment," while latent patterns "may result from repeated site activities or post-depositional processes that alter original distributions" (Petraglia 2002:244). He further sub-divided the evident features into two categories: single-state and multi-state. Single-state features have one use, such as use as a hearth, while multi-state features have two or more uses. As one example of a multi-state feature, an empty storage pit may have been subsequently used as a trash pit. Multi-state evident features can represent longer occupations of a site. Latent patterns are more difficult to reconstruct, as they can be the result of post-depositional patterning on top of human activity. In addition, latent patterns can result from re-occupations on the same surface, as well as possible increased length of a single occupation. Repetitive processes such as trampling can also alter the original feature pattern. At Area 3-South, because of the extensive flooding and soil movement, these latent patterned features are widespread. The small number of refits (discussed below) is an indicator that these types of patterns are common at the site. Finally, Petraglia examined three Late Archaic to Middle Woodland sites from Pennsylvania and Delaware; the Connoquenessing Site in western Pennsylvania, the Kettle Creek East Site, in north-central Pennsylvania, and the Lums Pond Site, in northern Delaware. The Connoquenessing Site revealed single-state evident features, with well-delimited features. The Kettle Creek East Site had a wider range of evident types. At the Lums Pond Site, large, deep rounded pits were uncovered, and were identified as storage pits. Latent patterns were found at the Lums Pond Site, especially distributions of thermally-altered stone, with no definite boundaries. However, refits were discovered within some concentrations and across units, to indicate that they had been scattered post-depositionally. According to Petraglia, "a spatial association between the thermally altered stone and the subsurface features was implied [from the refits] indicating that hearths may have been situated adjacent to the pits." (Petraglia 2002:260). He concluded that the Connoquenessing Site was used sporadically and non-intensively. At Kettle Creek, the features were found to be single-state, and at Lums Pond, latent patterns emerged.

Lastly, Kent (1999) attempted to separate storage areas from trash areas. Her analysis was based in part on her observations of the storage and trash remains of a historically nomadic and now sedentary group, the Kutse residents of an area south of the Kalahari Game Reserve in Africa. Kent collected data on 247 individual features and compared her findings to archaeological features at a mid-Pueblo II Anasazi site in the southwest U.S. Both sites were sedentary, single-component habitation camps. Kent employed a modified version of the Teachman Information Statistical Measure of Diversity to separate loci. Her conclusion was that the areas with the lowest diversity index were trash deposits, while the areas with higher diversity were storage areas.

The features in Area 3-South were examined using methods similar to those described above, as well as both simple and more powerful statistics to search for patterns that could be used to group features and assign functions. The aim was to infer function based on dimensions and types of artifacts recovered within each feature. In addition, the locations of the features were examined to search for intrasite spatial patterning (discussed below). For these statistical analyses, feature notes, photographs, plan views and profiles were examined

and measured. Attributes used in the analysis included: top elevation, plan view, profile, thickness, width, charcoal presence and amount (none, low, medium, high), reddening (none, low, medium, and high), whether or not a feature was stratified, presence of different artifact classes, debitage counts, and average weight of FCR. Results of the more simple statistical tests are presented in Section C, Results.

As a further examination of the grouping of features, two powerful statistical analyses were conducted; a principal components analysis, and a *k*-means analysis. This was completed for the initially designated 95 features. Ultimately only 78 features were defined as cultural, but all 95 entities initially given feature numbers were included in the statistical analyses in an attempt to aid in determining if they were cultural or non-cultural. Features excluded from these specific analyses lacked the information required, or were clearly disturbed. Results from the principal components analysis were inconclusive and none of the attributes generated significant explanatory power, either individually or in groups. For example, combining four of the attributes explained slightly more than 50 percent of the total variance. Adding a fifth attribute only increased the explanatory power by an additional nine percent. No single attribute accounted for more than 15.9 percent of the total variance.

A *k*-means analysis was also conducted. Based again on examination of field notes, plan views, and profile drawings, 10 nominal terms for plan view and 11 nominal terms for profile were used to classify the morphological characteristics for this analysis. The term "Insufficient data" was used when there was not sufficient visual evidence or there was confused visual evidence for a feature, and the term "Other" was used when the feature did not confidently appear as any other type, nor did it exhibit enough regular characteristics to facilitate the addition of a new term.

Since feature size plays an important role in the inferred function, two additional variables were included in the *k*-means analysis. The thickness of the feature in profile was calculated based on the difference between top and bottom elevations (NGVD). The average diameter of the plan view prior to excavation was also calculated. Where features were not circular in plan, use of the average of the minimum and maximum horizontal dimensions was necessary to simplify this variable. Due to the diverse range in values for these two fields, a coded ranking system was used to reduce the variety. The presence or absence of stratigraphy was the final morphological variable included in the analyses.

Five characteristics governing presence or absence of the most common materials associated with archaeological features were analyzed. The characteristics included those representing an association with fire: presence or absence of charcoal, reddened soil, and FCR; those representing associations with food, in the form of faunal remains; and debitage.

A hierarchical form of clustering was utilized for this analysis using SYSTAT 9 software. A variety of methods were exchanged to produce multiple sets of results, and these results were compared to each other and to the raw data to search for statistically meaningful trends. For each of the classifications run, three sets of variables were employed. The first set included all possible variables. The second set included only the strict morphological variables of profile, plan, average plan diameter and thickness in profile, and presence or

absence of stratigraphy. The last set included the morphological variables excluding the last variable identifying presence or absence of stratigraphy. Again, as with the principal components analysis, results were inconclusive with no meaningful clusters being formed.

The wide diversity in feature shapes (both plan and profile), and sizes (both horizontally and vertically), and the attendant variety of variables examined may have been a prime factor leading to the inconclusive statistical analyses. Since the statistical analyses were less than revealing, a more traditional means of categorizing cultural features was explored. The features were examined simply for their general characteristics and content, and interpreted in a more subjective manner. Examples of categories considered were surface hearth, pit hearth, cooking/roasting pit, post mold, storage pit, and refuse pit. All of the site features were further evaluated for possible function and were found to be one of the following categories:

- Hearth. This term was applied to all features (surface, shallow, or deep) with evidence of *in situ* burning coupled with FCR and wood charcoal. Hearths may or may not have associated artifacts.

- Roasting or Processing Pit. These features typically have dense layers of FCR and/or charcoal. Features with abundant nut and seed remains and or tools associated with these materials, like pitted stones, were identified as nut roasting or processing pits.

- Post Mold. These types of features were generally round in plan view with a profile characterized by straight to slightly sloping sides terminating in a rounded-to-pointed bottom. These are generally small features containing no artifacts or materials to suggest any other function. Normally these would be clustered as they are thought to be related to above ground structures or supports.

- Pit, Indeterminate. This is a feature that is clearly excavated (that is boundaries are well-defined) that may contain charcoal or FCR but does not have any indication of in situ burning and does not, in form or by artifact content, suggest any specific function. These may represent the remains of storage features, trash pits, or other specialized activities.

It quickly became apparent that almost all of the Area 3-South features were fire-related, and most had little or no distinctive characteristics or content to provide a more in-depth interpretation. Ultimately this did not prove any more revealing than the statistical analyses.

Radiocarbon Samples

To aid in answering research questions about site and cultural chronology, carbon samples were collected from site deposits and features when possible and prudent. Recovery efforts were focused on features. In order to minimize the potential for contamination, samples were collected immediately upon identification using tweezers, trowel, or similar tools. They were then placed in foil packets which were then put into zip-closure plastic bags segregated from other collected objects and artifacts. Like all other material remains

found on site, carbon samples were tagged and labeled with provenience information and entered into the project tracking system and database.

Thirteen samples were selected for analysis. Two were analyzed using the AMS dating technique and 11 were analyzed using a standard technique. All material subject to radiocarbon dating was unspecified wood. No paleobotanical analyses were performed on the charcoal prior to radiocarbon dating. Dating was completed by Beta Analytic Inc. laboratories.

Spatial Analysis

Following the approved SOW, formal spatial analysis was conducted on two "living surfaces," or cultural components within the excavations at Area 3-South. Because the Terminal Late Archaic (2BC horizon) and Early Woodland (AB horizon) components contained the densest cultural remains, it was logical to focus the formal spatial analysis on those two cultural components. Furthermore, strata containing Terminal Archaic and Early Woodland materials were excavated in larger, more contiguous blocks compared to strata containing earlier cultural deposits. For the purposes of formal spatial analysis, the soil horizons containing Terminal Archaic and Early Woodland materials were assumed to represent relatively intact "living surfaces." Statistical tests used to examine spatial patterning included variations of Nearest Neighbor, Hodder and Okell's A, and additional clustering tests, including a *k*-means analysis.

Sources Consulted

The primary source guiding formal spatial analysis was Kintigh (1990), which discusses the state-of-the-art of intra-site spatial analysis and evaluates the major methods that archaeologists use in archaeological interpretation. In addition, two essential books devoted to intra-site spatial analysis in archaeology were exhaustively consulted during analysis: *Intrasite Spatial Analysis in Archaeology*, edited by Harold Hietala (1984); and *Intrasite Spatial Analysis in Theory and Practice*, by Hans Peter Blankholm (1991).

Computational Software

Much of the statistical analysis and formal spatial analysis conducted on the artifactual remains from Area 3-South was conducted using *Tools for Quantitative Archaeology*, a commercial software package developed by Dr. Keith W. Kintigh of Arizona State University to satisfy the unique analytical needs of archaeologists. Additional statistical analysis was conducted using SPSS 11.5.0 for Windows. All data were obtained from the Microsoft Access database for Area 3-South, and exported into Microsoft Excel for manipulation.

Components Analyzed

Formal spatial analysis was conducted on two "living surfaces" or cultural components within the excavations. The Terminal Archaic and Early Woodland were the two components selected, because these two cultural components contained the densest collection of cultural remains. Furthermore, strata containing Terminal Archaic and Early Woodland materials were excavated in relatively large blocks compared to strata containing earlier cultural deposits. This is primarily because these two components were found in the

two uppermost strata of the excavation block containing cultural remains. As excavations proceeded deeper, the amount of area uncovered and the volume of soil that was screened were decreased significantly, considerably limiting the application of formal spatial analysis techniques to these remains.

For the purposes of formal spatial analysis, the soil horizons containing Terminal Archaic and Early Woodland materials have been assumed to represent relatively intact "living surfaces." This is a common assumption behind most, if not all, spatial analysis techniques that archaeologists use to evaluate intra-site artifact patterning. Unfortunately, the methods do not allow for clearly determining whether the material remains associated with each component resulted from a single occupation or multiple occupations. The major obstacle that all current methods of spatial analysis cannot satisfactorily overcome is data overlap.

Overlap can take two forms. First, two activity areas within a single temporal occupation may have overlapped, resulting in the superposition, or more accurately, the mixing of material remains from each activity area. Second, temporally distinct occupations in the same location can result in overlapping material remains. In either case, established methods of spatial analysis have difficulty revealing the original material patterning when aerial or temporal overlap has taken place. In any event, all artifacts from the Terminal Archaic and Early Woodland components were analyzed, respectively, as single and distinct assemblages.

Stratigraphic Composition

The soil horizon containing the Early Woodland component was an AB soil horizon and was appropriately designated as the AB horizon. This soil horizon, also relatively homogeneous across the excavation block, was characterized by three slightly different manifestations identified by geomorphic analysis. The different manifestations of the AB horizon were designated as Field Designations F4, F9, and F14. The AB horizon was either directly superimposed over the 2BC horizon (the soil horizon containing Terminal Archaic material remains), or there was a C Soil horizon (Field Designation F6) between the AB and 2BC horizons. The AB horizon also varied approximately 30 cm in depth across the site, lying between 214.93 m and 214.62 m NGVD.

The soil horizon containing the Terminal Archaic component was a BC soil horizon that was designated as the 2BC horizon. The 2BC horizon was fairly homogeneous across the site; however, two slightly different manifestations of this soil horizon (Field Designations F8 and F10) were identified. The F8 and F10 Field Designations differed only slightly and primarily in terms of subtle changes in texture. The 2BC horizon lay between 214.62 m and 214.33 m NGVD.

Artifact Class Definitions

In order to allow for functional and behavioral interpretation of the data, it was necessary to conduct spatial analysis on specific classes of artifacts. The classification system used in this analysis divides the artifact assemblage into mutually exclusive artifact

categories. The following discussion defines each category and discusses the behavioral and functional implications of each.

The classes of artifacts examined during formal spatial analysis included: bifaces/tools, pp/ks, flakes (including whole and proximal flakes), bipolar artifacts, groundstone artifacts, and FCR.

Bifaces/Tools Class

Since so few bifacial artifacts were found, the standard categorical sub-divisions (e.g., reduction stage, discard reason, etc.) were not evaluated through spatial analysis. To increase sample size for the purpose of various spatial analysis techniques, unifacially modified flakes were combined with bifaces to create the bifaces/tools artifact class. These artifacts served primarily as expedient tools. An expedient tool is the simplest of stone tools consisting of a single flake utilized for its sharp edges.

Lithic Debitage

Spatial analysis of lithic debitage focused primarily on whole and proximal flakes, since non-flake debris strongly correlates with flake distribution (Terminal Archaic: $r = .906$, $p < .01$, $n = 120$; Early Woodland: $r = .809$, $p < .01$, $n = 228$). Due to the very similar distribution of flakes and non-flake debris, flake patterning is assumed to be reflective of all lithic debitage patterning. Eliminating the non-flake debris from the chipped stone artifact assemblage simplifies the spatial analysis considerably. Furthermore, since flakes contain much more detailed information pertaining to behavior (method of manufacture, stage of reduction, etc.), the spatial analysis of flakes can reveal patterning that a combined analysis of all lithic debitage would not identify.

Groundstone Tools

Groundstone artifacts were relatively scarce for both the Terminal Archaic and Early Woodland components. As a result, they were combined in the spatial analysis. Thus, the distinct functions of the various groundstone artifacts are not evaluated through spatial analysis. Rather, through combining all groundstone artifacts in the spatial analysis for each component, the general groundstone technology is what was evaluated. In addition to representing a particular stone tool technology, groundstone artifacts are also used to evaluate the relative permanence of a site. Since groundstone artifacts tend to be relatively large and heavy, they are much less common on short-term encampment sites, which are generally associated with more mobile, itinerant populations.

Fire-Cracked Rock

Stones and fragments that show evidence of having been exposed to extremely high temperatures are classified as FCR. This excludes chipped stone artifacts that have undergone deliberate thermal alteration. FCR is typically associated with artificial fire use, though it can result from wildfires as well. FCR is a particularly important artifact class as it is often found in situ and is typically interpreted to represent the location of hearths and/or roasting pits.

Weights, as opposed to counts, are typically used to evaluate the distribution of FCR as the weights are often a much better representation of the actual data. However, in the case of the FCR data for the Terminal Archaic and Early Woodland components at Area 3-South, the counts correlate fairly strongly with the weights with a high degree of significance

(Terminal Archaic: $r = .759$, $p < .01$, $n = 361$; Early Woodland: $r = .782$, $p < .01$, $n = 416$). Since all other artifact classes were evaluated based on their counts, FCR counts (rather than weights) were examined to remain consistent across artifact classes.

Initial Pattern Recognition

Material patterning was evaluated through a combination of methods of spatial analysis beginning with the relatively simple and somewhat subjective examination of distribution maps of various artifact classes. Classed post maps revealing the quantities and densities of the various artifact classes were created to give an overall indication of any patterning that may exist. The distribution of artifact densities was particularly useful during analysis, as it is a method that is unaffected by any bias that may have been introduced from the excavation of differential volumes of matrix in different locations throughout the site.

Cowgill et al. (1984) discuss the advantages of examining artifact contouring, and the spatial analyst, Tim McAndrews, believes that the examination of artifact contouring is absolutely essential to initial pattern recognition. Although this method does not yield statistically significant results, it has been shown to reflect behavioral patterning at least as effectively as more rigorous methods. Furthermore, it helps to evaluate other methods of spatial analysis against the simple contour plots. The variant of *k*-means analysis that was implemented (described below) was evaluated against the original contour plots to evaluate its validity in terms of cluster identification.

In particular, two types of contour plot were generated for each artifact class. Absolute and relative artifact densities were calculated for each grid intersection point (i.e., where four excavations squares come together), and those data were used to generate contour plots to allow for the initial evaluation of artifact patterning.

The absolute and relative artifact densities were calculated following Whallon (1984) and Blanckholm (1991). For absolute densities, the total quantity of each class of artifact for the four adjoining excavation squares was calculated, and then this total was divided by four square meters. This resulted in a vector of absolute density values for each of the artifact classes analyzed at each grid point intersection within the established excavation grid. Relative densities for each artifact class at each grid point were then calculated by adding the vector of densities at each grid point, then dividing each individual artifact class density by the sum of all densities at that point. The resultant values represent the relative proportions of the various artifact classes represented in the four adjoining excavation squares. These data were then used to generate the absolute and relative density contour plots presented in the results

Formal Spatial Analysis Methods

Methods Requiring Point-Provenienced Data

Unfortunately, the classic application of some of the methods of statistical spatial analysis could not be performed on the data including nearest neighbor analysis (and its many permutations), Hodder and Okell's A, and pure locational clustering (conventional k-means cluster analysis). Nearest neighbor analysis is basically an index of spatial patterning. It provides a means of evaluating whether the data are characterized by a patterned

distribution or are reflective of a random distribution. Hodder and Okell's A is often used to examine the relationship between classes of data by calculating intertype distance values (Kintigh 1990:174). Finally, pure locational clustering uses point-provenienced data to delimit within-class clusters. As will be shown below, other effective means of evaluating the relationship between classes of artifacts can be applied to grid-count data, and a variant of pure locational clustering can be used to delimit clusters within individual classes of artifacts.

The analytical methods discussed above could not be conventionally applied because they require point-provenienced data, and the data recovery strategy did not implement systematic point-proveniencing of artifacts. A number of artifacts were point provenienced; however, a high percentage of those artifacts were recovered from features, which are eliminated from the spatial analysis of the material remains from the "living floors." Even more importantly, however, the distribution of point-provenienced data is more a reflection of the excavation habits of specific excavators than a reflection of ancient behavior. A number of different excavators point-provenienced artifacts that they encountered; however, of the many excavators that worked at the site, four of them recorded over half of all point provenienced artifacts.

Variant of Nearest Neighbor, Hodder and Okell's A, and Pure Locational Clustering

In an effort to exhaust all avenues of analysis, the above methods were implemented in an unconventional way to explore potential patterning in the data. These methods were applied to the artifact classes that contained a maximum of one artifact in any one unit. The classes of artifacts from the Terminal Archaic component that satisfied this criterion were bifaces/tools, pp/ks, bipolar artifacts, and groundstone artifacts. The classes of artifacts from the Early Woodland component were bifaces/tools and groundstone artifacts. The coordinates of the grid squares in which the single artifacts were found were assigned to the artifacts themselves, as if they were point proveniences. It is acknowledged that the only condition in which this type of data manipulation would work is where the sample size is very small. In this case, only a handful of units contained a single artifact of the respective artifact classes, while all remaining units lacked such artifacts. Not surprisingly, statistically significant results were not obtained due to the small sample sizes involved. Unfortunately, spatial analysis methods that are reserved exclusively for point-provenienced data are particularly sensitive to sample size, and the results of the exploratory analysis just described were not statistically meaningful.

Unconstrained Clustering

Unconstrained clustering is an analytical method that delimits within-class artifact clustering, and it evaluates the relationship between different classes of artifacts. Sources that outline this particular method (Whallon 1984; Blankholm 1991) claim that it can be applied to grid-count data, and yet these sources only illustrate the method with point-provenienced data. Instead, following Kintigh (1990:194-197) and Gregg et al. (1991), an arguably more effective variant of grid-based unconstrained clustering was implemented, as described in the next paragraph.

Unsmoothed Grid-Based Unconstrained Clustering

Kintigh (1990:194-197) effectively described how an unsmoothed grid-based variant of unconstrained clustering yields useful results. In fact, he argued that this method yields "cleaner" results than other methods of unconstrained clustering that evaluate point-provenienced data (Kintigh 1990:196). Following this method, the Sum Squared Error (SSE) data and graphical plots are powerful tools used in determining the number of clusters represented in the data (Kintigh and Ammerman 1982).

Unfortunately, as Kintigh (1990:193) suggests, it is often desirable to drop units containing counts less than some threshold. Since many of the Area-3 South per-unit counts of even the most abundant artifact classes (i.e., flakes and FCR) were relatively low, low count units could not be dropped, and thus, results were negatively affected by the low density of artifacts recovered from Area 3-South. Furthermore, the data to which Kintigh (1990) applied this method, the famous Mask Site (ethnographically documented by Binford, 1978) lends itself nicely to this form of analysis since the different classes of material culture are relatively discretely distributed. The technique seems far less effective in situations where the most abundant artifact classes are distributed across the entire site, as is the case with flakes and FCR in Area 3-South. As a result, meaningful results were not achieved using this method.

Variant of *K*-Means Cluster Analysis

In an effort to objectively delimit different distributional clusters within artifact classes, a variant of conventional *k*-means cluster analysis was also implemented. It seemed apparent that a traditional *k*-means cluster analysis could be applied to the artifact classes in which the maximum number of artifacts for any excavation unit was one. The coordinates of the units containing only one artifact were assigned to that artifact as a point provenience. Of course, for the artifact classes in which the maximum of artifacts for any unit was one, we are dealing with a very small sample. As discussed above, the drawbacks to this are clear. However, by taking this method a step further, and applying it to all artifact classes, some of the results do seem to reflect real patterns in the data.

The above reasoning was simply applied to the more densely distributed artifact classes. Basically, for units in which multiple artifacts of a particular class were found, the unit's coordinates were applied, as a point provenience, to all artifacts contained within. The result is, in effect, weighting each unit in the analysis (weight being a function of the number of artifacts).

This method was reasoned to be a viable technique based on the following argument. If every artifact were, in fact, point provenienced, an archaeologist interested in the nature of artifact distribution would readily apply a conventional *k*-means analysis to identify patterning and delineate clusters in the data in an effort to reveal patterns of behavior. However, doing so would assume that all of the point-provenienced artifacts were *in situ*. This assumption is tenuous given that after deposition a number of processes could have acted on those artifacts and moved them around (plowing, bioturbation, cryoturbation, etc.). Nevertheless, the point proveniences and artifacts are generally assumed, at the very least, to be close to where the flake originally was deposited. By assigning every point found within a one-meter square unit to that unit's coordinates (or the coordinates at the center of the unit),

we are assuming that the flake moved no more than about 50 cm from its original location. The exact methods described below were implemented and follow the procedure as outlined by Kintigh and Ammerman (1982) and McAndrews et al. (1997:75-78).

The analysis began with an evaluation of the nature of clustering of the various classes of artifacts. In order to evaluate this, the K-MEANS and KMPLT modules in Kintigh's Tools for Quantitative Archaeology software package (1998) were utilized to generate percent sum squared error (SSE) plots for various clustering solutions. The SSE original plot reflects the actual data, and additional random plots are generated for comparative purposes. If the SSE original plot lies within the random plots, then a random distribution is suggested. If it lies above the random plots, the data tend toward an even distribution. Finally, if the original plot lies below the random plots, then the data tend toward a clustered distribution.

The SSE original plot also provided a means of determining exactly how many clusters were represented in the data. An elbow on the graph represents the point at which the SSE value stops dropping rapidly and begins a more gradual descent. It is at that point, at the elbow, where the clearest clusters have been delineated. Once the clusters were identified through *k*-means cluster analysis, they were plotted on artifact density contour maps. These analyses are discussed in the Results section.

Artifact Class Correlation Analysis

Another type of statistical analysis that was applied to the data simply involved calculating Pearson's bivariate correlation coefficient (*r*) for all potential pairs of artifact class. This analysis evaluated whether different artifact classes correlated positively or negatively, or did not correlate in a meaningful way. The patterns revealed through this type of analysis address which artifact classes may have influenced the distribution of other artifact classes. Once such patterns were recognized, artifact distribution maps were consulted to see if the suggested patterns were evident. If clear patterns did emerge, then behavioral models were formulated to explain the positive and/or negative relationships that certain artifact classes shared with others. Again, as with any method of statistical analysis applied to small datasets, results must be interpreted with caution.

Three different representations of the data for the various artifact classes were analyzed using Pearson's r correlation coefficient: raw artifact counts, absolute artifact densities, and relative artifact densities. Raw count data simply involved correlating the total quantities of each class of artifacts found in each one-meter excavation square. Absolute and relative artifact densities were calculated for each grid intersection point (i.e., where four excavations squares come together). The method for determining absolute and relative densities mirrors that discussed above for the absolute and relative density contour plots.

The absolute and relative artifact densities were calculated following Whallon (1984) and Blanckholm (1991). For absolute densities, the total of each class of artifacts for the four adjoining excavation squares was calculated, and then this total was divided by four square meters. This resulted in a vector of density values for each of the artifact classes analyzed at each grid point intersection within the established excavation grid. Relative densities for each artifact class at each grid point were then calculated by adding the vector of densities at

each grid point, then dividing each individual artifact class density by the sum of all densities at that point. The resultant values represent the relative proportions of the various artifact classes represented in the four adjoining excavation squares.

Again, Pearson's r correlation coefficient was calculated using each of the three measures of artifact distribution: raw artifact counts, absolute artifact densities, and relative artifact densities.

Relationship between Artifact Distribution and Cultural Features

Finally, spatial patterns that were identified through formal spatial analysis were examined against the distribution of cultural features that were identified in the respective cultural components. Cultural features provide more detailed evidence concerning behavioral patterning than any other type of archaeological data. Therefore, the distribution of cultural features provided a behavioral backdrop against which spatial patterning revealed in the formal spatial analysis could be evaluated.

C. RESULTS

This section of the report details the results of field work and laboratory analyses. The first part of the section addresses site stratigraphy, chronology, and cultural affiliations. This is followed by an overview of total Area 3-South artifact recovery and feature identification. The third part of this section describes, in detail, the findings by stratigraphic level and cultural horizon.

Site Stratigraphy, Chronology, and Cultural Affiliations

Analysis of site stratigraphy, geomorphology, and cultural material shows that the Area 3-South portion of 36AL480 was suitable for human occupation and use throughout the prehistoric period. Cultural remains that survived post depositional natural and cultural processes date mainly to the Late Archaic and Early Woodland Periods. Isolated artifacts typically associated with earlier and later periods were also found but not in adequate quantity or integrity to warrant lengthy discussion.

Site Stratigraphy

Through a system of sampling and controlled excavations, a total of 175 F-numbers was assigned to discreet strata, cultural features, natural features, and non-cultural anomalies (Appendix 8H). During excavations 14 stratigraphic layers were identified and defined on site by archaeologists and project geomorphologists. Table 8.1 presents a list of these strata organized from the stripped ground surface to the base of deposits. Included in the table are depths; soil descriptions including texture and color; thickness and location on site; and soil generation identifications made by the project geomorphology team. Figures 8.31 and 8.32 show east-west and north-south oriented profiles for the portion of the site excavated within Area 3-South. Basic soil generation terms are defined as follows:

- A Horizon. Typically a surface horizon stable enough for biological activity and a mini-ecosystem consisting of plants, insects, animals, and or fungus to develop. A horizons tend to be darker and more organically rich, or humic, than underlying soils.

A horizons affected by plowing are called Ap horizons. A horizons can be found on the surface or they can be buried (Ab horizon).

- B Horizon. Typically B horizon soils are called "subsoils" as they are located beneath A horizons. They tend to have less organic material and intrusion than the overlying surface horizon(s) and are the location of mineral and clay accumulation resulting from leaching. An AB horizon is a transition zone from the A to B horizon. The addition of a 'w' suffix to the soil symbol indicates a B horizon that has some development of color or soil structure without any apparent illuvial accumulation.

- C Horizon. This may refer to a parent material such as rock which is decaying and forming into soil or, as in the case of Site 36AL480, it refers to sands or gravels deposited by natural processes such as flooding. C horizons are typically but not always found under B horizons. The transition zone between B and C horizons is called a BC horizon.

A, B, and C horizons on site have been numbered sequentially from the surface such that the closest to the surface has the lowest number.

Table 8.1. Site Stratigraphy as Identified during Archaeological Investigations.

F-Number	Depth below Stripped Surface (m)	Description
F3	0 to 0.06 to 0.09	Silt loam to loam Dark brown 7.5 YR 3/4 to 7.5 YR 3.2 1 cm to 9 cm thick Present across block Ap horizon capped by historic fill
F4/F9/14	0.16 to 0.42	Silt loam Brown to dark brown 7.5 YR 4/3 to 4/4 to 7.5 YR 3/4 7 cm to 36 cm thick Called F14 to the west; F9 to the east based on texture (sand content) Present across block except northeast corner AB horizon
F6	0.28 to 0.51	Sandy loam Brown 7.5 YR 4/4 8 cm to 35 cm thick Present across block, thickest on west C horizon
F8/F10	0.42 to 0.69	Sandy loam Brown 7.5 YR 4/4 14 cm to 41 cm thick Present across block 2BC horizon

F-Number	Depth below Stripped Surface (m)	Description
F15	0.65 to 0.80	Sandy loam Dark brown 7.5 YR 3/3 0 cm to 38 cm thick Discontinuous 3Ab1 horizon
F11	0.70 to 0.95	Silt loam to sandy loam Dark brown to brown 7.5 YR 3/3 to 3/4, to 7.5 YR 4/4 5 cm to 30 cm thick Present across block 3Ab2 horizon
F13 Levels 4 to 6	0.95 to 1.35	Silt loam Dark yellowish brown 10 YR 4/4 20 cm to 75 cm thick Present across block 3Bw horizon
F13 Levels 7 to 8	1.35 to 1.7	Silt loam Dark yellowish brown 10 YR 4/4 40 cm to 75 cm thick Present across block 4Bw horizon
F13/F140	1.7 to 2.3-2.8	Silt loam Dark yellowish brown 10 YR 4/4 1.3 m to 1.8 m thick Present across block 5Bw horizon
F167	2.3 to 3.0	Sandy loam to loamy sand Dark yellowish brown to yellowish brown 10 YR 4/4 to 10 YR 5/4 to 5/6, fine 5BC
F172	2.8 to 3.3-3.4	A: 7.5 YR 3/4 to 10 YR 3/4 Dark brown to dark yellowish brown 6AC C: 10 YR 4/6, dark yellowish brown Fine to medium sandy loam 6AC Thickened to the east
F172	3.4 to 3.55	10 YR 4/4 to 4/6, Dark yellowish brown, loamy fine to medium sand Thin to the west; thickened between Unit N233/234 6BC

F-Number	Depth below Stripped Surface (m)	Description
F172	3.45 to 3.75	A: 7.5 YR 3/4 to 10 YR 3/4 Dark brown to dark yellowish brown 7AC C: 10 YR 4/6, loamy sand Dark yellowish brown 7AC Thickened to east
F173	4.55	10 YR 3/6, silt loam Dark yellowish brown Numerous silt and sand lenses 7CB
F174	8.0	7.5 YR 3/4 to 10 YR 3/4, loamy sands Dark brown to dark yellowish brown Stacked incipient A and C horizons to basal gravels at 8 m below datum 8AC

Allostratigraphic Model

Parallel to archaeological investigations, geomorphological studies were being carried out (Schuldenrein et al. 2003) to explain landform formation processes and relate the landforms to each other, correlate strata across the site, date soil strata present on site, and place the site in its environmental context. These studies used an allostratigraphic model in correlating and dating the soil across 36AL480. This model identifies units on the basis of bounding discontinuities. Four discreet allostrata, along with an approximate timeline, were identified (Table 8.2).

Table 8.2. Summary of Area 3-South Allostrata.

Allostratum	Characteristics and Time Period
AU-1	Early Holocene sands Potential for Early Archaic deposits (ca. 11,500 to 6,500 B.P.)
AU-2a	Middle Holocene overbank sands, silts, and deep soils with Middle Archaic to Late Archaic deposits (ca. 6,500 B.P to 3,500 B.P.)
AU-3	Upper Holocene episodic high discharge sands, shallow poorly developed soils Late Archaic to Woodland deposits (ca. 3,500 to 1,000 B.P.)
AU-4	Capping fill, irregular preservation of late prehistoric deposits and historic debris Late prehistoric, historic, modern times (after ca., 1,000 B.P.)

Strata identified during excavations fit within the allostratigraphic model, showing Area 3-South to contain all four of the depositional settings, but not necessarily cultural

occupations. A summary of archaeological strata and how they fit into the allostratigraphic model is presented below, following Schuldenrein et al. (2003).

AU-4

Industrial fill removed mechanically as part of site preparation correlates to the AU-4. This stratum was designated F5 during excavations.

AU-3

The AU-3 allostratum contained four soil generations and contained most of the Area 3-South artifacts and features. It is important to note that not all soils preserved the A-B-C horizons; in some parts of Area 3-South, soils had been removed or displaced by erosion.

The Ap (F3), AB (F4/F14/F9), and C (F6) horizons form the first generation of soils within the AU-3 allostratum. The material was coarse-grained alluvium to suggest episodic flooding that carried a large sediment load and deposited it near the existing stream bank.

The Ap horizon (F3) was a silty loam to loam soil rich in organics and also containing charcoal. Patches of it, containing historic and modern materials mixed with prehistoric artifacts, were identified across the excavation block.

The AB horizon (F4/F14/F9) was present across most of the excavation block occurring as a thicker package in the western portion of the block. However, the AB horizon was absent in the northeast corner. This horizon was assigned three different field designation numbers (F4, F9, and F14) during initial excavations because testing was performed in isolated units, and the soil texture varied slightly across the excavation block. For example, the AB horizon was sandier and coarser in the east side of the excavation area, indicating that these sands were laid down by a different alluvial event from the west side. After trenches spanning the block in both directions were opened, it became clear that the three field designations were in fact assigned to the same soil package. This horizon contained artifacts associated with the Woodland period (including stone tools and pottery), consistent with the allostratigraphic framework.

Horizon C (F6) lay beneath the Ap (F3) and the AB (F9), from 0.28 to 0.51 m below the stripped surface, and was thicker on the west side of the excavation area. Occurrences of this horizon were discontinuous across the area and appear to be overbank sediments, laid down during one single flood event. No archaeological materials of significance were identified in this horizon.

The second soil generation contained within AU-3 was the 2BC (F10/F8). This horizon was identified immediately below the AB horizon in some places; in other locations the AB and 2BC were separated by the C (F6) horizon flood deposits. It was located 0.42 to 0.69 m below the stripped surface and appears to have formed as “a fining upward sequence demonstrating eastward migration along the immediate margins of the stream channel.” (Schuldenrein, et al. 2003: 4-19). This horizon contained artifacts associated with the Terminal Archaic to Woodland transition period.

The 3Ab1-3Ab2-3Bw sequence formed the third soil generation within the AU-3 allostratum. It was located in the lower part of the first meter of controlled excavations and continued into the upper half of the second meter. The uppermost horizon, 3Ab1 (F15) was a discontinuous buried A horizon. Horizon 3Ab2 (F11), also a buried A horizon, appeared across the entire Area-3 South block.

Horizon 3Bw (F13) was also visible across the entire block. The horizon appeared between 0.95 to 1.35 m below the stripped surface, and continued into the second meter of controlled excavations across the block. The presence of secondary clay films suggest repeated floodplain inundation at this time. Artifacts found within the 3Ab1-3Ab2-3Bw sequence are culturally and temporally affiliated with the Late Archaic period.

AU-2

This allostratum included the deepest portions of the 3Bw (F13), 4Bw (F13), 5Bw (F13/F140), and 5BC (F167) horizons. These stacked, well developed B horizons were all characterized as silt loams. Their presence allowed the geomorphologists to reconstruct the landform, which was identified as a long-term stable terrace surface that existed during the Terminal Middle Archaic to Late Archaic Period. Granulometry studies were performed by the geomorphologists as part of this reconstruction.

Over time the B horizons became stacked and thickened due to infrequent replenishment of silts and clays during high flood stages. Flood discharge was evident in the underlying 5BC horizon, which evidenced a weak structure and sorting of the fine sandy deposits. This allostratum represents a higher, drier, and more stable landform significantly above the floodplain, so that the Late Archaic population was able to occupy this area. Artifacts recovered in the AU-2 came from the lower 3Bw and 4Bw. Diagnostics are associated with the Late Archaic Period.

AU-1

This allostratum consisted of lamellar sands and silts, including horizons 6AC (F172), 6C (F172), 7AC (F172), and 7CB (F173), overlying coarse 8AC (F174) deposits. Channel lag gravels were encountered in the lower one meter of the 8AC horizon. The soils in this allostratum are weakly developed and consist primarily of stacked incipient A horizons and flood deposited silts and sands. No temporally or culturally diagnostic artifacts were found in this horizon. A single chert flake was recovered in one of the backhoe bucket loads from the upper portion of the 8AC horizon, but the provenience is questionable.

Chronological and Cultural Affiliation

Temporal periods were assigned to the identified soil horizons based on the following: geomorphology, as discussed above; artifact finds (diagnostic projectile points, prehistoric ceramics); and radiocarbon dating. Table 8.3 summarizes the different lines of evidence that were used to reconstruct the chronology of prehistoric occupation at the site and to assign each soil horizon to a specific time period and cultural tradition.

Table 8.3. Area 3-South Chronological Assignations, ^{14}C Dates, and Diagnostic Artifacts.

Time Period	Geological Horizon	Field Designation	^{14}C Dates	Diagnostic Pottery by Field Designation	Diagnostic PP/Ks by Field Designation
Early Woodland Horizon	AB	F4/F9/F14	Feature 238, A.D. 70-240 Feature 166, 1200-940 B.C. Feature 243, Level 1, A.D. 5 to 340 Feature 243, Level 2, A.D. 120 to 415 Feature 243, Level 3, A.D. 40-230	F4: Adena Plain; Half-Moon Cord-Marked; Watson Cord-Marked; McKees Rocks Plain. F14: Adena Plain; Half-Moon Cord-Marked; Watson Cord-Marked; McKees Rocks Plain. Feature 155: Half-Moon Cord-Marked. Feature 163: Watson Cord-Marked. Feature 177: Half-Moon Cord-Marked. Feature 198: Half-Moon Cord-Marked. Feature 200: Half-Moon Cord-Marked. Feature 238: Adena Plain. Feature 243: Adena Plain, possible Watson Cord-Marked.	F4, Level 3: Genesee, (initial Terminal Archaic, 1900-1060 B.C.) F4, Level 1: Adena ovate (late Early Woodland/early Middle Adena, 455-190 B.C.) F14, Level 1: Manker Corner-Notched (Middle Woodland, 130 B.C.-A.D. 320); Forest Notched, (early Early Woodland, 1080-740 B.C.) F14, Level 2, poss. Forest Notched (early Early Woodland 1080-740 B.C.) F14/9, Level 1, Forest Notched (early Early Woodland 1080-740 B.C.)

Time Period	Geological Horizon	Field Designation	^{14}C Dates	Diagnostic Pottery by Field Designation	Diagnostic PP/Ks by Field Designation
Terminal Late Archaic	2BC	F8/F10	Feature 209, 1430-1270 B.C. Feature 196, 1440-1280 B.C.		F10, Level 1: untyped, similar to Fairchance Notched (possibly Middle Woodland, A.D. 135-530) F6/10, Level 1, untyped, similar to Fairchance Notched (possibly Middle Woodland) F10, Level 1, possible Adena Ovate (late Early Woodland-Middle Adena, 455-190 B.C.) F10, Level 1, Adena or Kramer (either late or early Early Woodland), Lehigh Broad (Terminal Archaic 2060-1580 B.C.) F6/F10, Level 1: Merom Trimble (Terminal Archaic, 1710-1010 B.C.) F10 Level 2, Lehigh Broad-like, and Lehigh Broad (Terminal Late Archaic/2060-1580 B.C.)
Later, Late Archaic (1)	3Ab1	F15	Feature 219, 2470-2210 B.C. Feature 220, 2310 to 2120 B.C. and 2090 to 2050 B.C.		F15, Level 1, Steubenville Lanceolate (late Late Archaic to Terminal Archaic, 2400-1580 B.C.)
Later, Late Archaic (2)	3Ab2	F11	Feature 217, 2450-2140 B.C. Feature 227, 2330-2130 B.C.; 2080-2060 B.C.		

Time Period	Geological Horizon	Field Designation	^{14}C Dates	Diagnostic Pottery by Field Designation	Diagnostic PP/Ks by Field Designation
Earlier, Late Archaic	3BW	F13, Levels 4-6	Feature 244, 3640-3490 B.C.; 3460-3370 B.C.		F13, Level 4, Bottleneck stemmed-like (early Late Archaic, 3770-3000 B.C.) F13, level 6, early Late Archaic, Laurentian tradition 3780-2350 B.C.)
Terminal Middle/Early Late Archaic	4BW	F13, Levels 7-8			
Unidentified	Surface Find				Manker Corner-Notched (Middle Woodland, 130 B.C.-A.D. 320)
Unidentified	Found in wall shaving				Forest Notched-like (early Early Woodland, 1080-740 B.C.)

Overview of Artifact Recovery and Features

This section describes the findings at Area 3-South as a whole, in general terms and is aimed at characterizing the overall data recovery project. This section is followed by detailed discussions of findings organized by soil horizon.

Artifacts

Data recovery excavations at Area 3-South produced a total of 35,359 artifacts consisting of stone, ceramics, glass, metal, industrial waste, floral, and faunal materials. Both historic (*n* = 259) and prehistoric (*n* = 35,100) period artifacts and ecofacts were found. A brief overview of the assemblage as a whole is presented here. Artifacts are discussed in detail by soil horizon (arranged from the most recent to the oldest) in subsequent parts of the Results Section. Specialized study reports are provided as appendices.

Historic Artifacts

Historic artifact recovery can be broadly broken into three groups: industrial waste, architectural debris, and household ceramics and glassware. Historic artifact recovery is summarized in Table 8.4. More details on the assemblage are presented in the section "Ap Horizon and Overburden (Mixed Prehistoric, Historic, and Modern Periods)."

Table 8.4. Summary of Historic Artifact Recovery.

Historic Artifact Type	Count
Industrial	
Slag	120
Coal	25
Subtotal	*145*
Architectural	
Nails	3
Mortar	3
Brick	34
Ceramic drain	1
Flat glass	12
Subtotal	*53*
Kitchen	
Ceramics	14
Glass	35
Bone	12
Subtotal	*50*
Total	**259**

Historic artifacts came mostly from a remnant Ap horizon found sporadically just under the industrial fill. Some material was also found intruding into the underlying horizons and features. Historic materials were recovered as a result of surface collection, site preparation, and unit excavations following the mechanical removal of industrial fill that covered the work area. Minimal historic period remains were also found in soil samples

processed by flotation. All material appears to be associated with historic industrial activity at the site.

Prehistoric Artifacts

Prehistoric artifact recovery includes flaked stone tools and debitage; groundstone tools and implements; other stone objects of indeterminate function such as hematite and mica; FCR; pottery and fired clay; faunal; and floral remains. Prehistoric artifact recovery is summarized in Table 8.5.

Table 8.5. Summary of Prehistoric Artifact and Ecofact Recovery.

Prehistoric Artifact Type	Count
Flaked Stone Tools	
Projectile Points/Knives	48
Bifaces	31
Expedient Tools	8
Cores	118
Debitage	7,865
Groundstone	21
Other stone	76
Fire-cracked rock	11,108
Ceramics	
Pottery	222
Fired clay	133
Faunal Remains	1,084
Floral Remains	14,386
Total	**35,100**

Prehistoric materials were recovered from excavations, flotation, and as surface or isolated finds. Prehistoric artifacts from disturbed contexts total 107, consisting of 59 pieces of debitage, 37 pieces of FCR, three pp/ks, three ceramic sherds, two cores, one biface, one expedient tool, and one groundstone tool. The debitage, FCR, pottery, two pp/ks, cores, and expedient tool from disturbed contexts were found during site clean-up that followed mechanical removal of the industrial overburden. The other pp/k was recovered from the eroding wall of a previous contractor's excavation trench. The biface and groundstone tool were found during mechanical stripping of the second meter of depth.

Prehistoric materials recovered from excavation units and features total 35,025 and these were found in eight of the 13 soil horizons explored. Artifact recovery by soil horizon is presented in Table 8.6.

Table 8.6. Prehistoric Material Recovery by Artifact/Ecofact and Horizon.

	Ap	AB	2BC	3Ab1	3Ab2	3Bw	4Bw	5Bw	8AC
Artifact Type									
Flaked Stone Tools									
PP/K	3	23	13	2		5	1	1	
Bifaces	1	11	4	1	2	12			
Expedient Tools	1	2	1	2		2			
Cores	2	65	7	6	7	31			
Debitage	59	3,524	505	108	108	3,526	29	5	1
Groundstone	1	10	3	3	1	1	2		
Other Stone		50	7	3	8	4	4		
FCR	37	4,603	2,204	1,961	1,863	371	69		
Ceramics									
Pottery	3	218	1						
Fired Clay		133							
Faunal Remains	12	1,071	1						
Floral Remains		12,575	573	818	104	4	312		
Total	**119**	**22,285**	**3,319**	**2,904**	**2,093**	**3,956**	**417**	**6**	**1**

Artifacts are discussed in detail by recovery soil horizon in later parts of the Results section. The Area-3 South assemblage is summarized here by artifact type.

Flaked Stone Tools

Flaked stone tools or tool fragments total 205, consisting of pp/ks (*n* = 48), bifaces (*n* = 31), expedient tools (*n* = 8), and cores (*n* = 118). They were found in all strata bearing cultural materials except the 8AC (one flake of indefinite provenience was recovered during mechanical testing of this 8-m deep soil horizon). Seven flaked stone tools were found in the Ap or disturbed contexts, 101 came from the AB horizon, 25 from the 2BC horizon, 11 from the 3Ab1 horizon, nine from the 3Ab2 horizon, 50 from the 3Bw horizon, and one each from the 4Bw and 5Bw horizons.

Projectile Points/Knives

Forty-eight artifacts identified as whole or partial pp/ks were recovered during excavations. Appendix 8K deals specifically with the pp/k collection and includes a table linking diagnostic tools to Excavation Unit, stratum, type, material, cultural time period and tradition, catalog, and FS numbers. This is followed by completed PP/K Forms for each of the 48 pp/k artifacts recovered. These standardized forms record provenience, tracking numbers, type and date range, shape and segments, measurements, weight, material type, comments, and provide a photo.

Half of the recovered point fragments are associated with known diagnostic types as summarized in Table 8.7.

Table 8.7. Diagnostic Point Recovery by Type, Count, and Cultural Affiliation.

Type	Count	Cultural Affiliation	Date
Manker Corner-Notched	2	Middle Woodland	A.D. 130 to 320
Adena Ovate	3	Early Woodland to Early Middle Adena	130 B.C. to A.D. 320
Forest Notched	8	Early Woodland	1080 to 740 B.C.
Merom-Trimble	1	Terminal Archaic	1710 to 1010 B.C.
Genesee	1	Terminal Archaic	1900 to 1060 B.C.
Lehigh Broad	3	Terminal Archaic	2060 to 1010 B.C.
Steubenville Lanceolate	1	Late Archaic to Terminal Archaic	2400 to 1580 B.C.
Bottleneck	1	Early Late Archaic	3770 to 3000 B.C.
Brewerton Side-notched	1	Early Late Archaic	3780 to 2350 B.C.

Most of the pp/ks were made from Onondaga chert (*n* = 38). Other materials types were Flint Ridge/Vanport chert (*n* = 3), Upper Mercer chert (*n* = 3), quartzite (*n* = 3), and indeterminate chert (*n* = 1). It seems likely that all were derived from locally available Ohio River cobbles. The raw material analysis report is included as Appendix 8L.

Use-wear analysis was conducted on all the recovered pp/ks, and based on this analysis, all of the pp/ks served as knives. Use-wear was apparent on all of them and none had edge angles sharp enough to use for piercing. One trend among the assemblage noted in the analysis is that the older and deeper (Archaic period) tools appear to have served as general utility knives. The Woodland period tools, that is, those found in the AB horizon, appear to be more task specific, displaying characteristics better suited for scraping. The full microwear analysis report is included as Appendix 8M.

Bifaces

Recovered bifaces included both whole bifaces as well as fragments. They were recovered from disturbed contexts (*n* = 1), the AB horizon (*n* = 11), the 2BC horizon (*n* = 4), the 3Ab1 horizon (*n* = 1), the 3Ab2 horizon (*n* = 2), the 3Bw horizon (*n* = 12). All of the bifaces except one were made on Onondaga chert. With respect to reduction sequence, three were indeterminate, 15 were Stage 2, 13 were Stage 3, and no Stage 4 bifaces were represented.

Use-wear studies carried out on the biface assemblage again showed an observable difference between the older and more recent materials. Those associated with Late Archaic occupation of the site tended to have more apparent polish or abrasion than those affiliated with the Early Woodland use of the site. However, it is unclear from the analysis whether any bifaces were specifically manufactured to the current form or if they broke during the manufacturing process and were opportunistically used. In fact, some of the apparent polish and abrasion could be associated with the reduction sequence and be a result of edge or platform preparation before knapping.

Expedient Tools

Eight artifacts classified as expedient tools were found during Area 3-South excavations; one from disturbed soils, two each from the AB, 3Ab1, and 3Bw horizons, and one from the 2BC horizon. All of these were made on Onondaga chert and exhibited signs of use on one or more edges.

Cores

One hundred eighteen cores and core fragments were found during Area 3-South excavations. Cores were distributed among five horizons with 65 from the AB, seven from the 2BC, six from the 3Ab1, seven from the 3Ab2, and 31 from the 3Bw. Two additional core fragments were found during site cleanup after removing the historic industrial fill and overburden. Of these, 114 are Onondaga chert presumably derived from local river cobbles. Three were made of quartzite and one is an unidentified material. Eighty-six were exhausted, and only 18 bore no cortex. A range of cores and core fragments was found, from test cobbles to rejuvenation flakes, and many indicate bipolar reduction techniques.

The core assemblage as a whole suggests that lithic reduction took place on site. All of the cores are associated with cobble or pebble type sources as opposed to being quarried tabular fragments. This, when coupled with the fact that Onondaga chert dominates the assemblage in terms of material type, suggests that cores were by and large obtained locally from Ohio River cobbles and reduced on site. The bipolar technology observed among the assemblage may be related to the use of small river cobbles as this technique is more efficient with smaller cores. Finally; use-wear analysis indicates that bipolar flakes seem to have been used on site to make compound tools.

Debitage

Debitage recovery totaled 7,865 pieces including whole flakes, proximal fragments, other fragments, and shatter. It was found in all of the artifact-bearing strata in Area 3-South. The vast majority of the material was Onondaga chert; Upper Mercer, Flint Ridge/Vanport, quartzite, and unidentified types were found in small quantities, consistent with the flaked stone tool assemblage. Table 8.8 summarizes the findings across strata. This table excludes the 59 flakes collected as part of the surface clean up flowing removal of the industrial fill overburden and a single flake found during deep testing (the 8AC horizon, 8 m below datum).

The debitage assemblage basically suggests that tool manufacture, maintenance, and use occurred on site and that most of the work involved the processing of lithic raw materials obtained from local river cobbles. Technologies included direct hard and soft hammer percussion as well as bipolar reduction. Flakes with signs of use evident to the naked eye are categorized as expedient tools and discussed with the flaked stone tools. The use-wear analysis (Appendix 8M) identified evidence of microliths most likely used in compound tools. Bipolar reduction techniques may have been related to the use of small cobbles and pebbles as cores for the purpose of obtaining flakes for use in these compound tools. Also noteworthy is that while debitage was the most common stone artifact found onsite (with the exception of FCR), the quantity and weight are small. This suggests that prehistoric use of

the site occurred as multiple short term occupations. The low overall counts of other chipped and groundstone tools further support this conclusion.

Table 8.8. Area 3-South Debitage Findings by Horizon.

	AB	2BC	3Ab1	3Ab2	3Bw	4Bw	5Bw	Total
Total	**3,524**	**505**	**108**	**108**	**3,526**	**29**	**5**	**7,805**
Raw Material								
Onondaga Chert	3,494	491	105	103	3,521	28	5	7,747
Upper Mercer	12	3		1	1			17
Flint Ridge/Vanport	9	7		1	1			18
Unidentified	9	4	3	1	3	1		21
Salicified Shale				2				2
Cortex Present	2,289	220	80	64	2853	22	1	5,529
Thermally Altered	2,048	173	27	17	1,464	11	1	3,741
Reduction Stage*								
Primary	427	52	2	9	71	4		565
Secondary	962	140	23	25	170	6		1,326
Tertiary	268	44	3	2	53	1		371
Unidentified	7							

* Detailed level analysis only.

Groundstone

Groundstone tools were found in small numbers during Area 3-South excavations. Groundstone, roughstone, and pitted stones comprise only a small part of the overall lithic assemblage for Area 3-South. Present are items possibly associated with a number of activities: nutting stones, assumed to be for processing nuts which is consistent with a number of features identified and the botanical assemblage; hammerstones and anvils, often associated with tool manufacture; pitted stones which may serve multiple purposes including use in tool manufacture and the processing of plant remains; and net weights (or possibly bola stones), indicating fishing or hunting. The Area 3-South groundstone tool recovery is summarized by type and soil horizon in Table 8.9.

Table 8.9. Area 3-South Groundstone Tool Recovery by Type and Horizon.

Artifact	AB	2BC	3Ab1	3Ab2	3Bw	4Bw	Total
Nutting Stone	2		2	1		2	7
Hammerstone		1			1		2
Anvil		2	1				3
Hammerstone/Anvil	1						1
Net Weight	2						2
Pitted Stone	5						5
Total	**10**	**3**	**3**	**1**	**1**	**2**	**20**

Other Stone

A total of 76 other stone artifacts was recovered and consists primarily of unmodified pebbles and cobbles (67.1 percent). These are interpreted as cultural manuports due to a general lack of natural stone or rock material in the excavated matrices, and the nature of the deposits precluding the natural transport of such items onto this site. Other items of interest include steatite, a soft stone often utilized as raw material for making vessels and pipes (*n* = 5, including a bowl fragment); hematite and ochre (*n* = 8), sometimes used for pigment, and mica (*n* = 5), sometimes used for ornamentation although all of these specimens are unmodified. All of these materials, with the exception of the steatite, occur naturally within the region of this site. A sourcing study was performed on the steatite (Vento and Stahlman 2004), but no particular outcrop could be identified; however, it was suggested that the source is most likely in Chester County, Pennsylvania. The entire recovered Other Stone assemblage is summarized by type and soil horizon in Table 8.10.

Table 8.10. Area 3-South Other Stone Recovery by Type and Horizon.

Artifact	**AB**	**2BC**	**3Ab1**	**3Ab2**	**3Bw**	**4Bw**	**Total**
Unmodified Pebble	25	4	1	7	3	4	44
Unmodified Cobble	2	2	2	1			7
Unidentified	4	1					5
Steatite Vessel	1						1
Steatite Fragments	3						3
Steatite Cobble					1		1
Mica	5						5
Hematite Pebble	1						1
Hematite / Ochre	7						7
Claystone	1						1
Total	**50**	**7**	**3**	**8**	**4**	**4**	**76**

Fire-Cracked Rock

Excavations recovered 11,071 pieces in soil horizons AB through 4Bw, with a total weight of approximately762 kg. The distribution of FCR by soil horizon, count, and weight is summarized in Table 8.11. The FCR recovered from the 4Bw horizon has a noticeably higher average weight, by a factor of approximately four times, than that recovered from any of the other horizons. However, the 4Bw assemblage has a considerably smaller count, thus the average weight is more susceptible to being skewed by a few unusually heavy specimens. Overall the FCR is associated primarily with hearths, and tends to be found in and around concentrations of features in every soil horizon. This is both a factor of how features are defined by archaeologists and how FCR was utilized by the prehistoric inhabitants.

Table 8.11. Area 3-South FCR Recovery by Horizon, Count, and Weight.

	AB	**2BC**	**3Ab1**	**3Ab2**	**3Bw**	**4Bw**	**Total**
Count	4,603	2204	1,961	1,863	371	69	11,071
Weight (g)	308,227	144,277	137,082	130,736	21,145	20,407	761,874

Ceramics

A total of 222 prehistoric ceramic sherds weighing 538.5g and 133 fragments of fired prepared clay surfaces weighing 438.6 g were recovered. All but four of the prehistoric ceramic sherds were recovered from the AB horizon. Three were from the overlying Ap horizon and one was from the underlying 2BC horizon; all four appear to have been displaced from the AB horizon. The ceramic sherds were derived from three strata and eight cultural features. The fragments of fired prepared clay surfaces or floors were recovered from two features within the AB horizon. Both were relatively deep pits displaying multiple internal lenses representing successive use and filling episodes. Fourteen temper types in 20 combinations were defined. Types of pottery identified include Adena Plain, Half-Moon Cord Marked, Watson Cord-Marked, and McKees Rocks Plain, all associated with the Early Woodland period. A discussion of all prehistoric sherds and prepared clay feature floor fragments is presented in the AB horizon section; however, the four sherds of suspect origin are also briefly presented in their respective horizon discussions in order to maintain an accurate accounting of where items were recovered. The full analysis report is included as Appendix 8N. Additionally, one piece of possible daub was recovered from the first level of the AB horizon.

Faunal Remains

A total of 1,084 bone and mussel shell fragments was recovered from non-feature contexts within eight units and from four features. The assemblage is highly fragmented and calcined. The majority (98 percent) of the remains could not be identified to the class level due to poor preservation. Deer and rabbit are the only two taxa recognized. The vast majority of faunal remains (98.5 percent) were recovered from the AB horizon (n = 1,071), although 12 were found in the Ap horizon and/or disturbed contexts, and one piece was found in the 2BC horizon. Given the presumed potential of surrounding ecosystem, it seems doubtful that the recovered assemblage is representative of the full suite of animals exploited by the prehistoric inhabitants.

Floral Remains

Floral remains were both hand collected and recovered as a result of flotation. A detailed analysis of the botanical materials is included in Appendix 8P. Wood, nut shell and meat, and seeds were found along with small quantities of unidentifiable or unknown materials. A summary of the type of remains found and how they were collected is presented in Table 8.12.

Table 8.12. Area 3-South Botanical Material Types by Collection Method.

Paleobotanical Materials	Hand Collected	Flotation	Total
Wood	57	6,120	6,177
Nutshell	1,089	6,314	7,403
Seeds	14	425	439
Other	21	346	367
Total	**1,181**	**13,205**	**14,386**

Fourteen different types of wood were identified in the assemblage including hickory, walnut, honeylocust, cherry, maple, oak, elm, conifer, sycamore, and chestnut with the first three amounting to almost half the assemblage. All of these species are common to the region and would have been readily available to the prehistoric inhabitants. A generalized approach to wood collection and use is suggested by the varied data. These trees grow in a variety of settings, but all tend to be shade intolerant, thriving in canopy openings, at forest edges, or in early successional stages of forest growth (Johannessen, Appendix 8P, this report).

The nut assemblage is dominated by walnut and butternut, with hickory, acorn, and hazelnut found in much smaller quantities. Recovered seeds include those from goosefoot and knotweed, both part of the Eastern Agricultural complex, as well as honey locust, poke, and leadplant, plus some which could not be identified. Mustard seeds, native to Eurasia, were also found and are interpreted as modern contamination.

Botanical remains were recovered from all horizons bearing cultural material except the disturbed Ap and the 5Bw. Total count and number of involved contexts is summarized in Table 8.13.

Table 8.13. Area 3-South Botanical Recovery by Horizon.

	AB	**2BC**	**3Ab1**	**3Ab2**	**3Bw**	**4Bw**	**Total**
Count	12,575	573	818	104	4	312	14,386
Contexts	25	9	4	7	2	1	44

Features

Features numbers were assigned to 117 anomalies during the field work. These anomalies were excavated in accordance with feature protocols as outlined in Section B.

Subsequent analyses categorized these anomalies into two groups—cultural features and non-cultural anomalies. The Cultural Features category is restricted to those anomalies that retain integrity and are, with certainty, a result of deliberate human activity at the site during prehistoric times. Non-cultural anomalies consist of anomalies that are a result of natural processes such as root or rodent activity, or tree falls. In some cases, natural processes may have completely disturbed cultural features and these types of anomalies were eliminated from further analysis based on a lack of integrity. Of the 117 anomalies initially identified and treated as features in the field, 78 have been analyzed as cultural and 37 have been identified as non-cultural. In addition, two feature numbers were assigned to components of larger features (Feature numbers 201 and 205).

Later sections of this report discuss cultural features in depth. Non-cultural features are also briefly described as a matter of record. Table 8.14 identifies, by feature number, those features identified as definitively cultural and therefore subject to further analysis and discussion, and non-cultural anomalies. It should be noted that Feature numbering for the Area 3-South data recovery project began at 151.

Table 8.14. Cultural Features and Non-Cultural Anomalies.

Cultural Features	Non-Cultural Anomalies
151, 152, 153, 154, 156, 157, 158, 159	155
161, 162, 163, 164, 165, 166, 168, 169	160, 167
170, 171, 172, 174, 175, 176, 177, 179	173, 178
180, 181, 182, 184, 185, 187	183, 186, 188, 189
192, 194, 195, 196, 197, 198	190, 191, 193, 199
200, 202, 204, 206, 207, 208, 209	201, 203, 205
210, 211, 212, 214, 215, 216, 217, 219	213, 218
220, 223, 224, 225, 226, 227	221, 222, 228, 229
232, 237, 238	230, 231, 233, 234, 235, 236, 239
240, 242, 243, 244, 245, 246, 247, 248, 249	241
251, 252, 256, 258, 259	250, 253, 254, 255, 257
261, 262, 265, 266	260, 263, 264

Cultural features were found in six horizons as summarized in Table 8.15. Features were most prevalent in the AB horizon (49 percent) followed by the 2BC horizon (18 percent), the 3Ab2 horizon (17 percent), and the 3Bw horizon (10 percent).

Table 8.15. Cultural Features by Horizon and Cultural Affiliation.

Horizon and Cultural Affiliation	Count	Feature Numbers
AB Horizon, (F4/F9/F14) Early Woodland	38	151, 154, 156, 157, 158, 159 161, 162, 163, 164, 165, 166, 168, 169 170, 171, 172, 174, 175, 176, 177, 179 180, 181, 182, 184, 185 192, 194, 195, 198 200, 237, 238 240, 242, 243, 258
2BC Horizon (F8/10) Terminal Archaic	14	152, 187, 196, 197 206, 207, 208, 209, 210, 211, 212, 214, 215 259
3Ab1 Horizon (F15) Later, Late Archaic (1)	3	202, 219, 220
3Ab2 Horizon (F11) Later, Late Archaic (2)	13	153, 204, 216, 217, 223, 224, 225, 226, 227, 246, 247, 248, 249
3Bw Horizon, (F13, Levels 4-6) Earlier, Late Archaic	8	232, 244, 245, 256, 261, 262, 265, 266
4Bw Horizon, (F13, Levels 7-8) Terminal Middle Archaic/Late Archaic	2	251, 252

Note: Features 166 and 172 may in fact be associated with the 2BC horizon but were identified in the field during AB horizon excavations.

Features were examined based on shape, form, location, and contents in an effort to answer research questions pertaining to site settlement patterns, subsistence and seasonality practices, and site chronology. Shallow and deep basins, conical, and amorphous shaped pits were identified. Many of these contained mixes of artifacts, wood, FCR, and botanical remains indicating possibly generalized and multiple uses including cooking and processing of food and plants, and possibly for heat treatment of lithic raw material. Others may have been used for storage or trash disposal; however, no evidence specific to the use as storage pits was identified. Some basic functions have been assigned to the Area 3-South features based largely on the presence or suggestion of *in situ* burning and accompanying artifacts. Most of the features found were hearths (n = 63), that is they contained FCR and evidence of *in situ* burning and few artifacts, typically including some combination of debitage, pottery and botanical remains. Other types found include indeterminate pits (n = 6); post molds (n = 5); nut processing or roasting features (n = 3); and a cache of pebbles arranged in a circle.

The features collectively suggest reliance on nut mast more so than any other food source, and that processing these nuts was an activity that occurred on site from the early Late Archaic through the Early Woodland periods. Eastern agricultural complex seeds were also found indicating, possibly, some level of horticultural activity. In looking at form and function, no patterning useful in determining internal site structure was identified. In comparing Area 3-South to other sites, pit features of indeterminate function are well represented in the Early Woodland and Archaic periods (Weed 2002). Limited information can be gleaned from the features in terms of settlement patterns, subsistence strategies, seasonality, or site function. A total of 13 charcoal samples taken from features was submitted for radiocarbon dating. The results by soil horizon, feature, and sample are provided in Table 8.16. Figure 8.33 shows the results in a timeline.

Table 8.16. Summary of Horizons, Features, and Radiocarbon Dates.

Horizon and Cultural Affiliation	**Feature Number**	**Conventional Date**	**Calibrated Date**
AB Horizon, (F4/9/14) Early Woodland	Feature 238	1860 ± 40 B.P.	A.D. 70 to 240
	Feature 243	1860 ± 40 B.P.	A.D. 5 to 340
	Feature 243	1760 ± 60 B.P.	A.D. 120 to 415
	Feature 243	1890 ± 40 B.P.	A.D. 40 to 230
	Feature 166	2890 ± 40 B.P.	1200 to 940 B.C.
	Feature 172	3030 ± 40 B.P.	1400 to 1100 B.C.
3Ab1 Horizon (F15) Later, Late Archaic (1)	Feature 219	3870 ± 40 B.P.	2470 to 2210 B.C.
	Feature 220	3780 ± 40 B.P. (AMS)	2310 to 2120 B.C.; 2090 to 2050 B.C.
3Ab2 Horizon (F11) Later, Late Archaic (2)	Feature 217	3830 ± 40 B.P.	2450 to 2140 B.C.
	Feature 227	3790 ± 40 B.P.	2330 to 2130 B.C. 2080 to 2060 B.C.
3Bw Horizon, (F13) Earlier, Late Archaic	Feature 244	4730 ± 40 B.P. (AMS)	3460 to 3370 B.C. 3640 to 3490 B.C.

Note: Features 166 and 172 were excavated as part of the AB horizon but may in fact be associated with the underlying 2BC.

Results by Horizon

Ap Horizon and Overburden (Mixed Prehistoric, Historic, and Modern Periods)

Summary

Soil Components

The prehistoric assemblage from the Ap horizon and industrial disturbance is minimal in number and clearly no longer in context. Historic artifacts were found mixed with prehistoric artifacts in three soil horizons; the industrial fill that capped the project area, a remnant Ap horizon located just beneath the industrial fill, the AB horizon containing Early Woodland period remains, the 2BC horizon containing Terminal Archaic remains, the 2Ab1 and 3Ab2 horizons containing later Late Archaic remains, and the 3Bw containing earlier Late Archaic remains. Nearly all the industrial fill and the Ap horizon were found to be disturbed by modern and historical activity; that is, they are not intact nor do they retain their original integrity. The presence of historic materials in the AB horizon can easily be attributed to rodent activity, root disturbance, and other pedoturbation, as well as some amount of modern disturbances. The presence of minimal historic artifacts (n = 19) in the underlying horizons may be a result of various forms of pedoturbation, but just as likely those artifacts may have been introduced during one of the flash flood events that occurred during excavations or by the heavy machinery during one of the mechanical stripping events. Given the identified age and intact nature of the prehistoric components and their encompassing stratigraphy, it is apparent that all of the historic artifacts originated in the industrial fill and Ap horizon above the AB horizon. Therefore, the entire historic artifact assemblage is presented here for the sake of discussion.

Artifacts, Ecofacts and Features

Historic to modern period artifact recovery totaled 259 pieces, including industrial waste, architectural debris, kitchenwares, and a few faunal remains. No historic features were identified. The historic component to 36AL480 is, in this portion of the site, disturbed and retains no research potential.

Chronology

Recovered prehistoric artifacts range in date from the Early Woodland to the Late Woodland. The historic period artifacts range in potential date from the 1700s to modern times, and there is no apparent link between the depth or elevation of recovery and temporal affiliation of artifacts. Historic period artifacts in Area 3-South lack useful context, as they have been severely disturbed through historic and modern land use.

Prehistoric Artifact Recovery and Analysis

A sum of three other pp/ks were recovered and may be from destroyed Woodland period components. One is an extensively retouched Manker Corner-Notched pp/k (Figure 8.37) of Flint Ridge/Vanport chert (Catalog no. 2981.1) that was a surface find. Typically Manker points are attributed to the early Middle Woodland period (Justice 1987). Another

unprovenienced artifact (Catalog no. 1600) was recovered during wall shaving of a backhoe trench, and was identified as a hafted scraper on a retouched Forest Notched-like pp/k (Figure 8.37) of Onondaga chert, dating to the early Early Woodland period (Justice 1987; Mayer-Oakes 1955). Finally, a narrow ovate knife of Onondaga chert (Catalog no. 1616), of unidentifiable cultural and chronological context, was recovered from the industrial fill layer.

Other lithic artifacts include two cores (one spheroid and one bifacial) both of Onondaga chert, one unifacially utilized expedient tool of Onondaga chert, and 59 lithic debitage (58 of Onondaga chert and one of Upper Mercer chert). Finally, three prehistoric ceramic sherds were recovered from the Ap horizon. One is a mixed quartz and igneous rock-tempered cord-marked sherd attributable to Mayer-Oakes' (1955) Middle and Late Woodland period Mahoning Cord-Marked type. The other two are chert tempered but are too eroded to ascribe a particular ceramic type or temporal period.

Historic Artifact Recovery and Analysis

For the purposes of analysis and entry into the database, artifacts were identified primarily by the material from which they were made, manufacturing method, function, and decorative techniques. All of these factors contribute to an artifact's ascription of age and use in daily life. The most significant numbers of artifacts were found to fall into three main categories—industrial waste, architectural debris, and kitchenwares (objects used in food and beverage preparation, storage, or consumption). The remaining few objects are placed into a miscellaneous category. Much of the historic material is likely associated with the Harmony Brickworks or other light industry facilities that had operated at or near this locale.

Industrial Waste

The most frequently occurring single component of the historic assemblage falls within the category of slag, a general class identified as the waste byproduct of production involving heating, especially in the smelting of metallic ores. The artifacts classified as slag from this project fell into three general categories: iron slag, coal slag, and a slag-like substance that for the purposes of cataloguing has been identified as glass slag. Fourteen artifacts were identified as iron slag, two as coal slag, and 12 objects as glass slag. Iron slag occurs as a vitreous byproduct of iron-working. Coal slag, also termed "clinker" in archaeological usage, is a conglomeration of the incombustible impurities left after the burning of coal which, no longer retaining the properties of coal, is no longer classified as such. The substance identified as glass slag was an olive green, beige, or gray glossy and glass-like substance most likely either associated with glass production, or used in brick-glazing. In addition to slag, 13 pieces of utilized (burned or partially burned) coal were identified.

Several very small fragments of historical artifacts were extracted from the flotation analysis as well, including 49 fragments of iron slag, 43 fragments of coal slag, and 12 fragments of unutilized coal; the majority of these fragments from flotation were less than 1 mm in size.

Architectural Debris

Of the 56 artifacts classified as architectural in origin or function, three nails, 11 fragments of window glass, three mortar chunks, and 34 brick fragments were recovered. The brick fragments are all small pieces that are either rounded or weathered and exhibit no intact outer surfaces of the original brick. No larger portions of bricks were recovered. The nails recovered were so highly corroded that only one could be identified with certainty, and that was a wire nail. Wire nails were first manufactured after 1850 (Edwards and Wells 1993), though the nail recovered appeared to be quite modern. One other nail fragment, though corroded, appeared to have a spatulate tip, suggesting it is a wrought nail, thus dating up to 1790, though early cut nails can exhibit a hand-wrought head and tip until ca. 1815.

During excavation one fragment of lime mortar was recovered. Lime mortar is often of modern origin, and unlike the shell mortar of the seventeenth and eighteenth centuries in which oyster shell was often used as the alkaline component of the mortar. Two additional mortar fragments were discovered during the pottery analysis. One fragment of ceramic drainpipe was recovered, also classified as architectural in purpose. Of the 12 fragments of flat glass identified as window glass, the majority were modern glass. One fragment of crown glass was identified. Crown glass is a hand-blown form of window glass common from the late eighteenth century through much of the nineteenth century (Whelan 1986). Six fragments of window glass were identified as modern plate glass, due to their greater thickness and highly polished external surfaces. The remaining five fragments were not identified by manufacture method due to the level of patination or their small size, though they appear to be cylinder glass which dates up to the first quarter of the twentieth century (Scharfenberger 2004). Though window glass was one of the most frequently occurring architectural finds in the historical assemblage, the nature of window glass discourages its use as a dating tool except under certain circumstances or with the presence of specific portions of the original pane (as discussed by Jones and Sullivan 1989).

Kitchenwares

Glass and ceramic sherds almost exclusively comprise the kitchenwares component to the historic artifact assemblage. In addition one bovine bone with saw marks was also recovered.

Glass recovery totals 35 artifacts. Five fragments were identified as modern machine-made glass, primarily brown, green, and clear beer, soda, and whisky bottle glass. Fifteen additional fragments exhibited mold seams, embossed lettering, or portions of molded designs, and thus could be identified as mold-manufactured (molded) containers, though because the majority of these were small body sherds rather than rim, neck, shoulder, or base sherds, their functions were unidentified except as probable beverage containers. None were identified specifically as drinking vessels. Twenty sherds were slivers of clear and aqua glass that were unidentifiable in function and manufacture technology, except as bottle glass or miscellaneous containers. Two fragments belonged to a yellow-hued, small cylindrical bottle with an approximate (extrapolated) base diameter of 2 inches; this was likely a perfume (personal toiletry) or pharmaceutical bottle. Three fragments of dark olive green hand-blown wine bottle glass were recovered, one heavily vitrified mouth fragment

and two body fragments. One rim fragment of a mason jar was found, and three fragments of milk glass canning jar lids were recovered, one fragment exhibiting the letters 'YD.' Mason first patented his canning jar in 1858, and after 1865 a cap of opaque white "milk" glass replaced the zinc metal cap of the original design, so these fragments of jar and lid date to post-1858 and post-1865 respectively (Toulouse 1977).

Fourteen fragments of ceramic vessels and tableware were discovered. Of these, there were three fragments of whiteware, two fragments of ironstone, one fragment of creamware, one fragment of yellowware, one fragment of Rockingham, one fragment of refined redware, one terra cotta flowerpot fragment, one fragment of gray-glazed coarse earthenware, two small salt-glazed sherds of buff-bodied stoneware, and one Staffordshire brown stoneware sherd.

The whiteware fragments were all undecorated body sherds, two being very small chips that could not be identified as either hollow-ware or flat-ware, and the one remaining fragment was a rather thick hollow-ware sherd, most likely from a bowl. The generally accepted whiteware date range is 1820 to ca. 1900 (South 1977). One of the two ironstone sherds is a hollow-ware rim sherd with molded decoration, most likely from a serving bowl or tureen, the other an undecorated body sherd most likely from the same vessel. Both fragments appear to be of the transitional period, due to their slightly blue hue resulting from the addition of cobalt to the glaze, and thus this dates them close to the beginning of the range for ironstone of 1840 to 1900 (Wetherbee 1980).

The creamware sherd was an undecorated hollow-ware body sherd, dating from approximately 1762 to 1820 (South 1977). This fragment was found in a rodent burrow, according to the field notes, so its context is uncertain. The yellowware fragment was an undecorated body sherd and its thin and finely curved shape suggests it was used as tableware rather than for more utilitarian purposes. Undecorated yellowware first appeared in 1830, and yellowware in general was produced until approximately 1900 (Ketchum 1987). The two fragments of Rockingham, which is essentially a yellowware ceramic identified by its mottled brown glaze, most likely belonged to a utilitarian beverage container, probably a pitcher, for one fragment retains the base of a broken off handle, and the sherds are quite thick and curved. Rockingham was often produced in the same factories as yellowware and in the same forms, and dates from 1845 to ca. 1900 (South 1977).

The fragment of Staffordshire brown stoneware was the largest and most interesting ceramic sherd in the assemblage, dating between 1700 and 1800 (South 1977). The fragment is a buff-bodied hollow-ware body fragment exhibiting on its exterior a white glaze above an unglazed combed annular ring, which in turn is above a rich chocolate-brown iron-oxide glaze. The brown glazing pattern is imperfect and irregular on the exterior surface. Below the brown glaze is a diagonal hand-incised line. The interior of the vessel is glazed the same brown on its entirety, and has two hand-applied, down-tooled rings of clay (the meeting point of the two ends of one ring is visible). The crude nature of the manufacture and decoration of the vessel indicates that it was probably utilitarian in function and thus most likely a beverage (beer) container, probably a jug, rather than tableware. One other buff-bodied sherd exhibited a black lead-glazed interior and a white salt-glazed interior. One more buff-bodied and one gray-bodied sherd were recovered, both small salt-glazed hollow-ware body

sherds lacking any other decoration, most likely utilitarian in nature, and dating from 1720 to 1770 (Mullins 1988).

The redware was a small body fragment of refined paste exhibiting a black lead-glazed interior and greenish-gray flecked exterior, identified as Jackfield-type redware. Jackfield is normally characterized by black lead-glaze on its interior, and dates from ca. 1700 to 1830 (Barker and Halfpenny 1990), though the peak of popularity for refined redware overall is generally accepted as 1800 to 1840. Jackfield is most commonly associated with tea wares and pitchers, but this redware fragment was small and the exact function of the original vessel unknown.

In addition, 14 bone fragments and nine niaide valve shell fragments were found and interpreted as being associated with historic to modern times. This includes two large bone fragments, one with cut marks, which probably represent livestock. The nine shell fragments form a single valve of a freshwater mussel.

Feature Identification and Analysis

No historic features were excavated in this upper horizon during the Area 3-South data recovery project.

AB Horizon (Early Woodland Period)

Summary

Stratigraphy

The AB horizon in Area 3-South comprised three field designations, F4, F9, and F14. In the absence of the geomorphology team during initial control unit excavations, these three separate designations were assigned in different isolated excavation units across the site. Subsequent trenching and consultations with project geomorphologists identified the F4, F9, and F14 soils as belonging to a single AB horizon. The AB horizon was encountered vertically from 0.16 m to 0.42 m below datum and ranged in thickness from 7 cm to 36 cm. It was present across the whole excavation block except in the northeast corner. In texture the AB horizon was a silt loam, and color was described as brown to dark brown (7.5YR 3/4, 7.5YR 4/3, and 7.5YR 4/4).

Artifacts, Ecofacts and Features

Artifact recovery totaled 22,284 individual items as summarized in Table 8.17. A total of 53 feature numbers was assigned during excavations however subsequent analyses revealed only 38 could be attributed to cultural activity. Feature number assignments and final analysis are summarized in Table 8.18.

Table 8.17. Summary of Artifact and Ecofact Recovery from the AB Horizon.

Artifact	**Count**
Flaked Stone Tools	
Projectile points/ knives	23
Bifaces	11
Expediency tools	2
Cores	65
Debitage	3,524
Groundstone	10
Other stone	50
FCR	4,603
Ceramics	351
Faunal remains	1,071
Floral remains	12,575
Total	**22,284**

Table 8.18. Summary of AB Horizon Feature Designations.

	Count	**Feature Number**
Prehistoric cultural features	38	151, 154, 156, 157, 158, 159 161, 162, 163, 164, 165, 166, 166, 168, 169 170, 171, 172, 174, 175, 176, 177, 179 180, 181, 182, 184, 185 192, 194, 195, 198 200, 237, 238 240, 242, 258
Consolidated with another	2	205 (176), 201 (200)
Historic feature or disturbance	1	239
Non-cultural anomalies	12	155 160, 167 173, 178 183, 189 190, 191, 193 236, 241

Feature types identified in the AB horizon include hearths of indeterminate or generalized function (*n* = 26), indeterminate pits (*n* = 4), post molds (*n* = 5); three nut processing features, two of which are large and produced the preponderance of nut and seed remains found during Area 3-South excavations

Artifacts and features found on site indicate multiple short- to medium-term generalized site visits by small groups. Activities that occurred near the site must have included collection of local river cobbles for both use as tools themselves and for making other tools, collection of firewood, and collection of nuts and seeds for consumption. Hunting is also suggested by the presence of deer and rabbit bone, although none of the pp/ks on site was specifically identified as having been used as a projectile tip. Activities that occurred on site include stone tool manufacture, maintenance and retouch, and use. Direct and bipolar percussion reduction methods were used. Specialized nut processing, primarily walnuts, is indicated by two and possibly three of the features.

Chronology

The AB horizon is associated with the Early Woodland Period. This is based on stratigraphic positioning, diagnostic projectile points and ceramics, and radiocarbon dating. Weed (2002) provides a date range of 1,000 B.C. to 100 A.D. for the Early Woodland period. Potential dates for the Area 3-South AB horizon diagnostic materials range from 1,060 B.C. (end of range for the Genesee-type pp/k) to 130 B.C. Period (earliest date for Manker Corner-Notched points). Radiocarbon dates obtained from AB horizon features range from 1,100 B.C. to 120 A.D. Early Woodland pottery types were found across the excavation block and in features. Thus the AB horizon is interpreted as being associated with Early Woodland occupation. Additional details are presented below. Diagnostic materials are summarized in Table 8.19.

Table 8.19. Diagnostic Artifacts Recovered in AB Horizon.

Artifact	Date	Cultural Affiliation
Projectile Points		
Forest-Notched	ca. 1080 to 740 B.C.	Early Woodland (early)
Adena ovate	ca. 455 to 190 B.C.	Early Woodland (late)
Genesee	ca. 1900 to 1060 B.C.	Adena Period (early to middle)
Manker Corner-Notched	ca. 130 B.C. to A.D. 320	Middle Woodland (early)
Pottery		
Half-Moon Cord-marked	ca. 520 to 180 B.C.	Early Woodland (late)
Watson Cord-marked	ca. 180 B.C. to A.D. 530	Early Woodland (late) to Middle Woodland *
Adena Plain	ca. 645 B.C. to A.D. 150	Early Woodland
McKees Rocks Plain	no direct dates	Early Woodland

* The morphology of these specimens suggests an Early Woodland position in the development of Watson ware.

Half-Moon Cord-Marked ware has been identified as the earliest pottery within the Early Woodland sequence (GAI Consultants, Inc. 2003). The earliest radiocarbon date recorded for this type is a sandstone-tempered variant from a firepit evidencing approximately 300 years of reuse at Meadowcroft Rockshelter (36WH297) on Cross Creek in Washington County, Pennsylvania; associated wood charcoal dated to 865 B.C. $\pm$ 80 (Johnson 1982:154; Stuckenrath et al. 1982:80, Table 2). Elsewhere in the lower Upper Ohio Valley, Half-Moon Cord-Marked ware has been radiocarbon dated to 520 B.C. $\pm$ 120 at the Ohioview site (36BV9), located downstream from the Leetsdale site on the floodplain of the Ohio River (Alam 1961:73; 1976:36; Stanley W. Lantz 2009, pers. comm.), and to 450 B.C.

± 55 and 420 B.C. ± 55 on samples derived from two features at the deeply stratified 36WM601 site on the Youghiogheny River floodplain (Ballweber 1989: 84; 86-88; 90, Table 8).

A hearth containing two Half-Moon and two limestone-tempered Watson Cord-Marked sherds was present at the Lower Georgetown site (36BV29), located on the Ohio River downstream from the Ohioview site. Half-Moon Cord-Marked sherds in association with Adena Plain sherds were dated to 480 B.C. ± 55, 460 B.C. ± 60, and 420 B.C. ± 150 at the upland Crawford-Grist No. 2 site in the Monongahela River Valley in Fayette County, Pennsylvania (Grantz 1986:18, Table 4). Grit-tempered Adena Plain ceramics are the most common type of pottery found at Adena sites throughout the lower and middle Ohio River valley (GAI Consultants, Inc. 2003).

Radiocarbon dates were also obtained from four of the larger features identified within the AB horizon—Features 166, 172, 238, and 243. The results are provided in Table 8.20.

Table 8.20. AB Horizon ^{14}C Dates.

Feature/Sample Number	Conventional ^{14}C Date	Calibrated Date
238 / Beta-176120	1860 ± 40 B.P.	A.D. 70 to 240
243, Level 1 / Beta-182457	1860 ± 70 B.P.	A.D. 5 to 340
243, Level 2 / Beta-182458	1760 ± 60 B.P.	A.D. 120 to 415
243, Level 3 / Beta-182459	1890 ± 40 B.P.	A.D. 40 to 230
166 / Beta-159894-	2890 ± 40 B.P.	1200 to 940 B.C.
172 / Beta-182450	3030 ± 40 B.P.	1400 to 1100 B.C.

Diagnostic tools and pottery found at Area 3-South are consistent with assemblages found at other regional Early Woodland Period sites. Some of the ^{14}C dates from Area 3-South are slightly more recent, suggesting that the Early Woodland continues temporally farther than had been previously thought, although Weed (2002) does point out that the Thorpe site (36AL285) produced a date of 1900 ± 60 B.P. The exceptions at Area 3-South are the very early dates calculated for Feature 166 and Feature 172. It is postulated, and justified below, that these two features truly originate in the underlying 2BC horizon (see "Features" discussion for the AB horizon).

Artifact and Ecofact Recovery and Analyses

As summarized above, the total number of stone artifacts recovered from AB horizon excavation is 8,288 including 101 flaked stone tools and cores (or fragments); 3,524 pieces of debitage; 60 groundstone and other stone artifacts; and 4,603 pieces of FCR. In addition, there were 351 pieces of pottery, 1,071 faunal fragments, and 12,575 botanical remains found. This section discusses in detail the artifacts from the AB horizon.

Flaked Stone Tools

Flaked stone artifacts recovered from occupations represented by the AB horizon included projectile point/knives (*n* = 23), bifaces (*n* = 11), expedient tools (*n* = 2), and cores and core fragments (*n* = 65).

Projectile Points/Knives

Twenty-three whole and partial pp/ks were recovered from the AB horizon of Area 3-South. Overall, 87 percent of the pp/ks (*n* = 20) recovered from this horizon were manufactured from Onondaga chert. Eight of the points can be dated to the early Early Woodland period, one to the transitional Later Early Woodland/Early-Middle Adena period, two to the Middle Woodland Period, and one dated to the Initial Terminal Archaic period, while the remaining 11 pp/ks from the AB horizon were non-diagnostic as to a particular period. Figures 8.34 (a-f) and 8.35 (a-e) illustrate the pp/ks recovered from this horizon, and Appendix 8K lists them in tabular form and presents detailed measurements and morphological data. Figure 8.36 illustrates their spatial distribution. Two pp/k artifacts (Catalog nos. 2201 and 2209) dating to the Early Woodland period were recovered from the 2BC horizon, but these will be discussed in the section for that horizon.

Among the eight pp/k artifacts dating to the early Early Woodland period and recovered from the AB horizon were two whole Forest Notched pp/k artifacts of Onondaga chert (Catalog nos. 1660.1and 1823.1, Figure 8.34 [e] and [d], respectively). Often considered a morphological correlate to the Susquehanna Cluster (Broadspear points), this broad bladed, stemmed pp/k is found from eastern Ohio into southern New England. It typically has convex blade edges and broad side notches resulting in rounded shoulders. The stem is expanding or fishtailed. Forest Notched points are typically assigned a date range of 1080 to 740 B.C, or the early Early Woodland Period (Justice 1987; Mayer-Oakes 1955). Four haft fragments dating to the early Early Woodland period were also identified as Forest Notched pp/k fragments (Catalog nos. 1693.1, 1790, 2033, and 2057, Figure 8.34 [a], [c], [f], and [b], respectively). One additional haft fragment was identified as a possible Forest Notched pp/k fragment (Catalog no. 1909, Figure 8.35 [a]) and attributed to the early Early Woodland period. One untyped “ovate stemmed” Early Woodland pp/k (Catalog no. 2007) was also recovered from the AB horizon.

One Onondaga chert haft fragment recovered from the AB horizon was of a transitional time period, identified as an Adena Ovate Base pp/k dating to the Late Early Woodland Period/Early Middle Adena Period (Catalog no. 1774, Figure 8.35 [b]). This type of point has an ovate base rather than the tapered stem base of other Adena points. The blade is usually lanceolate with excurvate margins. Cross sections show a lenticular to biconvex shape. The haft region is usually ground. Adena pp/ks are common throughout the Ohio River Valley and its major tributaries (Justice 1987).

Two lateral halves of a haft fragment conjoin to form the base of an apparent Manker Corner-Notched pp/k made of Onondaga chert (Catalog nos. 1694 and 1711, Figures 8.35 [d] and [c], respectively). Manker points are broad bladed with corner notches, and may be more utilitarian versions of the Snyders points (Justice 1987). They are found throughout the Ohio River Valley and into the central Mississippi Valley. Manker Corner-Notched pp/ks

typically indicate an early Middle Woodland component (Justice 1987), however, the early end of the date range for that pp/k type does overlap what Weed (2002) has defined as the Early Woodland period (1000 B.C.-.100 B.C or possibly 1100 B.C.-A.D. 100).

Only one pp/k does not fit with the Early Woodland ascription of the AB horizon. It is a Genesee type (Catalog no. 1648, Figure 8.35 [e]), also made of Onondaga chert, and dates to the Initial Terminal Archaic period. Large, thick, straight stems characterized these point types. The blade is trianguloid and the basal edge is straight. Some specimens have grinding on the haft element. This type is found in the Great Lakes region into Ohio, Pennsylvania, and Vermont (Justice 1987). The Genesee pp/k recovered from the AB horizon was toward the bottom of the horizon, thus it is possible that it migrated upward, due to pedoturbation. The horizon directly underlying the AB in this portion of the site is a flood deposited C horizon, which may have initially lifted some of the artifacts from the horizon directly underlying the C and AB horizons.

Two thin untyped pp/ks, one of Onondaga chert and the other of unidentified chert, were recovered from the AB horizon (Catalog nos. 1713 and 1865). These two artifacts each had a wide blade and a short contracting stem, but no date or cultural context could be attributed to them. Nine more pp/k artifact fragments that were of uncertain cultural and chronological context (non-diagnostic) were recovered from the AB horizon. Three were unidentifiable pp/k base fragments of Onondaga chert (Catalog nos. 1751, 1764, and 2057), one was an unidentifiable base fragment of Upper Mercer chert (Catalog no. 1884), one was an unidentifiable base fragment of unidentified chert (Catalog no. 2063), two were midsection fragments of Onondaga chert (Catalog nos. 1722 and 1999), and the last two were fragments composed each of a tip and midsection fragment of Onondaga chert (Catalog nos. 1751 and 2112).

Bifaces

Four whole bifaces and seven biface fragments were recovered from AB horizon contexts. Of the 11 found, only one (Catalog no. 3518.2) was recovered from a feature (Feature 243). All of the bifaces were made from Onondaga chert and no evidence of thermal alteration was noted among the assemblage with the exception of one (Catalog no. 1995), which appears to have been discarded due to extensive thermal alteration. Descriptive data for each biface and biface fragment is provided in Table 8.21.

Table 8.21. AB Horizon Bifaces—Catalog Numbers and Descriptive Data.

Catalog Number	Portion	Stage	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Retouch/Use	Cortex Present	Comments
1680	Lateral	2	46	18	10	7.4	Scraping on moderate to hard material	Yes	Transverse fracture
1684.1	Whole	UID	31.7	29.2	5.9	6.04	Some grinding along distal edge	Yes	Edge collapse

Catalog Number	Portion	Stage	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Retouch/Use	Cortex Present	Comments
1707	Proximal	2	19	29	10	4.8	No evidence of use, probably broken during manufacture	Yes	Lateral fracture
1800.9	Whole	3	36	14.7	13	5.4	Some grinding	No	Stack
1800.14	Lateral	3	45.9	30.5	8.8	14.6	No use	No	Edge collapse
1995	Lateral	UID	12	16	5	0.9		No	Thermal damage
2002	Whole	2	38.6	24.1	13.6	111.3	Appears unused	Yes	
2046	Proximal	3	19.2	15.2	5.4	1.3		No	Lateral fracture
2053	Whole	2	47.8	38.6	25.1	32.5	Possible use on moderate hardness material	Yes	
2055	Distal	3	10	15	6	0.7	Possible scraping of moderate hardness material	No	Lateral fracture
3518.2	Proximal	3	25	32	11	8.5		Yes	Lateral fracture

Expedient Tools

Two whole, expedient tools were recovered from general AB horizon deposits. The first of these (Catalog no. 1752) measured 13.3 mm in length, 18.7 mm in width, and 2.8 mm in thickness. It weighed 0.6 g and was made on Onondaga chert. Cortex was absent and there was no evidence of thermal alteration. Evidence of utilization was unifacial and occurred along a single, lateral edge.

The second specimen (Catalog no. 1886) measures 33.2 mm long, 18.6 mm wide, and was 8.9 thick, and has a weight of 5 g. It was also made of Onondaga chert, bore cortex, and displayed signs of thermal alteration. It was unifacially retouched along the lateral edge.

Cores and Core Fragments

The largest number of the artifacts designated as cores and core fragments recovered during the Area 3-South excavations originated from the AB horizon and totaled 65 specimens (Table 8.22). Twelve of the cores came from features. All of the cores and core fragments from this horizon are of Onondaga chert and appear to have originated as cobbles from the Ohio River, rather than tabular sources from the bedrock outcroppings. The recovered core and core fragments fall into several categories by type, including two bipolar cores, three bipolar core fragments, two biface cores, 23 spheroid cores, two bipolar spheroid cores, 20 split piece cores, five sheared cobbles, one bipolar sheared cobble, one split cobble, three core rejuvenation flakes, one cobble core, and two cores unidentified by type. For the

cores/core fragments recovered from the AB horizon 39 artifacts retained less than 50 percent cortex, 16 retained more than 50 percent cortex, and 10 had no cortex. Six of the cores and core fragments were thermally altered, while the remaining 59 were not. Forty-five (69 percent) of the core artifacts recovered from the AB horizon have been classified as exhausted cores. The core with the largest number of negative flake scars was a spheroid core with 24 flakes removed (Catalog no. 2037).

It is clear that both bipolar and direct percussion techniques were utilized to reduce cores into tools or create flakes with working edges. The core assemblage suggests that the primary, or possibly exclusive, raw material source was cobbles and pebbles available locally, rather than quarried or found eroding from bedrock outcrops in block or tabular form. All of the cobble material can be found nearby within the Ohio River Valley.

Table 8.22. AB Horizon Cores—Catalog Numbers and Descriptive Data.

Catalog Number	Feature	Core Type	Length (mm)	Width (mm)	Thickness (mm)	Number of Flake Scars	Percent Cortex	Exhausted	Weight (g)
1831.1		Biface Core	48.5	28.5	18.5	19	50-99	Yes	27.0
3498	238	Biface Core	11.3	20.3	8.1	7	1-49	Yes	1.96
3539	243	Bipolar Core	21.6	9	4.9	3	0	No	1.17
3539	243	Bipolar Core	27	14.8	10	10	1-49	Yes	4.29
1962		Bipolar Core fragment	59	39	22	14	1-49	Yes	45.64
2045.1		Bipolar Core fragment	45	31.5	17	6	1-49	Yes	21.74
2054		Bipolar Core fragment	25.8	30.2	7.8	7	1-49	No	4.56
1639		Cobble Core	66.3	49.4	30.8	3	50-99	No	121.5
2024		Flake, Whole/ Bipolar	41.6	31.9	13.9	8	1-49	No	14.7
3537.1	243	Flake, Whole/ Bipolar	28.1	18.1	4.4	10	0	No	2.24
3495	238	Flake, Whole/ possible Bipolar	31.5	27.2	6.9	10	1-49	No	6.66
1695		Sheared Cobble	41	39.5	24.5	0	50-99	No	34.41
1699		Sheared Cobble	37.5	24	19.5	0	50-99	No	22.17
1712		Sheared Cobble	42	31	26	0	50-99	No	27.13
1771		Sheared Cobble	42	28	15	7	50-99	No	20.02
1942		Sheared Cobble	49.5	41.5	19	2	1-49	No	27.26
1763		Sheared Cobble/Bipolar	45.5	34.5	17	4	50-99	No	22.61
1632		Spheroid Core	27	21	14	4	1-49	Yes	7.98
1662		Spheroid Core	17.5	18	15	9	0	Yes	4.69
1676		Spheroid Core	17	12	7	7	0	Yes	1.29
1724		Spheroid Core	64	48	33	11	1-49	No	85.45
1758		Spheroid Core	20.5	11	12	9	1-49	Yes	2.64
1799		Spheroid Core	22	24	9	10	1-49	Yes	4.75
1800.13		Spheroid Core	27.5	15.5	6	10	0	Yes	2.44
1838		Spheroid Core	21.5	18	13	12	1-49	Yes	5.08
1846		Spheroid Core	22	20	11	11	1-49	Yes	4

Catalog Number	Feature	Core Type	Length (mm)	Width (mm)	Thickness (mm)	Number of Flake Scars	Percent Cortex	Exhausted	Weight (g)
1852		Spheroid Core	14	13.5	9	4	1-49	Yes	1.70
1853		Spheroid Core	28.5	13	5	8	1-49	Yes	1.77
1853		Spheroid Core	15	10.5	5.5	2	0	Yes	0.6
1870		Spheroid Core	23.5	14.5	7.5	3	1-49	Yes	2.58
1875		Spheroid Core	23	11	10	3	0	Yes	2.71
2051		Spheroid Core	26	20.5	7	14	50-99	Yes	4.01
1885		Spheroid Core	26.5	21	16	8	1-49	Yes	8.4
1885		Spheroid Core	17	10	12.5	9	0	Yes	2.04
1887		Spheroid Core	35	34	16.5	12	1-49	Yes	18.35
2037		Spheroid Core	41	34	33	24	1-49	Yes	24.84
3497	238	Spheroid Core	72	51	33.2	13	50-99	Yes	108.63
3499	238	Spheroid Core	25.6	27.2	16.8	9	1-49	Yes	8.11
3499	238	Spheroid Core	21.6	15.9	9.6	10	1-49	Yes	3.03
3520	243	Spheroid Core	39.6	29	21.2	6	1-49	Yes	21.07
1872		Spheroid Core/Bipolar	20	8.5	6.5	7	1-49	Yes	1.16
1882		Spheroid Core/Bipolar	16.5	8.5	4	5	0	Yes	0.61
3555	243	Split Cobble	30.9	39.9	18.6	9	50-99	No	25.15
1639		Split Piece	25	18	9.5	1	50-99	Yes	4.63
1684		Split Piece	15	11	11	0	1-49	Yes	2.1
1690		Split Piece	31	20	21	4	50-99	Yes	24.13
1691		Split Piece	25.5	11.5	11	2	1-49	Yes	2.81
1714		Split Piece	28	20	20	3	1-49	No	10.66
1728.1		Split Piece	32	22	14.5	3	1-49	Yes	13.53
1735		Split Piece	12	15.5	6	4	0	Yes	1.12
1795		Split Piece	32	25	13	0	50-99	Yes	9.42
1795		Split Piece	20	23.5	7	2	1-49	Yes	4.35
1799		Split Piece	17	23	7	0	1-49	Yes	1.38
1838		Split Piece	57	31	20	4	1-49	No	34.23
1861		Split Piece	21.5	12	11	3	1-49	Yes	2.97
1868		Split Piece	17	13.5	6.5	1	1-49	Yes	1.46
1873		Split Piece	20	13	9	4	1-49	Yes	2.31
2051		Split Piece	35	36.5	20	3	50-99	Yes	27.67
1907		Split Piece	30.5	22	13	0	50-99	Yes	8.7
2037		Split Piece	26.5	13	8	1	1-49	No	2.9
2042		Split Piece	40.5	31	19	17	50-99	Yes	19.28
3555	243	Split Piece	24.4	22.2	7	7	1-49	No	3.06
3546	243	Split Piece/possible Bipolar	31.4	12.2	12.5	6	1-49	No	5.79
1730		UID Core fragment	39	32.5	13.5	2	1-49	Yes	7.76
2024		UID Core fragment	34	17.5	16	4	1-49	No	8.61

Debitage

A total of 3,524 pieces of debitage were recovered in the AB horizon. The total weight of all debitage recovered was 2,922.7 g. This number included 830 whole flakes, 834 proximal flake fragments, 1,795 flake fragments and shatter pieces, and 65 fragments identified as bipolar, not including cores and core fragments. Mass analysis was conducted on the entire debitage assemblage while detailed analysis was carried out on the entire assemblage of 1,664 whole and proximal flake fragments recovered from this horizon.

Mass Analysis

Size Grade. All debitage from this horizon was sorted according to size, as discussed above. The majority of the debitage (59.9 percent) was classified as less than 0.5 in, and greater than 0.25 in. The next most frequent grade was less than 0.25 in (35.3 percent). Figure 8.38 illustrates the distribution by percent for each size grade.

Raw Material. Data on raw material type was also collected as part of the mass analysis. Almost all the artifacts were Onondaga chert (*n* = 3,494; 99.1 percent). This material was probably acquired locally, as a secondary source river cobble. Other materials appeared in much smaller amounts. They included 12 fragments of Upper Mercer flint; Flint Ridge/Vanport chert (*n* = 9); seven artifacts that were unidentifiable, but probably quartzite; one fragment that was completely cortex from a chert cobble; and one fragment that was possible from an igneous rock. Table 8.23 presents the information on raw material type, and weight.

Table 8.23. AB Horizon Raw Material Data.

Material Type	Count	Percent by Count	Weight (g)	Percent by Weight
Onondaga chert	3,494	99.14	2793.54	95.58
Cortex	1	0.03	0.20	0.00
Flint Ridge/Vanport chert	9	0.26	4.10	0.14
Upper Mercer chert	12	0.34	6.20	0.21
Unidentified quartzite	7	0.20	105.36	3.60
Unidentified, possible igneous	1	0.03	13.30	0.46
Total	**3,524**	**100**	**2,922.70**	**100**

Cortical Material. Cortex was identified on 2,289 debitage artifacts, or 65 percent of the total.

Thermally Altered Material. All debitage was examined for presence of thermal alteration. Some form of thermal alteration was present on 2,048, or 58.1 percent, of the total.

Detailed Analysis of Whole and Proximal Flakes

All of the whole flakes and proximal flake fragments (*n* = 1,664) from the AB horizon were examined at a detailed level of analysis as described above in Section B. To reconstruct reduction methods, data were collected on flake reduction stage (primary, secondary, or tertiary), presence of bulb of percussion, and platform characteristics. Table 8.24 lists their division by reduction stage. Secondary reduction was the most prevalent (57.8 percent), but reduction of cobbles may preclude production of a large number of primary flakes simply due to the nature and size of the raw material.

Table 8.24. AB Horizon Whole and Proximal Flake Reduction Stages.

Reduction Stage	Count	Percent
Primary	427	25.66
Secondary	962	57.81
Tertiary	268	16.11
Indeterminate	7	4.21
Total	**1,664**	**100**

Data were collected on platform shape, angle, and thickness for all whole flakes and proximal flake fragments. Platform shapes were identified as flat, lipped, cortical, or faceted. Of the 1,664 whole and proximal flake fragments examined, there is an almost even division among flat (29 percent), lipped (22 percent), faceted (31 percent) and cortical (17 percent) platform types, to suggest that both soft and hard percussors were used to reduce cores and shape bifaces. Slightly over three quarters of the flakes (78 percent) exhibited a bulb of percussion, to indicate a hard hammer technique was used to remove flakes from cores and in biface manufacture. Results for platform angles are as shown in Table 8.25.

Analysis of the lithic assemblage indicates that the entire sequence of reduction technology took place at Area 3-South during the Early Woodland period utilization of the site. Cores, primary, secondary, and tertiary stage flakes, and finished bifaces and pp/ks were recovered from this occupation period. The cores included bipolar cores, indicating that technique of lithic reduction, as well as the more well-known direct percussion technique of reducing cores, was also used during this occupation period. Groundstone tools include anvils and hammerstones. The presence of the anvils also provides evidence for the use of the bipolar technique to reduce the cobbles.

Table 8.25. AB Horizon Platform Angles for Whole Flakes and Proximal Fragments.

Platform Angle	Count	Percent
0-4°	0	0
5-9°	0	0
10-14°	1	0.06
15-19°	0	0
20-24°	5	0.3
25-29°	8	0.48
30-34°	26	1.56
35-39°	22	1.32
40-44°	62	3.73
45-49°	47	2.83
50-54°	150	9.01
55-59°	63	3.79
60-64°	203	12.20
65-69°	79	4.75
70-74°	234	14.06
75-79°	132	7.93
80-84°	204	12.26
85-89°	113	6.79
> 90°	50	3.00
Indeterminate	265	15.93
Total	**1,664**	**100**

Although there is a wide range of platform angles represented, most striking platform angles were found to fall within three categories: the 60° to 64° category (12.20 percent), 70° to 74° (14.06 percent), and 80° to 84° (12.26 percent). Angles greater than 90° and less than 30° made up only five percent of the collection studied. The presence of the larger platform angles suggests that direct percussion rather than pressure flaking was more common in reducing cores and shaping bifaces. While some pressure flaking surely took place, the peaks in the middle to larger range of angles is most likely the result of core reduction and biface thinning. If cobbles, rather than tabular (quarried) lithic material, was the primary raw material source, than more initial reduction may have occurred than would be apparent from the platform angle data, since by its nature the size of a cobble would seem to limit the possible striking platform angle and/or the need to remove large amounts of stone.

In sum, tool manufacture during the Early Woodland occupation(s) of Area 3-South was a combination of percussion and pressure flaking technology, and bipolar reduction, as shown in the variety of platform types identified and the striking platform analysis. Combined with the small size of flakes, the Early Woodland Period occupants of the site appear to have used locally available cobbles that were shaped and reduced in an expedient manner to accommodate the cobble size. Bipolar manufacture has also been proposed as a type of expedient manufacturing technique for smaller cobbles.

Groundstone and Other Non-Flaked Stone Implements

The AB horizon contained by far the greatest number of groundstone lithic artifacts. Figures 8.39 (a-d) and 8.40 (e-g) illustrate the types of groundstone tools recovered in the AB Horizon. Figure 8.41 illustrates their spatial distribution. For the purposes of classification, the groundstone category for all soil horizons within Area 3-South included groundstone lithic implements, as well as modified and unmodified cobbles and pebbles. A total of 10 lithic artifacts was categorized within the groundstone classification for the Early Woodland horizon. The artifacts classified within this category are five pitted stone artifacts, two nutting stones, two net weights, and one hammerstone/anvil. Five of these, all the pitted stones, were found within features, and the other five groundstone artifacts came from non-feature contexts. Table 8.26 lists the groundstone artifacts recovered and provides measurement data.

Table 8.26. AB Horizon Groundstone Tools—Catalog Numbers and Descriptive Data.

Catalog Number	Feature	Artifact	Portion	Material	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
3274	151	Pitted Stone	Whole	Sandstone	122.6	80.6	42.9	552.4
3300	162	Pitted Stone	Fragment	Sandstone	79.9	61.9	24	97.4
3300	162	Pitted Stone	Fragment	Sandstone	160	145.4	81.1	1798.2
3349	177	Pitted Stone	Fragment	Sandstone	133	75.5	54.6	646
3520.2	243	Pitted Stone	Whole	Sandstone	111.1	65	44.6	456.9
1647.1		Nutting Stone	Fragment	Sandstone	160	143	46.9	899
2032		Nutting stone	Fragment	Sandstone	62.5	45.3	11.5	50.3
1645.1		Net Weight	Whole	Quartzite	103.5	85.9	18.6	356.8
1796		Net Weight	Whole	Sandstone	88.5	63.8	26.3	179.1
1799		Hammerstone/Anvil	Whole	Sandstone	97.5	86.7	54.2	549.7

Pitted Stones

All five of the artifacts classified as pitted stones were recovered from feature contexts. These artifacts were so designated because they exhibited modification in the form of pitting, but their function is unknown. Two of the pitted stone artifacts were whole stones, while three were fragments. All were sandstone, and all but one showed evidence of thermal alteration. Two pitted stone fragments came from Feature 162 within Unit N67 E235. The larger of these two stones (Catalog no. 3300, Figure 8.40 [g]) weighed 1,798.2 g and was irregular in shape along all three axes. The stone had two pits, each measuring approximately 15 mm in diameter, and the stone contained thermal spalls indicative of alteration by heat. The other pitted stone fragment from Feature 162 weighed 97.4 g, was irregular in shape along all three axes, and also exhibited thermal spalling. The pitting scars on the surface of this stone were relatively shallow, and thus did not warrant measurement for diameter or depth.

One of the two whole pitted stone artifacts, weighing 456.9 g, (Catalog no. 3520.2) was found within Feature 243 in Unit N60 E230, Level 2. There was one shallow pit on one face of the stone, measuring approximately 30 mm by 18 mm. This stone was thermally altered and was oval in plan view and plano-convex in profile and cross-section. The other whole pitted stone artifact (Catalog no. 3274, Figure 8.40 [e]) was the only pitted stone

artifact that was not thermally altered, and was found within Feature 151 in Unit N60 E235. The stone weighed 552.4 g and its shape was irregular in profile, sub-rectangular in plan view, and rectangular in cross-section. The final pitted stone fragment (Catalog no. 3349, Figure 8.39 [c]) recovered from the AB horizon was found within Feature 177 in Unit N68 E234, and weighed 646 g. The stone was thermally fractured and its shape was irregular in plan view, profile, and cross-section.

Nutting Stones

Two nutting stone fragments were recovered. The first (Catalog no. 1647., Figure 8.39 [d]), was found in Unit N75 E225, Level 3. This fragment was tabular sandstone and weighed 899 g. The shape of the fragment was irregular in plan view, profile, and cross-section. It was fractured along one side of the nutting pit, but the extrapolated diameter of the pit was approximately 35 mm, and its depth was approximately 10 mm. The second nutting stone fragment (Catalog no. 2032) was recovered from Unit N78 E222, Level 2. It was made of water worn sandstone and was significantly smaller than the other nutting stone fragment, weighing only 50.3 g. The stone was sub-rectangular in plan view and plano-convex in profile and cross-section.

Net Weights

The two whole oval net weights were found in Unit N60 E235, Level 3 and Unit N70 E227, Level 1, respectively. One net weight (Catalog no. 1645.1) was of waterworn quartzite and weighed 356.8 g. The other net weight was smaller in dimensions and weight, weighing 179.1 g, and was derived from waterworn sandstone. This smaller net weight (Catalog no. 1796, Figure 8.39 [b]) showed evidence of thermal alteration; this may suggest use of the tool for another purpose at some time, or may merely be a result of naturally occurring circumstances before use or after discard.

Hammerstone/Anvil

The hammerstone/anvil implement (Catalog no. 1799, Figure 8.39 [c]) was recovered from Unit N70 E232, Level 1. It was oval in profile, plan view, and cross-section; was derived from waterworn sandstone; and weighed 549.7 g. This stone implement showed evidence of battering and pitting. Battering is evidenced by densely grouped signs of impact upon the surface of the tool, while “pitting” describes the presence of relatively deep depressions on the surface of the stone, usually circular or oval in shape, which may be caused by abrasion, grinding, clustering of impacts, or even thermal processes. The object described above was classified collectively as hammerstone/anvil due to its oval shape and to the fact that there was evidence of battering on the margins of the stone, suggesting use-wear patterns consistent with implementation as a hammerstone, yet there were also pits evident on the flat face that could suggest its use as an anvil.

Other Stone Artifacts

Several additional stone/mineral artifacts were recovered from the AB horizon. They were classified in the database as “Other Artifact” or “Other Material.” Table 8.27 provides dimensions and additional information for each of these “other” stone artifact recovered from the AB horizon.

Table 8.27. AB Horizon Other Stone Artifacts—Catalog Numbers and Descriptive Data.

Catalog Number	Feature	Artifact	Portion	Material	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
1662		Unmodified Pebble	Whole	Sandstone	45.7	42.3	14	36.8
1670		Unmodified Pebble	Whole	Quartzite	52.3	31.7	19.8	45.3
1670		Unmodified Pebble	Whole	Quartzite	45	30	23.4	43
1684		Unmodified Pebble	Whole	Sandstone	53.7	35.9	38.1	71.4
1684		Unmodified Pebble	Whole	Sandstone	64.7	36.3	28.1	99.7
1707		Unmodified Pebble	Whole	Quartzite	49.8	43.5	27.6	93.5
1722		Unmodified Pebble	Whole	Claystone	49.1	33.4	8.9	19.6
1802		Unmodified Pebble	Whole	Chert	38.2	35.7	24.3	39.8
1881		Unmodified Pebble	Whole	Quartzite	58	38	26.7	77.8
1881		Unmodified Pebble	Whole	Quartzite	43.2	41.2	24.8	57.3
2034		Unmodified Pebble	Whole	Sandstone	44.9	41.4	19.7	59.3
2060		Unmodified Pebble	Whole	Sandstone	82.5	37.5	27.2	100.6
2106		Unmodified Pebble	Whole	Sandstone	57.3	40.8	26	67.9
3276	151	Unmodified Pebble	Whole	Sandstone	55.9	34.3	16.4	47.29
3314	166	Unmodified Pebble	Whole	Sandstone	83.4	51.8	23.3	149.1
3315	166	Unmodified Pebble	Whole	Sandstone	42.9	34	19.3	35.2
3315	166	Unmodified Pebble	Whole	Sandstone	43	41.1	13.6	34.8
3315	166	Unmodified Pebble	Whole	Sandstone	42.8	36.3	23.2	46.5
3315	166	Unmodified Pebble	Whole	Sandstone	45.7	32.4	22.4	44.4
3492	237	Unmodified Pebble	Whole	Sandstone	42.8	42.4	27.3	72
3515	243	Unmodified Pebble	Whole	Sandstone	55.4	47.4	32.9	109.6
3515	243	Unmodified Pebble	Whole	Sandstone	64.4	47.8	34.9	130.8
3520	243	Unmodified Pebble	Whole	Sandstone	66.3	37.6	10.7	37.4
2024		Unmodified Pebble	Whole	Sandstone	40.2	38.4	27	54.9
2051.1		Unmodified Pebble	Whole	Sandstone	44.7	35.7	24.6	53.7
1895		2 Unmodified Cobbles						
1730		Worked Pebble	Whole	Hematite	10.5	8.9	2.8	0.7
3388	200	Possible Steatite						
3494	238	Possible Steatite						
3519	243	Possible Steatite						
3496	238	2 Hematite/Ochre						
3515	243	1 Hematite/Ochre						
1751		Steatite Vessel Fragment						
2095		Possible Hematite/Ochre						
3325	171A	Possible Hematite/Ochre						
3336	171C	Possible Hematite/Ochre						
3392	200	Possible Hematite/Ochre						
3495	238	Mica						
3496.1	238	Mica						
3498	238	Mica						
3501	238	Mica						
3514	243	Mica						

Catalog Number	Feature	Artifact	Portion	Material	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
1734		Clay Stone						
2019		Unidentified						
2100		Unidentified						
3517	243	Unidentified						
1895		Unidentified						

Unmodified Pebbles

Twenty-five whole unmodified pebbles and two unmodified cobbles were recovered from the AB horizon, and are potentially manuports, given the general lack of rocks throughout the AB horizon. Eighteen of these were waterworn sandstone pebbles, ranging in weight from 34.8 g to 149.1 g, and varying widely in shape. Twelve of the 18 sandstone pebbles came from features within the horizon; of these four were from Feature 166 and three were from Feature 243. The remaining unmodified pebbles of materials other than sandstone were found in the AB horizon in non-feature contexts. These consist of five waterworn quartzite pebbles, one waterworn chert pebble, two "claystone" pebbles, and two pebbles of ambiguous material source. None of the unmodified pebbles for the AB horizon showed any evidence of heat alteration.

Steatite Vessel Fragment

One unique lithic artifact recovered from the Early Woodland horizon was identified as a steatite vessel fragment (Catalog no. 1751) found in Unit N66 E231, Level 1. Although it is a small fragment, its shape suggests that it was part of a roughly formed vessel. Three other steatite fragments were recovered, one each from Features 200, 238, and 243, however based on their morphology it is not possible to determine if they originated from finished vessels or are the result of debris from vessel manufacture from a larger piece of raw material. The apparent vessel fragment was included in a material sourcing study (Vento and Stahlman 2004), and most closely resembles material at the Georgetown and Christiana quarries in Chester County, Pennsylvania.

Hematite and Ochre

One whole, worked hematite pebble (Catalog no. 1730) was recovered from the Early Woodland horizon in Unit N64 E236 (Level 1). This hematite pebble showed evidence of modification by grinding and was triangular in plan view, rectangular in profile, and plano-convex in cross-section. Six additional specimens characteristic of hematite or ochre were found in Features 171a, 171c, 200, 238 (two artifacts), and 243, respectively; however, none showed distinct evidence of utilization.

Mica

Five fragments of mica were discovered during excavation, four from Feature 238, and one from Feature 243. All measure less than 2 cm across and are extremely thin sheets with no evidence of modification.

Fire-Cracked Rock

A total of 4,603 specimens of FCR was recovered from the AB horizon. The total weight of these artifacts was 308.3 kg. The FCR from this horizon was the greatest in number and mass (weight) of all of the soil horizons excavated in Area 3-South, though the AB and 2BC horizons were also the most extensively excavated strata in the excavation area. Figure 8.41 illustrates their spatial distribution.

Ceramics

All but four of the prehistoric ceramic sherds recovered during Phase III excavations in Area 3-South were from the AB horizon. Three were from the overlying Ap horizon disturbed by industrial development, and one was from the underlying 2BC horizon. Based on metric and morphological attributes, the latter sherd is assumed to have originated within the AB horizon but migrated downward into the 2BC due to natural processes. It is apparent that the recovered ceramic assemblage is limited to the AB horizon. Therefore, in order to more coherently and comprehensively discuss the entire ceramic assemblage, the analysis of all prehistoric sherds is presented here, rather than breaking out the four sherds with suspect origins from adjacent horizons. However, those four sherds are also briefly presented in their respective horizon discussions in order to maintain an accurate accounting of where items were recovered. Additionally, one piece of possible daub was recovered from the first level of the AB horizon; however, it was not located within or near any features and thus cannot be interpreted any further.

The full ceramic analysis report is included as Appendix 8N. Key results are presented here. A total of 222 prehistoric ceramic sherds weighing 538.5g and 133 fragments of fired prepared clay surfaces weighing 438.6 g were recovered from the Phase III investigation at Area 3-South. A distribution map is included as Figure 8.42. Prehistoric ceramic sherds were derived from three strata and eight cultural features. The distribution of sherds by count, weight, and context is shown in Table 8.28. The fragments of fired prepared clay surfaces or floors were recovered from two features (Features 238 and 243). Both were relatively deep pits displaying multiple internal lenses representing successive use and filling episodes.

Table 8.28. Prehistoric Ceramic Sherd Distribution Summary.

Context	Count	Weight (g)
Ap Horizon or Disturbed	3	2.8
AB Horizon, Level 1	70	171.0
AB Horizon, Level 2	35	97.5
AB Horizon, Level 3	5	21.5
AB Horizon Features	108	243.3
2BC	1	1.6
Total	**222**	**537.7**

Physical Attributes

The ceramic analysis involved an assessment of physical attributes for each sherd. Attributes taken into consideration include temper, surface treatment or appearance, dimensions, weight, vessel segment represented, decoration. These attributes can be useful in identifying ceramic types, vessel forms, manufacturing techniques, and linking the ceramics to cultural traditions and time periods. Summary data on the physical attributes of the assemblage are presented in Table 8.29 and discussed in detail in the text that follows.

Table 8.29. Summary of Prehistoric Ceramics by Temper and Surface Finish.

Temper Type or Combinations	SURFACE FINISH						TOTAL			
	Eroded/ Spalled		Smooth		Cord-Marked					
	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)	Count	Freq. %	Weight (g)	Freq. %
Chert and Mixed Chert and Hematite	49	27.1	1	9.2	26	191.5	76	34.23	227.8	42.30
Mixed Chert and Sandstone	2	1.2					2	0.90	1.2	0.22
Mixed Chert, Siltstone or Claystone, and Hematite	1	0.3	1	4.4	2	5.1	4	1.80	9.8	1.82
Mixed Chert and Quartz and Mixed Chert, Quartz, and Hematite or Ironstone	4	6.6			3	8.1	7	3.15	14.7	2.73
Mixed Chert, Quartz, and Siltstone	1	0.3			1	6.2	2	0.90	6.5	1.21
Combinations of Quartz, Quartz Gravel, Hematite, and Ironstone	3	4.6			1	2.4	4	1.80	7.0	1.30
Combinations of Quartz, Quartz Gravel, Quartz Pebbles, Igneous Rock, and Hematite	6	4.6	1	11.0	1	1.8	8	3.60	17.4	3.23
Mixed Quartz, Igneous Rock, Chert, and Hematite	1	3.4			1	2.1	2	0.90	5.5	1.02
Igneous Rock	1	0.5					1	0.45	0.5	0.09
Limestone and Mixed Limestone and Hematite or Ironstone	38	13.9	9	32.8	4	9.2	51	22.97	55.9	10.38
Mixed Limestone and Sandstone					1	6.2	1	0.45	6.2	1.15
Sandstone and Mixed Sandstone, and Hematite	7	9.5			2	10.9	9	4.05	20.4	3.79
Mixed Sandstone and Quartz					1	2.2	1	0.45	2.2	0.41
Mixed Sandstone, Fireclay or Siltstone, and Hematite			1	3.4	1	14.6	2	0.90	18.0	3.34

Temper Type or Combinations	SURFACE FINISH						TOTAL			
	Eroded/ Spalled		Smooth		Cord-Marked					
	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)	Count	Freq. %	Weight (g)	Freq. %
Combinations of Shale, Siltstone, Claystone, Hematite, and Ironstone	16	16.4	5	24.7	5	57.0	26	11.71	98.1	18.22
Mixed Shale, Siltstone, and Chert					1	1.3	1	0.45	1.3	0.24
Mixed Claystone, Sandstone, and Hematite	1	2.6					1	0.45	2.6	0.48
Combinations of Claystone or Siltstone, Shale Pebbles, Quartz, and Hematite	2	2.7					2	0.90	2.7	0.50
Combinations of Siltstone, Sandstone, Igneous Rock, Fireclay, Shale Pebbles, and Hematite			1	2.8	1	4.4	2	0.90	7.2	1.34
Hematite and/or Ironstone	15	17.7	1	3.7	3	11.9	19	8.56	33.3	6.18
Untempered	1	0.2					1	0.45	0.2	0.04
TOTAL	**148**	**119.5**	**20**	**92.0**	**54**	**334.9**	**222**	**99.97**	**538.5**	**99.99**

The prehistoric ceramics from Area 3-South exhibit 14 temper types in 20 different combinations with a residual category consisting of a single sherd with no visible temper or diagnostic voids from leached or dislodged temper particles. The temper types include chert, limestone, hematite, crushed quartz, siltstone, sandstone, claystone, igneous rock, shale, ironstone, quartz gravel, fireclay, shale pebbles, and quartz pebbles in decreasing order of frequency. As well, hematite and ironstone frequently occur in combination with other aplastics, but it is not certain whether they are present as natural inclusions in the paste or as deliberate additions. Nineteen sherds exhibit only hematite and/or ironstone aplastic including one smooth surfaced sherd from Feature 198, and three cord-marked sherds, one from the AB horizon, Level 1, and two from Feature 243. All the putative fired prepared clay floor fragments, however, contain copious quantities of hematite, suggesting that the hematite and ironstone particles may well have been natural inclusions in the clay used for the construction of many of the vessels broken and discarded at the site.

The sherds display evidence for two different exterior surface finishes, cord-marked and smooth. The negative cordage impressions on the exterior surfaces of the cord-marked sherds are artifacts of the vessel construction process. The exterior wall of the vessels was malleated with a cord-wrapped paddle to weld together the successively stacked coils and to secondarily thin the vessel walls. The cords (or worn out fabrics or nets) wrapping the paddles were employed to roughen the surface of the paddles to inhibit the plastic clay from adhering to the otherwise smooth surfaces of the paddles. Most of the cord-marked sherds display evidence of subsequent smoothing ranging up to specimens that were essentially entirely smooth. Presumably, all of the Early Woodland vessels represented by sherds at

Area 3-South were initially cord-marked as a result of the construction process, as no sherds obviously derived from hand molded vessel walls were identified in the assemblage. The evidence indicates that subsequent smoothing of the vessel walls was either intentional, or an artifact of handling the vessel while it was still plastic, or subsequent abrasion. Twenty sherds were considered to display smooth exterior surfaces, and 54 evidenced cord-marked or variously smoothed-over cord-marked exterior surfaces. The remaining 148 sherds were consigned to a residual category displaying eroded and/or spalled away exterior and often interior surfaces. The majority of these sherds were tiny residual fragments remaining from the deterioration of large vessel sections and larger fragments of the fired prepared clay surfaces or floors. This was the most numerous sherd category, and represented 66.7 percent of the vessel fragments and 59.2 percent of the prepared clay surface fragments.

The interior surfaces of the sherds were overwhelmingly smooth, although a few exhibited faint smoothed-over horizontal cord impressions, again residual artifacts of the vessel construction process. Cord-wrapped paddles were apparently used as anvils on the interior of the pot while the exterior surface was being malleated. None of these faint smoothed-over interior cord impressions, however, resemble the deep, coarse diameter interior cord impressions characteristically exhibited by initial early Early Woodland ceramics in the Upper and Middle Ohio Valley. As well, the persistence of faint, well smoothed-over horizontal cord impressions on the interior of Middle and even Late Woodland pots—particularly at the area of the neck constriction as a relic of the vessel construction process—has been frequently documented in the Upper Ohio Valley (see, e.g., Mayer-Oakes 1955:86, Table 6; 192).

No rim sherds were recovered, and no diagnostic initial and early Early Woodland appliqué lugs or flat basal sherds were documented. One mixed siltstone and hematite-tempered cord-marked sherd, however, did exhibit a flange or heel along the juncture between the vessel wall and the outer edge of a flat base (Figure 8.43). Flat circular bases are considered to be a diagnostic characteristic of early Half-Moon Cord-Marked ceramics in the lower Upper Ohio Valley (Mayer-Oakes 1955:189).

Two mixed limestone and hematite-tempered sherds with smooth, almost burnished exterior surfaces were recovered from the same cultural feature (Feature 238). Both sherds exhibit relatively angular shoulders or junctures between the vessel walls and shallow, rounded bases (Figure 8.44). The shoulder angle in the larger sherd is 30º and very distinct. The smaller shoulder sherd displays a more rounded profile, but the wall angle is still 28º. The two shoulder sherds appear to have been derived from two different vessels. Angular shoulder sherds including the junction of a vessel wall and a shallow rounded base are frequently evidenced on late Early Woodland Adena Plain vessels in the Middle Ohio River Valley (see, e.g., Haag 1940:77, Figure 50, O, P; 78, Figure 51; Tune 1985:47, Figure 2, I, J). Angular shoulder sherds have been documented locally in an assemblage of late Early Woodland chert-tempered smooth surfaced sherds from the McKees Rocks Mound site at the confluence of Chartiers Creek and the Ohio River (Mayer-Oakes 1955:190-191).

Ceramic Types

As stated above, this prehistoric ceramic assemblage includes smooth and cord-marked surfaces, and numerous temper types in many combinations. Based on these attributes, as well as provenience and metric data of wall thickness and cordage impressions, many of the sherds are ascribable to formally defined ceramic types, and a number of others are judged to be from a particular temporal period even if no formal ceramic type description yet exists within which to place them.

Twenty-five chert and mixed chert and hematite-tempered cord-marked sherds conform to Mayer-Oakes' (1955:184, 189) chert-tempered variant of his early Early Woodland Half-Moon Cord-Marked type. Mayer-Oakes' (1955) Early Woodland Half-Moon Cord-Marked ware includes many temper varieties. This appears to be reflected in the assemblage recovered at Area 3-South. These include two mixed chert and sandstone-tempered sherds with eroded exterior surfaces; two mixed chert, claystone, and hematite-tempered cord-marked sherds; three mixed chert and quartz-tempered cord-marked sherds; one mixed chert, quartz, and siltstone-tempered cord-marked sherd; one mixed quartz, ironstone, and hematite-tempered cord-marked sherd; one mixed quartz, igneous rock, chert, and hematite-tempered cord-marked sherd; one small igneous rock-tempered fragment; one mixed limestone and sandstone-tempered cord-marked sherd with faint smoothed-over cord impressions on the interior surface; one sandstone cord-marked sherd; one mixed sandstone and hematite-tempered cord-marked sherd; one mixed sandstone and quartz-tempered cord-marked sherd; one mixed sandstone, fireclay, and hematite-tempered cord-marked sherd; and one mixed siltstone, shale pebbles, sandstone, igneous rock, and hematite-tempered cord-marked sherd. A single mixed quartz and igneous-tempered sherd with a smooth exterior surface probably represents an example of an Early Woodland smooth surfaced variety related to Half-Moon Cord-Marked.

Nine limestone and mixed limestone and hematite or ironstone-tempered smooth surface sherds are most likely all attributable to the late Early Woodland period Middle Ohio Valley Adena Plain type (Haag 1940:76).

One chert-tempered smooth surfaced sherd conforms to the late Early Woodland period McKees Rocks Plain type (Mayer-Oakes 1955:190-191).

A single mixed chert, siltstone and hematite-tempered smooth sherd probably represents one of the many temper varieties of the later Early Woodland smooth surfaced wares recorded but not described in the lower Upper Ohio Valley (Appendix 8N). A mixed sandstone, siltstone, and hematite-tempered sherd most likely also represents one of several as yet undescribed and unnamed late Early Woodland smooth surfaced ceramic types. Many other mixed temper varieties in the Area 3-South assemblage, both cord-marked and smoothed specimens, are considered to be assignable to an as yet unnamed and undescribed Early Woodland ceramic type or possibly more than one type.

Four limestone and mixed limestone and hematite-tempered cord-marked sherds are attributable to the Watson Cord-Marked type (Mayer-Oakes 1954:16, 1955:193-195). Given the recovery of these four sherds from the AB and 2BC contexts, it can be assumed that they

represent an early stage in the popularity of this type which persisted in popularity from some time in the later Early Woodland period to ca. A.D. 1100.

One mixed shale, siltstone, and chert-tempered cord-marked sherd in Feature 243, based on the feature date and the thin wall of the sherd, most likely represents an unnamed and undescribed terminal Early Woodland-initial Middle Woodland pottery type.

The mixed quartz and igneous rock-tempered cord-marked sherd recovered in the Ap horizon has relatively thin wall measurements suggesting that it is an example of Mayer-Oakes' (1955:191-193) Middle and Late Woodland period Mahoning Cord-Marked type.

The disturbed Ap horizon deposits obviously post-date the general Early Woodland AB horizon soils. The single sherd recovered from the Ap horizon that preserves both an exterior and interior surface is an example of the Middle-Late Woodland Mahoning Cord-Marked type. The sherd appears to be a later variety of this type as well. This fact would suggest that the Ap horizon probably includes cultural material dating from ca A.D. 500/700 to 2001.

The AB horizon deposits would seem to encompass the entire Early Woodland period. Two apparently earlier period cultural features, Feature 166 and 172, in the AB horizon have been radiocarbon assayed. Wood charcoal from Feature 166 is dated at 940 B.C. ± 40 in uncalibrated radiocarbon years, and charcoal from Feature 172 is dated at 1080 ± 40 B.P in uncalibrated radiocarbon years. No ceramics were recovered from either Feature 166 or Feature 172. No ceramic sherds were documented from the excavated AB horizon deposits around the feature. Presuming the ^{14}C ages are accurate, there may have been no occupation by pottery making groups along this stretch of the main stem Ohio River during the initial Early Woodland period. Alternatively, the excavation and use of the feature actually predates the appearance of early ceramics in the lower Upper Ohio Valley. The vertical provenience of these feature places them almost at the base of the AB horizon. Natural mixing and/or staining of the overlying soils or FCR protruding above the feature surface may have caused the excavators to define the top of these features higher than their true origin. Also, the AB-2BC interface was not distinct and simply may have been defined too low in this portion of the site. A vertical difference of only 2-5 cm in the definition of the feature surface would place both features in the underlying 2BC horizon, which contains two other cultural features with comparable radiocarbon dates.

In the upper South Branch of the Potomac River, a feature at the Wilson No. 3 site (46HY101) contained a single large sherd of what Dr. William Johnson (Appendix 8N) called early experimental period ware. The sherd was tempered with mixed steatite, quartz and claystone and displayed smooth exterior and interior surfaces. The sherd appeared to have been derived from the wall of a hand-molded vessel. As well, the sherd exhibited the edge of a basal heel at the junction of the vessel wall and flat base. The sherd is essentially a temper variant of Marcey Creek Plain ware, the earliest pottery documented in the Potomac Piedmont and Ridge and Valley provinces. Nutshell from the feature is accelerator mass spectrometrically (AMS) dated at 1005 B.C. ± 30 and 1010 B.C. ± 30 in uncalibrated radiocarbon years (Johnson 2007). A thermally altered rock feature at a second site,

46GT287, in the adjacent upper Patterson Creek drainage contained sherds from three vessels, two of which were tempered with mixtures of steatite and other lithic material. These sherds were also assigned to the broad category of early experimental period ware by Dr. Johnson. One of the three early experimental period vessel fragments also exhibited a basal heel at the junction of the vessel wall and flat base and displayed a simple stamped exterior surface. Nutshell from this feature is AMS dated at 980 B.C. ± 20. The three ^{14}C AMS dates associated with the early experimental period ware sherds tempered with steatite and various admixtures of other lithic material from these two sites in the upper Potomac River basin are argued to set a maximum base date for the appearance of initial ceramics in the trans-Appalachian lower Upper Ohio Valley.

At the Meadowcroft Rockshelter, ironstone-tempered, putative Half-Moon ware sherds recovered from the bottom and around the edges of Feature 60, a large fire pit, were associated with wood charcoal dated at 1115 B.C. ± 80, making these sherds putatively the earliest dated pottery in the Upper Ohio Valley. In retrospect, these sherds were misidentified by Dr Johnson in the late 1970s (Appendix 8N, Johnson 1982:153-154). The ironstone-tempered "sherds" were in reality fragments of a thick puddled clay hearth lining and, thus, do not represent the earliest pottery from the Upper Ohio Valley.

The initial Early Woodland Half-Moon Cord-Marked ware characteristically exhibits thick walled flower pot or barrel shaped vessels with flat circular bases. The vessels frequently display two large opposed loaf shaped lugs in the sublip area and coarse diameter exterior and interior cord impressions. The interior cord-impressions are essentially always oriented horizontally. As well, the vessel fragments display prominent coil breaks indicating that the vessels were coil constructed. These attributes strongly indicate that the source for the earliest pottery in the lower Upper Ohio Valley was diffusing from the adjacent Upper Potomac River Valley shortly after the initial Marcey Creek Plain ware evolved into coil constructed vessels, or perhaps from the upper Juniata Branch of the Susquehanna River where a similar type, Juniata Thick, has been documented. These facts strongly suggest that none of the ceramic sherds recovered from Area 3-South dates to the time that the radiocarbon dated Features 166 and 172 were constructed and utilized.

At Area 3-South, two other radiocarbon dated features were documented in the AB horizon. The reported ^{14}C assays and some of the associated diagnostic ceramics, suggest a more recent age. Feature 238 and Feature 243 were recorded in the southwestern corner of the block of excavated units. The features were only ca. 2.2 m apart. They are large and relatively deep and display multiple superimposed lenses indicating successive filling and reuse episodes. The third natural level or lens in each pit was associated with relatively large quantities of well-fired prepared clay floor fragments and large numbers of thermally altered cobbles and rock. None of the fragments of the prepared clay surfaces was recovered in the lower levels of either pit. Copious quantities of carbonized nutshell were recovered from both features, particularly from the same natural levels associated with the fired prepared clay surface fragments and thermally altered rock. In fact, only a relatively small amount of carbonized nutshell was recovered in the lenses below the third layer in either feature. The data argues for the deliberate preparation of smooth, probably puddled clay surfaces on the top of the underlying levels for the processing of nuts. The similarity of the structure and

usage of the two features and their close proximity also suggests that the two adjacent features were of essentially the same age.

Feature 238 is ^{14}C dated at A.D. 90 ± 40 in uncalibrated years. Feature 243 has three associated ^{14}C dates of A.D. 60 ± 40, A.D. 90 ± 70, and A.D. 190 ± 60 in uncalibrated radiocarbon years. Two diagnostic sherds derived from the shoulders of presumably two different type Adena Plain vessels were recovered from Level 2 in Feature 238 above the level containing most of the prepared floor fragments, thermally altered rock, and carbonized nutshell. Limestone-tempered smooth sherds that are arguably associated with the diagnostic Adena Plain shoulder sherds were the only other sherds recovered from Feature 238. Limestone-tempered smooth surfaced sherds were also recovered from Feature 243, but not exclusively. Sherds displaying other temper types were also recovered, but they were overwhelmingly small with eroded exterior and often interior surfaces. It is contended that these latter sherds were present in the AB horizon deposits when Feature 243 was excavated and were incidental inclusions in the pit fill or subsequently sloughed off the wall of the pit during its use. Alternatively, either the four radiometric dates are incorrect or they are dating younger wood that was inadvertently incorporated into the fill of the two features at a later date. The tight cluster presented by three of the four dates makes this scenario unlikely.

Greber (1991:1, 17-19) argued for a continuity between the ancestral Adena and the descendent Hopewell florescence in southern Ohio in tributary Ohio River basins with headwaters within the terminal Wisconsinan moraine beginning ca. 100 B.C. She states that otherwise local Adena manifestations, however, apparently continued to flourish in northern Kentucky and in some upper Middle Ohio River tributary drainages such as the lower Kanawha and Hocking river valleys after 100 B.C.-A.D. 1 without making the step of complexity to Hopewell, and thus, complicating the assignment of a date for the end of the Early Woodland period. Perhaps the lower Upper Ohio Valley is yet another example of an attenuated Adena-related manifestation.

Many of the remaining ceramic sherds recovered from the AB horizon fit the broad definition of Mayer-Oakes' (1955:184, 189) Half-Moon Cord-Marked type. But with the exception of the mixed siltstone and hematite-tempered cord-marked sherd with the basal heel, none of the remaining sherds ascribed to the Half-Moon Cord-Marked type or its yet undescribed and unnamed temper variants exhibit attributes that would suggest an assignment to the early part of the Half-Moon ware tradition. No deep, coarse diameter horizontal cordage impressions on the interior surfaces of sherds were identified. Only occasional faint, well smoothed-over impressions of relatively fine diameter cords were documented. No vessel lugs or flat basal sherds were recovered. The sherds do not resemble Early Woodland Half-Moon Cord-Marked sherds. The AB horizon ceramic assemblage suggests a local ceramic industry already transitioning from "classic" earlier Early Woodland ware to early Middle Woodland types, both defined and not yet defined.

The limestone-tempered cord-marked sherd recovered from Level 1 of the 2BC horizon, essentially Watson Cord-Marked ware despite its provenience, was located in unit N64 E233, directly below a larger cluster of sherds in the AB horizon displaying primarily siltstone and claystone temper particles. This cluster of sherds cross cut the upper-most levels of the AB horizon. This suggests that the sediments in this area were not well

consolidated at the time the vessels represented by these sherds were broken and discarded. This may have facilitated the vertical movement of the sherds in this area through human agencies such as trampling or through bioturbation. As well, this sherd weighs only 1.6 g. The presence of this small Watson Cord-Marked sherd in the 2BC horizon directly under the AB horizon sherd cluster argues for the agency of bioturbation for its recovery in the 2BC soil horizon.

Faunal Remains

A total of 1,071 bone fragments was recovered from four features and four units in the AB horizon. Faunal remains were found in Features 159, 165, 238, and 243. The excavation units in which faunal remains were recovered from the AB horizon outside of features were Units N60 E234, N64 E234, N77 E225, and N86 E226. Deer and rabbit were the only two taxa recognized. The Number of Identified Specimens (NISP) method was used to count the faunal material. The largest number (NISP=892) was recovered in Feature 238, a stratified, circular basin pit. A ^{14}C date from the pit is cal A.D. 70 to 240. Eight of the 892 specimens from this feature were identified as possible white-tailed deer (*Odocoileus virginianus*). All pieces are from the lower extremities. The remaining specimens from all features and non-feature contexts were rabbit (cf. *Sylvilagus* sp.) (*n* = 1), small mammal (*n* = 1), large mammal (*n* = 11), and indeterminate vertebrate (*n* = 1,047) The full faunal analysis report is included as Appendix 8O.

Floral Remains

AB horizon floral remains include hand collected materials (*n* = 1,113) and those found via flotation (*n* =11,462). This number includes 7,056 nutshell fragments, 4,991 wood fragments, 429 seeds, and 99 other unidentified plant remains. Hand-collected samples were recovered from Features 193, 238, and 243, and from the AB horizon. One walnut/walnut family (*Juglans* spp./Juglandaceae) nutshell fragment and 11 black walnut (*Juglans nigra*) nutshell fragments were hand collected from the AB horizon. The only hand-collected seeds from the AB horizon were 14 seeds discovered in Feature 238 (Level 3); 12 of these were goosefoot seeds (*Chenopodium spp*.), and two were erect knotweed seeds (*Polygonum erectum*). Twenty-one unidentifiable floral remains (classified as "Other") were also hand collected: these remains were rind-like fragments, amorphous spongy fragments, and one possible thorn.

Soil sample flotation led to the recovery of botanicals from Features 151, 154, 161, 162, 164, 165, 166, 172, 174, 177, 179, 180, 182, 184b, 185, 194, 195, 198b, 198c, 201, 236, 238, 242, 243, and 251. Wood fragments recovered included hickory (*Carya* spp.), black walnut (*Juglans nigra*), honeylocust (*Gleditsia triacanthos*), cherry (*Prunus* spp.), bitternut hickory (*Carya cordiformis*), maple (*Acer* spp.), ash (*Fraxinus* spp.), white oak (*Quercus* spp., white group), elm family (Ulmaceae), beech (*Fagus grandifolia*), conifer (gymnosperm or softwood), and hop hornbeam (*Ostrya virginiana*). Nutshells included those from walnut/thick-shelled hickory (Juglandaceae), black walnut (*Juglans nigra*), thick-shelled hickory (*Carya* spp.), acorn (*Quercus* spp.) and butternut (*Juglans cinerea*).

Charred seeds and plant fragments were also recovered from the flotation samples. From the AB horizon within the features listed above, 206 erect knotweed seeds, 175 goosefoot seeds, two mustard seeds, two honeylocust seeds, one poke seed, one leadplant seed, and 27 unidentified seeds were identified. A total of 77 unidentified charred plant fragments were also recovered from the AB horizon flotation samples. Floral remains from the features are described in greater detail below, in the Features discussion, and further elaboration on can be found in the Subsistence and Seasonality Interpretation section as well.

Feature Identification and Analysis

As described in the overview, 53 feature numbers were assigned during AB horizon excavations at Area 3-South. Subsequent analyses determined that of these, only 38 were actual intact cultural features. Others were either a result of non-cultural activity or historic period site disturbance. Two features numbers were eliminated based on the idea that they were assigned to components of larger features. Figure 8.45 illustrates the spatial distribution of these features. Table 8.30 provides an overview of Area 3-South AB horizon features including possible type, provenience data, and associated radiocarbon dates.

Table 8.30. AB Horizon Feature Summary.

Feature Type and Number	Dimensions (L x W x Th)	Unit Location(s)	Opening Elevation	Radiocarbon Date
Hearth				
Feature 151	40 x 20 x 23	N60 E235	215.05	
Feature 156	18 x 9 x 13	N60 E233	215.11	
Feature 159	60 x 50 x 12	N60 E234	214.95	
Feature 162	90 x 60 x 14	N67 E235	214.90	
Feature 163	60 x 30 x 10	N61 E234/E235	215.07	
Feature 164	45 x 40 x 10	N63 E233	214.99	
Feature 165	38 x 33 x 15	N69 E229	214.84	
Feature 166	176 x 163 x 25	N70 E227/E228	214.82	2890±40 B.P.
Feature 168	25 x 25 x 7	N66 E238	214.90	
Feature 171	105 x 95 x 18	N64 E234	214.99	
Feature 172	97 x 60 x 19	N62 E236	215.00	3030±40 B.P.
Feature 174	65 x 60 x 25	N71 E225	214.92	
Feature 176	30 x 20 x 14	N71 E226	214.86	
Feature 177	108 x 102 x 34	N67/N68 E234/E235	214.92	
Feature 179	60 x 50 x 9	N62 E236	214.87	
Feature 180	37 x 25 x 11	N71 E231	214.64	
Feature 182	70 x 40 x 12	N63 E235	214.86	
Feature 184	80 x 70 x 28	N72 E225/E226	214.93	
Feature 185	78 x 73 x 28	N77/78 E225/226	214.90	
Feature 192	32 x 24 x 10	N76 E231/E232	214.61	
Feature 194	55 x 45 x 10	N78 E226	214.71	

Feature Type and Number	Dimensions (L x W x Th)	Unit Location(s)	Opening Elevation	Radiocarbon Date
Feature 198	117 x 114 x 14	N76/N77 E235/E236	214.73	
Feature 200	69 x 47 x 7	N76 E231	214.70	
Feature 237	16 x 14 x 5	N68 E227	214.93	
Feature 240	67 x 45 x 14	N85 E228	214.61	
Feature 258	100 x 45 x 00	N59 E230	215.20	
Post Mold				
Feature 154	8 x 6 x 26	N73 E228	214.86	
Feature 157	7 x 7 x 4	N65 E236	214.86	
Feature 158	7 x 7 x 4	N65 E237	214.91	
Feature 169	9 x 6 x 5	N66 E238	214.87	
Feature 170	7 x 6 x 7	N66 E238	214.85	
Pit Indeterminate				
Feature 175	42 x 40 x 22	N65 E233	214.87	
Feature 181	30 x 30 x 15	N78 E227	214.65	
Feature 195	74 x 48 x 35	N75 E234	214.43	
Feature 242	80 x 80 x 21	N59 E231	215.22	
Nut Processing				
Feature 161	20 x 20 x 13	N66 E238/E239	214.95	
Feature 238	110 x 106 x 21	N57 E232	215.03	1860±40B.P
Feature 243	130 x 120 x 73	N60/61 E230/231	215.13	1860±70 B.P. 1760 ±60 B.P. 1890±40 B.P.

Hearths included the possible remains of surface fires suggested by amorphic thermal staining and FCR clusters or scatters; and shallow and deep basin shaped fire pits. Some contained only FCR and charcoal flecking (*n* = 15); others contained more diverse assemblages at times comprising FCR, debitage, pottery sherds, and faunal or floral remains (*n* = 11). The range of elevation in which these features occurred in the AB horizon is 215.20 m to 214.61 m above NGVD, or spanning 59 cm. They varied in size from smaller than 18 cm by 9 cm in plan and 13 cm deep to as large as of 1.76 m by 1.63 m and 25 cm deep. Radiocarbon dating was performed for two of the hearth features, Features 166 and 172. Both results were earlier than expected, compared to diagnostic artifacts and other dated features in the AB horizon. The Feature 166 result was 2890 ± 40 B.P. (1,200 to 940 B.C.). The Feature 172 date was 3,030 ± 40 B.P. (1,400 to 1,100 B.C.). The dates are associated with the latest Terminal Archaic to earliest Early Woodland periods. Neither feature contained pottery. The vertical provenience of these feature places them almost at the base of the AB horizon, within 2-5 cm. Natural mixing and/or staining of the overlying soils or FCR protruding above the feature surface may have caused the excavators to define the top of these features higher than their true origin. Also, the AB-2BC interface was not distinct and simply may have been defined too low in this portion of the site. A vertical difference of only 2-5 cm in the definition of the feature surface would place both features in

the underlying 2BC horizon, which contains two other cultural features with comparable radiocarbon dates.

Five possible post molds were identified during excavation of the AB horizon in Area 3-South. These features are small in size and contain no artifacts. Four of five (Features 157, 158, 169, and 170) are located within two adjacent excavation units, and are similar in size and depth (average width/diameter is 6 cm to 9 cm; depth ranges from 4 cm to 7 cm). The fifth, Feature 154, is similar in plan but is 26 cm deep and located roughly 6 m from the others. The four collocated post molds are thought to possibly represent the remains of a rack, windbreak, or other similar type structure. None of these features was dated.

Four pits of indeterminate function were identified. These pits do not contain evidence of *in situ* burning, appear to have been excavated, may contain some charcoal flecking or FCR and other artifacts but do not appear to have been hearths. They may have been used for storage or some other unidentifiable purpose. They were found between 215.22 m and 214.43 m above NGVD, or across roughly 80 cm. They range in size from 30 cm to 80 cm in diameter and depth ranges from 15 cm to 35 cm. No radiocarbon dating was carried out for the indeterminate pits.

Three nut processing features were found. These features are characterized by copious amounts of nutshell combined with light density lithics, FCR, mixed woods, and in the case of Features 238 and 243 internal structure that includes fired prepared clay surfaces. These features were large in plan—110 cm and 130 cm in length respectively. Feature 161 was smaller (only 20 cm in diameter) and contained fewer remains. These three features were found between 215.13 m and 214. 95 m above NGVD. Radiocarbon dating results for these features are summarized as follows:

- Feature 238—1860 ± 40 B.P. (A.D. 70 to 240)
- Feature 243—1860 ± 40 B.P. (A.D. 5 to 340); 1760 ± 60 B.P. (A.D. 120 to 415); 1890 ± 40 B.P. (A.D. 40 to 230).

Unlike the other radiocarbon dates for the AB horizon, these dates fall solidly within the Early Woodland Period, consistent with some stone tools and pottery found during the excavations.

Feature Descriptions

Feature 151

Feature 151 is a Pit with FCR and is interpreted as a general purpose cooking hearth. It was located in Unit N60 E235. It had an opening elevation of 215.05 NGVD and a closing elevation of 214.82 NGVD. The feature was approximately 40 cm by 20 cm in size, and the FCR was shaped in an arch-like alignment (Figure 8.46). The soil stain was semicircular, with charcoal flecking. The matrix was described as dark brown (10YR 3/3), loosely compacted, fine sandy silt with very dark gray brown (10YR 3/2) along ped faces. The feature was slightly basin-shaped with a flat bottom and steep sides. Artifacts from this feature include one flake fragment, 16 FCR fragments, and two groundstone artifacts. Of the

two groundstone artifacts recovered from this feature (Catalog nos. 3274 and 3276), one was a (whole) pitted stone (552.4 g in weight) and the other was a whole unmodified pebble (47.29 g).

Feature 154

This feature is a possible post mold identified in Unit N73 E227. It had an opening elevation of 214.86 NGVD and a closing elevation of 214.52 NGVD. Its dimensions were 6 cm east-west by 8 cm north-south. It was roughly circular in plan view and straight sided with parallel edges in profile (Figure 8.47). The fill was described as dark brown (10YR 3/3), fine sandy silt to fine silt, mottled with brown (10YR 4/3) fine silt. No artifacts were recovered. Root casts were noted along the side and extending from the base of the feature, and may indicate some amount of disturbance.

Feature 156

This is a thermal feature identified as a possible surface hearth of indeterminate function. It was identified in Unit N60 E233. Its opening level was 215.11 NGVD and its closing level was 214.98 NGVD. It measured 18 cm north-south in length by 9 cm east-west in width. It consisted of a concentrated area of charcoal. The soil was described as staining of a loose to medium compacted, dark brown (10YR 3/3), fine sandy silt, with a very dark gray (10YR 3/2) rim around the charcoal. This feature was irregular both in plan view and profile, with no clear boundary to the stain (Figure 8.48). No artifacts were recovered.

Feature 157

This post mold was located in Unit N65 E236. Its top elevation was 214.86 NGVD, and its bottom elevation was 214.82 NGVD. It measured 7 cm in diameter. It was circular in plan view and basin-shaped in profile (Figure 8.49). The fill was described as a dark yellowish brown (10YR 3/4-4/4) fine sandy silt. It appeared to be slanted from the northwest at the top to the southeast at its base. No artifacts were recovered from this feature.

Feature 158

This post mold was located in Unit N65 E237. It had an opening elevation of 214.91 NGVD and a closing elevation of 214.87 NGVD. It was circular in plan view and shaped like an inverted cone in profile (Figure 8.50). It measured 7 cm in diameter and was 4 cm thick. The fill was described as a dark yellowish brown (10YR 4/4), sandy silt. No artifacts were recovered in this feature.

Feature 159

This FCR cluster appeared as a dark, circular stain in the southeast quadrant of Unit N60 E234. It is interpreted as a general purpose and cooking hearth. It measured 50 cm north-south by 60 cm east-west in width. It had an opening level of 214.95 NGVD and a closing level of 214.83 NGVD. Feature 159 was circular in plan view and was shallow and basin-shaped in profile (Figure 8.51). The fill was described as a dark brown-brown (7.5YR 3/3-4/3) fine sandy silt. A small rodent intrusion was identified in the profile. Two small pieces of calcined bone (indeterminate vertebrate) and a moderate amount of charcoal

flecking were identified in the feature. Additional artifacts included four FCR fragments, one whole flake and two debitage fragments.

Feature 161

Feature 161 was a pit that was probably for short-term or small-scale nut processing or roasting. This feature was located in Unit N66 E239. It had an opening elevation of 215.95 NGVD and a closing elevation of 214.82 NGVD. It was approximately 20 cm in diameter. It was ovoid in plan view and was basin-shaped in profile (Figure 8.52). The feature fill was described as a dark yellowish brown (10YR 3/4), friable silt loam. The artifacts recovered from this feature were three FCR fragments, and 98 charred floral fragments recovered from flotation comprised of 58 walnut/thick-shelled hickory nutshell fragments (Juglandaceae), 23 black walnut nutshell fragments (*Juglans nigra*), two thick-shelled hickory nutshell fragments (*Carya* spp.), 10 hickory (*Carya* spp.) wood fragments, and five unidentifiable wood fragments. Moderate charcoal flecking was found throughout the feature fill. At a depth of about 7.8 cm, there was a noticeable reduction in the charcoal flecking.

Feature 162

This feature was a pit with FCR and probably functioned as a general purpose and food preparation hearth. It was located in Units N67 E235 and E236. It was elongated to ovate in plan view and was a shallow basin in profile (Figure 8.53). It had a top elevation of 214.90 NGVD and a closing elevation of 214.76 NGVD and was 60 cm north-south by 90 cm east-west wide. The fill matrix was described as a dark yellowish brown (10YR 3/4), very compact, fine sandy silt, mottled with brown (10YR 4/3), dark yellowish brown (10YR 4/6), and yellowish brown (10YR 5/6). The feature was identified as a rock cluster with burnt earth, and it might have functioned as a burning pit or some type of preparation pit. The soils in the feature were heavily mottled, with burnt soils and clays and some partially organic material, but no definite stratification. Artifacts recovered were two stone debitage fragments, 43 FCR fragments, and two groundstone artifacts. The two groundstone artifacts were both pitted stone fragments, one was 1,798 g in weight and the other weighed 97.4 g, and were both designated as Catalog no. 3300. The artifacts appeared as a thin lens immediately above the rock cluster. Also, the feature had a highly amorphous boundary that was difficult to distinguish from the surrounding AB horizon matrix. The compaction of soils in and around this feature was thought by the excavators to represent a possible living floor; however, no other data was encountered to support that scenario. Charcoal flecking was also observed throughout the surrounding soil matrix. The base of this feature had been dug into the underlying 2BC horizon soil matrix.

Feature 163

Feature 163 was an FCR cluster and possible hearth of indeterminate function located in Units N61 E234 and N61 E235. It had an opening elevation of 215.07 NGVD and a closing elevation of 214.93 NGVD. It was 60 cm in length by 30 cm in width, and it was roughly oval in plan view (Figure 8.54). There was no significant change in soil between the feature and the surrounding matrix, with the exception of increased charcoal flecking that was shallow and diffuse. No profile was discernable enough to warrant a drawing. One

pottery fragment was recovered from this feature, a body sherd with cordmarking on the exterior and smoothed-over cord impressions on the interior. This limestone tempered sherd is attributable to the Watson Cord-Marked type of the late Early Woodland period. Eleven FCR fragments were also recovered.

Feature 164

Feature 164 was an FCR cluster and possible hearth of indeterminate function located in Unit N63 E233. This feature had an opening elevation of 214.99 NGVD and a closing elevation of 214.88 NGVD. It measured 45 cm east-west by 40 cm north-south. Feature 164 was circular in plan view, and its profile was basin-shaped (Figure 8.55). A small charcoal concentration was found in the south-central portion of the feature. The soil matrix was described as a dark brown (10YR 3/3) clay silt loam with mottling of dark yellowish brown (10YR 3/4-4/4). This feature has been classified as a rock cluster. Four FCR fragments and three unidentifiable wood fragments were recovered.

Feature 165

Feature 165 was a pit with FCR probably used as a general purpose and food preparation hearth. It was located in Unit N69 E229 near the base of the AB horizon. It had a top elevation of 214.84 NGVD and a bottom elevation of 214.69 NGVD. It measured 33 cm north-south and 38 cm east-west. It was roughly circular in plan view, and basin-shaped in profile (Figure 8.56). The feature contained charcoal flecking, decaying thermally altered sandstone, and small pockets of heavily oxidized soil. The soil matrix was described as a dark reddish brown (5YR 3/3) silt loam. The feature appeared to be the remains of a small fire pit or roasting pit, based on the shape, and type of artifacts. One whole flake, one proximal flake, and five fragments of lithic debris were recovered, as well as six FCR fragments and 11 pieces of calcined bone (indeterminate vertebrate). Seven floral remains were also recovered, comprised of two honeylocust wood fragments (*Gleditsia triacanthos*) and five unidentifiable wood fragments.

Feature 166

Feature 166 was a pit with FCR that probably served as a hearth. This feature was located primarily in Unit N70 E227 and extended into Units N70-71 E227-228. It originated in the bottom 2 to 3 cm of the AB horizon. It was circular in plan view and basin-shaped in profile (Figure 8.57). It had a starting elevation of 214.82 NGVD and a closing elevation of 214.57 NGVD. It measured 176 cm north-south by 163 cm east-west. The first layer excavated had a dense layer of charcoal, and the eastern half of the feature had dense charcoal flecking and oxidized soils. Within the eastern area was a large concentration of FCR, underlain by oxidized soils. The upper feature fill was described as a dark yellowish brown (10YR 3/4-3/6), fine, sandy silt; while the lower fill was described as a dark red (2.5YR 3/6), heavily oxidized soils, mottled with dark yellowish brown (10YR 4/4), fine, sandy silt. Artifacts recovered included 64 FCR fragments, five whole flakes, four proximal flakes, seven fragments of lithic debris, and five groundstone artifacts. The groundstone artifacts were all whole unmodified pebbles; four of these were designated with Catalog no. 3315, and the other was identified with Catalog no. 3314. A total of 28 floral remains were recovered from this feature, including one hickory wood fragment (*Carya* spp.), five cherry

wood fragments (*Prunus* spp.), four bitternut hickory wood fragments (*Carya cordiformis*), one maple wood fragment (*Acer* spp.), one chestnut wood fragment (*Castanea dentata*), and 16 unidentified wood fragments.

Feature 166 was excavated in two levels. Level 1 had very little oxidation and charcoal flecking, but contained the majority of artifacts. The whole and proximal flakes and the debitage (lithic debris) were recovered from this level. The floral remains and FCR were recovered from both levels of the feature. The southern half of this feature lacked FCR, but it did contain most of the oxidized soils seen in the feature. One radiocarbon sample was collected from this feature and dated using the AMS dating technique. The date was 1200 to 940 cal B.C. or a conventional date of 2890 ±40 B.P. Given the unusually early date for a feature within this soil horizon, it is possible that Feature 166 actually belongs to the underlying 2BC horizon, which contains features that produced comparable dates. The upper surface of Feature 166 was identified only 2 cm above the 2BC. The surface of the feature may have been defined slightly too high as a result of natural mixing/staining of the overlying soils as well as the initial identification of the feature including the tops of FCR which protruded above the actual surface on which the feature was created. Additionally, the AB-2BC interface is not distinct and simply may have been defined slightly too low in elevation at this localized portion of Area 3-South.

Feature 168

Feature 168 was a pit that probably served as a hearth. It was uncovered in Unit N66 E238 and was 25 cm in diameter. Its top elevation was 214.90 NGVD, and its closing elevation was 214.83 NGVD. It was circular with a rounded base (Figure 8.58). The feature was first identified as a dark stain in the AB horizon. The stain had an intense concentration of charcoal flecking that dropped off drastically after the first 3 to 4 cm. The soil matrix was described as a dark brown - dark yellowish brown (10yr 3/3-3/4) silt to fine sandy silt, organic, compacted soil with inclusions of oxidized soil and charcoal. No cultural material was identified in this feature.

Feature 169

This post mold was located in Unit N66 E238. It had an opening elevation of 214.87 NGVD and a closing elevation of 214.82 NGVD. It measured 9 cm east-west by 6 cm north-south. It was ovate in plan view and was irregular basin-shaped with steep sides in profile (Figure 8.59). The soil was slightly darker than the surrounding matrix, and was described as a dark brown (10YR 3/3) sandy silt. No artifacts were recovered in this feature.

Feature 170

This post mold was located in Unit N66 E238. It had a top elevation of 214.85 NGVD and a closing elevation of 214.78 NGVD. It was 7 cm across northwest-southeast, 6 cm across northeast-southwest, and 7 cm deep. The feature was ovate in plan view, and was a straight-sided, deep, narrow basin in profile, with an irregular shape at the top (Figure 8.60). The feature fill was described as a dark brown (10YR 3/3) sandy silt. No artifacts were recovered from the feature.

Feature 171a,b,c

This pit feature probably served as a general purpose and cooking hearth. It was located in Units N63 E232-E234 and N64 E233-E234. During excavation it was separated into three sections, a, b, and c (Figure 8.61). It was an irregular circle shape in plan view and lens-shaped in profile. This feature had an opening elevation of 214.99 NGVD and a closing elevation of 214.81 NGVD. It measured 95 cm north-south and 105 cm east-west in the area of Feature 171b, and 60 cm north-south by 55 cm east-west in the area of Feature 171c. Feature 171a and Feature 171b consisted of concentric, irregular, circular dark stains with a concentration of large fire-cracked cobbles in the Feature 171a portion of the feature. A large amount of gravel, 1 to 3 mm in size, was found associated with the FCR in Level 1 of the eastern half of Feature 171a. Excavations of the west half of 171a uncovered a stone cluster, but no other artifacts were recovered. The soil of Feature 171a was described as a dark brown (10YR 3/3) mix of organic ashy silt and fine sandy silt, with charcoal; while the Feature 171b portion was described as a brown (10YR 4/3) fine sandy silt, with charcoal flecking.

In the northern portion of the feature, the FCR fragments were in a burned area with charcoal fragments. None of the stones extended into Level 3 of Feature 171a, suggesting a "floor" at the Level 2 to 3 boundary, and the 171c Level 1 to 2 boundary. Feature 171b included tabular sandstone fragments that were lying flat when excavated. Flakes, gravel and pebbles were also found in this part of the feature. Charcoal was limited to a few pieces.

Feature 171c consisted of an adjacent, irregularly shaped stain. The matrix was described as a brown (10YR 4/3) fine sandy silt, with large charcoal fragments. Cultural remains were limited to Level 1, and FCR was the predominant artifact. Feature 171c had an opening elevation of 214.99 NGVD and a closing elevation of 214.76 NGVD. Two whole flakes were also recovered from Level 1 of Feature 171c.

Artifacts recovered in Feature 171a were two whole flakes and 44 FCR fragments; Feature 171b yielded one whole flake, one proximal flake, two fragments of lithic debris, and 13 FCR fragments; and Feature 171c yielded two whole flakes and 14 FCR fragments. A rodent burrow created a disturbance in the feature, as did numerous root disturbances. A burned area was observed beneath the northernmost cluster. The dark, mottled, burned area seen in Level 2 continued into Level 3. Level 3 contained fairly abundant charcoal.

Feature 172

This pit feature with FCR probably served as a general purpose and cooking hearth. It was located in Units N61 E235, N62 E235, N61 E236, and N62 E236. It was identified within the AB horizon. The feature had a top elevation of 215.00 NGVD and a closing elevation of 214.81 NGVD. It measured 97 cm north-south by 60 cm east-west. It was amorphous with a convex profile (Figure 8.62). The feature fill was described as a brown (10YR 4/3), very mottled, sandy silt loam. The feature contained one whole flake and two proximal flakes, 25 FCR fragments, and a large amount of charcoal. A total of 41 floral remains was also recovered from this feature, and consisted of six hickory wood fragments (*Carya* spp.), one black walnut wood fragment (*Juglans nigra*), one bitternut hickory wood fragment (*Carya cordiformis*), one ash (*Fraxinus* spp.), 30 unidentified wood fragments, and

two black walnut nutshell fragments, all recovered from flotation. One ^{14}C date was calculated for this feature using the AMS technique. The result was a conventional date of 3030 ± 40 B.P (cal. 1400 to 1140 B.C.). This date is considerably earlier than the diagnostics and other features (except Feature 166) within the AB horizon. No diagnostic artifacts were recovered in Feature 172, so it is not possible to cross-check this date with other information. Given the unusually early date for a feature within this soil horizon, it is possible that Feature 172 actually belongs to the underlying 2BC horizon, which contains features that produced comparable dates. The upper surface of Feature 172 was identified roughly 5 cm above the 2BC horizon. Like Feature 166, the surface of the feature may have been defined slightly too high as a result of natural mixing/staining of the overlying soils as well as the initial identification of the feature including the tops of FCR which protruded above the actual surface on which the feature was created. Also, the center of this feature was mounded above the elevation of the feature edges. Additionally, the AB-2BC interface is not distinct and simply may have been defined slightly too low in elevation at this localized portion of Area 3-South.

Feature 174

This pit feature with FCR probably served as a general purpose and cooking hearth. It was located in Unit N71 E225 and extended into Unit N72 E225. It also extended outside the excavation block toward the west. It had an opening elevation of 214.92 NGVD and a closing elevation of 214.67 NGVD. It measured approximately 60 cm north-south by 65 cm east-west. It was amorphous in plan view and was basin-shape in profile (Figure 8.63). This feature first identified as a small rock cluster with burnt soils and charcoal flecking. The entire feature was flecked with charcoal. The matrix was described as a yellowish red (5YR 4/6), compact, sandy silt, mottled with strong brown (7.5YR 4/6). The base of the feature was an elongated bowl shape that ran into the western extent of the block. Artifacts included one proximal flake fragment, 16 FCR fragments, and prehistoric pottery fragments; the latter were too fragile to recover. A total of 32 floral remains were also recovered from flotation, including one black walnut wood fragment ((*Juglans nigra)*, 29 unidentifiable wood fragments, and one unidentified porous and amorphous plant part. The porous amorphous fragment resembled a starchy plant part (tuber or starchy seed) in which the starch cells exploded with heat, according to the paleoethnobotanical analysis.

Feature 175

This indeterminate pit feature was located in Unit N65 E233 and extended into Unit N66 E233. It appeared as a dark, charcoal-flecked stain, identified at 214.89 NGVD. It had a top elevation of 214.87 NGVD and a bottom elevation of 214.65 NGVD. It was approximately 40 cm east-west by 42 cm north-south wide. It was an amorphous ovoid shape in plan view, and a rounded-bottom basin in profile (Figure 8.64). The feature fill was described as a dark brown-dark yellow brown (10YR 3/3-3/4), organic, fine sandy silt. The feature could be the remains of a mid-sized storage pit. One flake fragment and three fragments of FCR were recovered in the feature excavations.

Feature 176/205

This pit probably served as a hearth of indeterminate function. It was located in Unit N71 E226. It had a top elevation of 214.86 NGVD and a closing elevation of 214.72 NGVD, and measured 30 cm east-west by 20 cm north-south. It was circular in plan view and bowl-like in profile (Figure 8.65). The feature was a small, circular pit with fill deposits described as brown (7.5YR 4/4), sandy silt, with moderate charcoal flecking. The base consisted of a thin layer of reddish brown (5YR 4/4), sandy silt. This feature was fairly well defined. There seemed to be an adjacent small, round stain at the surface that was defined as part of the major portion of the feature. The only artifacts were three FCR fragments recovered in the northern half of the feature, and one fragment of lithic debris.

Directly beneath what was defined as Feature 176, was a circular stain with lenticular charcoal and reddened soil along the perimeter, initially defined as Feature 205. This feature was found to be a portion of Feature 176, though it was initially given its own feature designation number. It was located in Unit N71 E226. It had a top elevation of 214.66 NGVD and a bottom elevation of 214.59 NGVD. It measured 17 cm north-south and 20 cm east-west. It was circular in plan view and basin-shaped in profile. The Feature 205 portion was first identified extending 1 to 2 cm into the first level of the F10 Field Designation. Excavations revealed three levels in profile—distinct, concentric, bowl-shaped lenses—field designated as F77a, F77b, and F77c (Figure 8.65). F77a was described as brown (7.5YR 4/3) fine sandy silt loam – clay loam. F77b was a dark yellowish brown (10YR 3/4) silty clay loam with heavy carbon concentrations. Finally, F77c was described as yellowish brown (10YR 5/6), mottled with yellowish red (5YR 5/8), silt loam, and appears to be reddened oxidized soil. Three FCR fragments were recovered in this feature.

Feature 177

This pit feature with FCR probably served as a general purpose and cooking hearth. It was located in four different Units—N67 E234, N67 E235, N68 E234, and N68 E235. The feature was first defined during the excavation of Level 1 of Unit N68 E234, in the AB horizon. It had an opening elevation of 214.92 NGVD and a closing elevation of 214.58 NGVD. It measured 102 cm east-west by 108 cm north-south. The feature was circular in plan view, and in profile it was a shallow basin with a smaller, deeper basin in its center (Figure 8.66). The feature fill deposits were described as very dark grayish brown (10YR 3/2), silty clay loam, mottled with reddish brown (5YR 4/4). It had three levels of excavation, but was not stratified. The excavation included a rim area approximately five cm below the edge of the feature; the rim sloped into a lower level that included most of the feature; the third level was located approximately in the center of the feature, with this area dipping down approximately 14 cm.

It appeared to be the remains of a hearth or small roasting pit that was expanded to form a ledge that encircled the smaller, deeper basin. The ledge was approximately 11 cm deep from the top of the feature on its eastern half, and was between 23 cm and 43 cm wide. A small, triangular-shaped basin was present in the middle of the feature, and extended 15 cm to 18 cm in depth from the ledge. There were small areas of burnt soil where the charcoal or soot concentrations were located. This feature may have originally been constructed as a

hearth or small roasting pit and then was later expanded to form a larger roasting pit, based on its size and shape, evidence of burning, and artifacts recovered.

Feature 177 contained 55 FCR fragments and scattered charcoal throughout its matrix. The deeper, smaller basin contained two pottery fragments: one was identified as an Early Woodland Half Moon Cord-marked body sherd with unidentified temper, a cord-marked exterior surface treatment, and an eroded interior surface. The other sherd was of unidentified type, vessel portion, and surface treatment, but had grit tempering. One pitted stone artifact fragment (Catalog no. 3349, Figure 8.43 [c]) that seemed to have been used as an anvil and showed thermal alteration was also recovered. Additionally, two whole flakes and three fragments of lithic debris were recovered from this feature. The floral remains recovered were six charred fragments of unidentified tree bark.

Feature 179

Feature 179 was a pit with FCR that probably was a hearth. This feature was located in Units N62 E236 and N63 E236. It had an opening elevation of 214.87 NGVD and a bottom elevation of 214.78 NGVD. It measured 60 cm across north-south by 50 cm east-west. It was semicircular in plan, and bowl-shaped with a concave surface in profile (Figure 8.67). The feature was a large stain with a concentration of FCR and charcoal found at its center. The matrix was described as dark reddish brown (5YR 3/2), sandy loam. It was located very close to Feature 172. Six FCR fragments were recovered in this feature. A total of 30 charred wood fragments were also recovered, including four honeylocust wood fragments (*Gleditsia triacanthos*) and 26 unidentified wood fragments.

Feature 180

This pit feature probably served as a general purpose and cooking hearth. It was located in Unit N71 E231. It had a top elevation of 214.64 NGVD and a closing elevation of 214.53 NGVD. It measured 25 cm east-west by 37 cm north-south. The feature was ovoid in plan view and basin-shaped in profile (Figure 8.68). This feature was a fairly small, dark stain located in the AB horizon. It consisted of an intense charcoal concentration, with small pieces of eroded pottery and burnt soil. The matrix was described as dark yellowish brown (10YR 3/4-3/6) loam. Feature 180 is defined as a possible fire pit. The artifacts identified were highly eroded pottery fragments, which could not be recovered, one lithic debitage fragment, and 138 floral remains. The floral fragments recovered included 20 unidentified tree bark fragments, 12 walnut/thick-shelled hickory (Juglandaceae) nutshell fragments, five black walnut nutshell fragments (*Juglans nigra*), one unidentified porous, amorphous plant portion, and 100 fragments too small to analyze.

Feature 181

This indeterminate pit feature was located in Unit N78 E227. It had a top elevation of 214.65 NGVD and a closing elevation of 214.50 NGVD. It was 30 cm in diameter, was round in plan view, and was basin shaped in profile (Figure 8.69). This feature appeared to be a fairly deep oxidized pit. The fill deposits were described as reddish brown-yellowish red (5YR 4/4-4/6), fine sandy silt. No artifacts were recovered within the feature, although one chert core was recovered in the overlying level.

Feature 182

This pit feature with FCR probably served as a general purpose and cooking hearth. It was located in Unit N63 E235 and extended into Unit N63 E236. It was located in the AB horizon. It had an opening elevation of 214.86 NGVD and a bottom elevation of 214.74 NGVD. It measured 70 cm across southwest-northeast by 40 cm east-west. It was crescent-shaped in plan view, and was a steep, basin shape in profile (Figure 8.70). The matrix was described as very dark grayish brown to dark brown (10YR 3/2 to 3/3), organic silt loam. Charcoal staining was also present. Eighteen FCR fragments and one proximal flake fragment were recovered from the feature. A total of 69 floral remains were recovered, including nine hickory wood fragments (*Carya* spp.), five honeylocust wood fragments (*Gleditsia triacanthos*), one maple wood fragment (*Acer* spp.), 50 unidentified wood fragments, one acorn (*Quercus* spp.), two unidentified seeds, and one porous, amorphous plant portion. FCR had been laid at the base of the feature, and the additional FCR fragments were within the charcoal stain and along its edge. This feature had been partially excavated and the northwest corner had been removed as part of unit excavations before the feature was identified.

Feature 184a,b,c

Feature 184 was a pit with FCR that probably was a hearth. This feature was located in Unit N72 E226, and extended into Unit N72 E225. It was identified in the AB horizon. The feature was excavated in three sections, designated 184a, 184b, and 184c. Overall, the feature had an elevation of 214.93 NGVD at its opening. Feature 184a had a closing elevation of 214.79 NGVD, and Feature 184c – underlying 184b – had a closing elevation of 214.65 NGVD. The entire feature was approximately 70 cm east-west across, by 80 cm north-south (Figure 8.71). It was a slightly elongated ovoid in plan view and was a double pit in profile. It appeared to have had multiple uses as a fire pit. The Feature 184a portion was the remains of one continuous use episode, while the Feature 184b portion seemed to have multiple firing episodes or some type of residual displacement near its top, followed by a rock-lined burning episode. The 184a feature fill soils were described as dark reddish brown (5YR 4/3), fine sandy silt, mottled with yellowish brown (10YR 5/4), yellowish red (5YR 5/8), reddish brown (2.5YR 4/4), and reddish brown (5YR 4/4); possibly burnt soils. The 184b soils were described as dark yellowish brown (10YR 4/4), fine sandy silt, with large amounts of charcoal. Beneath the Feature 184b was a deeper, narrower depression, designated Feature 184c. That portion of the feature was described as being filled with yellowish red (5YR 5/8), sandy silt, mottled with reddish brown (2.5YR 4/4), and reddish brown (5YR 4/4).

The soil consistency initially was a scattering of a relatively compact, heavily reddened fine soil. At the start of excavation, the feature was treated as one feature, but as excavation continued it became clear that it was the remains of two small pits. Feature 184a contained reddened and burnt soils, charcoal flecking, seven FCR fragments, one whole primary flake fragment, and one piece of lithic debris. Feature 184a was a relatively shallow, compact basin. Feature 184b contained an ash layer with charcoal flecking, which was possibly a cap to the feature. The underlying portion, Feature 184c, contained more fired soils and had a scattered, rock-lined bottom. Most of the artifacts were FCRs. Eleven FCR

fragments were recovered in 184c. One floral specimen was recovered from 184b, a small porous amorphous fragment, possibly a part of a starchy plant (tuber or seed). It appeared in the field that the feature could have been the remains of a processing or steaming pit, with multiple uses for both pits.

Feature 185

Feature 185 was a pit with FCR that probably was a general purpose and cooking hearth. It appeared in Unit N77 E225 and extended into Units N77 E226, N78 E225, and N77 E226. It had a top elevation of 214.90 NGVD and a bottom elevation of 214.62 NGVD. It measured 78 cm across in the north-south direction and 73 cm east-west. It was circular in plan view and basin-shaped in profile (Figure 8.72). Feature 185 consisted of a concentration of FCR in the southern portion, with a rodent burrow disturbance. The feature fill was described as very dark grayish brown (10YR 3/2), compact silty sand. Artifacts recovered were one proximal flake fragment, three pieces of lithic debris, and 21 FCR fragments. A total of 38 floral remains was recovered from this feature, of which 31 were unidentified, four were black walnut wood fragments (*Juglans nigra*), and three were honeylocust wood fragments (*Gleditsia triacanthos*).

Feature 192

This feature was a stone cluster located primarily in Unit N76 E232 but that extended into Unit N76 E231. It had a top elevation of 214.61 NGVD and a bottom elevation of 214.51 NGVD. It measured 24 cm north-south by 32 cm east-west across (Figure 8.73). The feature consisted of a flattened ring of six large, rounded, smooth river cobbles that overlapped tightly. In addition to the six cobbles, the only artifact recovered was one flake fragment. The feature sediments, although not unlike the surrounding soil, was described as dark brown (7.5YR 3/3), sandy loam, with moderate charcoal flecking.

Feature 194

This pit with FCR was probably a hearth. It was located in Unit N78 E226. It had a top elevation of 214.71 NGVD and a closing elevation of 214.61 NGVD. It measured approximately 55 cm east-west, by 45 cm north-south. It was ovate in plan view and a shallow bowl in profile (Figure 8.74). This feature first appeared as a darkened brown stain with several pieces of FCR and large charcoal flecks in the center of the unit. It was 30 cm northeast of Feature 185, which was a large, round, basin-shaped feature. It consisted of burnt soil concentrations with moderate amounts of charcoal flecking throughout the entire feature fill. The feature matrix was described as brown (7.5YR 4/4), compact, sandy silt, mottled with strong brown (7.5YR 5/6). Apart from the five FCR fragments, artifacts were limited to one piece of lithic debris and 28 floral remains. The floral finds included four fragments of charred hickory wood (Carya spp.), and 24 unidentified wood fragments. It is worth noting that the feature may have originally extended further to the north, as a slightly darker and slightly reddened area was observed just north of the northern edge of the feature.

Feature 195

This indeterminate pit feature was identified in Unit N75 E234. It had an opening elevation of 214.40 NGVD in the northern half and 214.43 NGVD in the southern half, and a closing elevation of 215.05 NGVD. It measured 48 cm by 74 cm across. It was roughly circular in plan view, and cauldron-shaped in profile (Figure 8.75). The feature matrix was described as dark yellowish brown (10YR 4/4) silt loam, with small amounts of charcoal throughout, but no artifacts except for one fragment of FCR. Plant remains were recovered from the floated soil sample. They consisted of one honeylocust (*Gleditsia triacanthos*) wood fragment, two unidentifiable wood fragments, and one unidentifiable thin, flat fragile plant fragment, identified as 'Type J' by the paleobotanical analyst. 'Type J' fragments have fine braided interior striations and are most likely from stems of a reed or grass-like plant. The feature might have been a storage pit.

Feature 198a,b,c

This pit feature probably served as a general purpose and cooking hearth. This feature was identified in Unit N76 E226. It extended into Units N76 E225 and N77 E226. It had a top elevation of 214.73 NGVD and a closing elevation of 214.59 NGVD. It was roughly circular shape in plan view and basin-shaped in profile (Figures 8.76 and 8.77). This feature consisted of three types of soil, separated out as 198a, 198b, and 198c. Feature 198a measured 28 cm north-south by 44 cm east-west, and is a circular pocket at the northern edge of the overall feature. Feature 198b measured 94 cm north-south by 104 cm east-west, and comprises the main body of the overall feature. Feature 198c measured 117 cm north-south by 114 cm east-west, and is a relatively thin layer that lines the base and outside of the overall feature. Feature 198a appears to be a later intrusion into Features 198b and 198c, and may in fact be a natural intrusion rather than cultural. Feature 198c may be the leaching out of Feature 198b.

Feature 198a was described as dark yellowish brown (10YR 4/4), sandy loam, with gray (10YR 5/1) inclusions. It contained a light scatter of charcoal, with only two pieces of FCR, at the surface. Feature 198b was described as dark yellowish brown (10YR 4/4), sandy loam, mottled with very dark grayish brown (10YR 3/2). It included a much greater concentration of charcoal, and had a generally darker matrix than 198a. It also yielded one fragment of an as yet unnamed type of Early Woodland pottery, two whole flakes, one piece of lithic debris, and 12 FCR fragments. Plant remains were recovered from the floated soil sample of 198b. They consisted of one honeylocust (*Gleditsia triacanthos*) wood fragment, and 10 unidentifiable wood fragments.

Feature 198c was described as yellowish brown (10YR 5/4), silt loam, with gray (10yr 5/1) inclusions and some light charcoal flecking. Three pottery fragments were recovered in 198c. One is ascribed to the Half-Moon Cord-Marked type from the Early Woodland period, and the other two sherds are indeterminate as to type or temporal period. Other artifacts from 198c were one flake fragment, two pieces of lithic debris, and two FCR fragments. Plant remains were recovered from the floated soil sample of 198c. They were limited to one unidentifiable wood fragment, one walnut/thick-shelled hickory (Juglandaceae) nutshell fragment, and two porous amorphous plant fragments.

Feature 200/201

This pit feature with FCR is probably the remains of a general purpose and cooking hearth. It was located in Unit N76 E231, in the F14/9 field designation, Level 2. The main body had an opening elevation of 214.60 NGVD. It measured 49 cm east-west by 36 cm north-south, with staining of the underlying soil that extended down approximately 4 cm. The feature was egg-shaped in plan view, and lens-shape in profile (Figure 8.78). It consisted of an ephemeral elliptical stain that was slightly darker than the surrounding AB horizon, overlain by an artifact and charcoal concentration. The Feature 200 portion was described as dark yellowish brown (10YR 4/4), silt loam, with charcoal flecking and reddening of the soil. Artifacts recovered from the Feature 200 portion include a pottery fragment, five FCR fragments, 16 flakes (nine whole and seven proximal), and nine fragments of lithic debris. The pottery was identified as the Early Woodland period Half-Moon Cord-Marked type. The lower portion of the feature (designated Feature 201 [Figure 8.79]) was a relatively thin FCR scatter. Unlike the Feature 200 portion, no charcoal or reddening of the soil was evident. It was described as dark brown (7.5YR 3/3), sandy loam, only slightly darker than the surrounding horizon. Artifacts recovered from the Feature 201 portion include one whole flake and three FCR fragments, all from the surface. Three plant remains were recovered from the floated soil sample. These were one walnut/thick-shelled hickory (Juglandaceae) nutshell, one thick-shelled hickory (*Carya* spp.) nutshell, and one porous amorphous fragment.

Feature 237

Feature 237 was an FCR cluster and probably the remains of a hearth. It was located in Unit N68 E227. It had a top elevation of 214.93 NGVD and a closing elevation of 214.88 NGVD. It was circular in plan view and amorphous in profile, and measured 16 cm north-south by 14 cm east-west in width (Figure 8.80). The feature was defined on the basis of the presence of a small, concentrated cluster of FCR (n = 4), without any associated organic staining or fire-reddened soil present. The soil within the defined feature boundary was described as dark brown to dark yellowish brown (10YR 3/3-3/4), fine silt loam, identical to the AB horizon. In addition to the FCR, one unmodified pebble was recovered. Based on size, soil characteristics, and artifacts, this feature was identified as a possible hearth remnant.

Feature 238

Feature 238 is the remains of a nut processing station. This feature was identified in Unit N57 E232 and extended about 19 cm into Unit N57 231. It had elevations of 215.03 NGVD (opening) to 214.82 NGVD (closing), with four identified levels, or natural strata, to indicate multiple use. The overall feature measured 106 cm across east-west by 110 cm north-south. It was circular in plan view with a deep basin-shaped profile (Figures 8.81 through 8.85). One carbon sample from this feature was sent for AMS dating. The resulting ^{14}C date was cal A.D. 70 to 240, or a conventional date of 1860 ± 40 B.P. The feature yielded 649 FCR fragments, as well as one steatite fragment, 10 whole flakes and 39 flake fragments, five cores, 34 pottery sherds, and 982 calcined bone fragments. Of these, eight were possibly from white-tailed deer (*Odocoileus virginianus*). Eleven fragments were from

large mammals, probably deer; however, because the element could not be identified, the fragments were placed in a size category. All other bone fragments from Feature 238 were unidentifiable to the class level. The average weight for the bone fragments was 0.1 gram, indicating their small size. The calcination was most likely caused by deliberate burning of refuse rather than accidental inclusion in fire during cooking, although the latter could be possible.

Level 1 (field designation F135a) spanned the width of the feature, and exposed a densely packed layer of FCR at its base, which sloped to the north. The matrix of Level 1 was described as strong brown (7.5YR 4/6), sandy loam. A total of 68 nutshell fragments and four wood charcoal fragments were hand collected from this level. The nutshell fragments included one hickory (*Carya* spp.) fragment, 27 black walnut (*Juglans nigra*) fragments, 11 butternut (*Juglans cinerea*) fragments, and 29 walnut/walnut family (*Juglans* spp.) fragments. The wood fragments included two walnut (*Juglans* spp.) fragments, one white oak (*Quercus* spp.) fragment, and one unidentifiable wood charcoal fragment.

Level 2 (field designations F135b) also spanned the width of the feature, and was characterized by the presence of burnt soil with a tremendous increase in charcoal flecking and a large number of bone fragments. The matrix was described as dark yellowish brown (10YR 4/4), silt loam. The FCR in this level was identified by the excavators as forming a ring/cluster shape; an inside ring/cluster and an outside ring were present. This level averaged about 5 cm thick. It was probably the remains of both use and cleaning events. The mixing of soil with regular matrix, burnt soil, charcoal, and bone, along with smaller pieces of FCR, indicates multiple use. Sixty-one nut and charcoal fragments were hand collected, including 18 black walnut (*Juglans nigra*) fragments, eight butternut (*Juglans cinerea*) fragments, and 35 walnut/walnut family (*Juglans* spp.) fragments.

A total of four pottery fragments was recovered from Level 2. Two of the sherds had preserved surfaces and can be ascribed to the late Early Woodland period Middle Ohio Valley Adena Plain type. Along with the pottery, also recovered are three fragments of what was apparently a prepared clay floor within the feature. These fragments are hard and similar in appearance to pottery, but have no evidence of being worked into a vessel or fired per se. They all have one well-smoothed, almost flat surface, while the opposing side is often undulating and/or rough, as if it was simply poured over the feature fill present from previous uses of the pit. A more complete description of theses artifacts is provided in the prehistoric ceramic discussion above.

The next level, identified as Level 3 (field designations F135c, d, e, f), was characterized at the opening of the level by a completely burned layer that covered nearly the entire feature, with red and orange soils to indicate burning. The matrix was described as primarily a black (10YR 2/1) silt and charcoal lens, with a shallow basin of strong brown (7.5YR 5/6) burnt clay and silt loam in the center, surrounded along the edges by pockets of Level 2 sediments mixed with pockets of red (2.5YR 4/6) burnt clay loam and dark red (2.5YR 3/6) burnt clay and silt loam.

Both the burnt soil and charcoal lens contained FCR. The charcoal layer had large amounts of burnt nutshell, and there was a cluster of FCR in the center of the feature. The sloping, from south (high) to north (low) continued through this level. Level 3 appeared to be the result of heavy initial use or a series of use events without much cleaning. The high amount of thermal alteration of the soil suggests either intense heat for a lengthy period of time or multiple heating events over a relatively short period of time. The charcoal lens and the basal ring burning beneath the charcoal probably represent an initial use or series of initial uses. The FCR in this level was larger in size, and the charcoal was not removed. The charcoal consisted mainly of burnt nutshells. Again, the calcined bone is more likely to represent refuse burning rather than inclusion during cooking, although the latter is possible.

Level 3 yielded 676 nutshell fragments and 24 charcoal wood fragments that were hand collected. The nutshell fragments were identified as 25 hickory (*Carya* spp.) fragments, 179 black walnut (*Juglans nigra*) fragments, 130 butternut (*Juglans cinerea*) fragments, 337 walnut/walnut family (*Juglans* spp.) fragments, and two acorn (*Quercus* spp.) fragments. The wood fragments included two maple (*Acer* spp.) fragments, seven ash (*Fraxinus* spp.) fragments, three walnut (*Juglans* spp.) fragments, one white oak (*Quercus* spp.) fragment, and 11 unidentifiable wood fragments. Seeds included 14 goosefoot (*Chenopodium* spp.) seeds and two erect knotweed (*Polygonum erectum*) seeds. Additional botanical remains in this level included 21 other unidentifiable fragments: nine were parallel-sided fragments, 10 were porous amorphous fragments, and two were unknown fragments.

A total of five pottery fragments and 20 prepared clay surface fragments were recovered from Level 3 of Feature 238. Of the five artifacts that were fragments of true prehistoric pottery, two retained enough characteristics to be ascribed to the Adena Plain type of the Early Woodland. Level 4 (field designation F135g) was the last and deepest level in the feature. It was basin-shaped and covered the entire base of the feature. This level appeared to be a slump level that probably occurred after initial feature construction and before heavy use. The matrix was described as strong brown (7.5YR 4/6) silty clay loam. This level contained bone fragments, charcoal flecking, and several clusters of FCR. It was thickest along the sides of the base of the feature. Level 4 yielded 61 hand-collected nutshell fragments and 14 hand-collected wood charcoal fragments. They were identified as eight hickory (*Carya* spp.) fragments, 16 black walnut (*Juglans nigra*) fragments, 14 butternut (*Juglans cinera*) fragments, and 23 walnut/walnut family (*Juglans* spp.) fragments. Wood fragments included five maple (*Acer* spp.) fragments, one ash (*Fraxinus* spp.) fragment, three Locust/leguminous (*Leguminosoe*) fragments, three walnut (*Juglans* spp.) fragments, one white oak (*Quercus* spp.) fragment, and one fragment that was unidentifiable. Pottery from this level consisted of one Adena Plain sherd and one non-diagnostic eroded fragment.

Plant remains were recovered from the floated soil samples retained from Levels 1 through 3 of this feature. Analyzed remains from Level 1 were two honeylocust (*Gleditsia triacanthos*) wood fragments, two bitternut hickory (*Carya cordiformis*) wood fragments, 16 unidentifiable wood fragments, eight walnut/thick-shelled hickory (Juglandaceae) nutshell fragments, and three black walnut (*Juglans nigra*) nutshell fragments. Plant remains identified from Level 2 were one hickory (*Carya* spp.) wood fragment, four honeylocust (*Gleditsia triacanthos*) wood fragments, four cherry (*Prunus* spp.) wood fragments, one

maple (*Acer* spp.) wood fragment, and 10 unidentifiable wood fragments. Nutshell fragments included 230 walnut/thick-shelled hickory (Juglandaceae) fragments, 125 black walnut (*Juglans nigra*) fragments, seven butternut (*Juglans cinerea*) fragments, and three thick-shelled hickory (*Carya* spp.) fragments. Finally, one mustard (*Brassica* cf. *juncea*) seed was recovered in Level 2. Level 3 yielded three black walnut (*Juglans nigra*) wood fragments, two honeylocust (*Gleditsia triacanthos*) fragments, one conifer (gymnosperm or softwood) fragment, and 14 unidentifiable wood fragments. There was a great number of nutshell fragments—2,700 walnut/thick-shelled hickory (Juglandaceae), 403 black walnut (*Juglans nigra*), 104 butternut (*Juglans cinerea*), and 19 thick-shelled hickory (*Carya* spp.). Seeds included 196 erect knotweed (*Polygonum erectum*), 167 goosefoot (*Chenopodium* sp.), three unknown fragments identified by the analyst as 'Type K' (long, thin plant parts covered with a thick wrinkled 'skin' that may be a subterranean plant part such as a tuber or rhizome), one honeylocust (*Gleditsia triacanthos*), one poke (*Phytolacca americana*), one leadplant (cf. *Amorpha* sp.), and five unknown seed types. Finally there were eight porous amorphous fragments, and two rind-like plant fragments. As discussed in the paleobotanical analysis, the porous amorphous fragments resembled starchy plant parts (tubers or starchy seeds) in which the starch cells exploded with heat, while the parallel-sided rind-like plant parts were unidentifiable, except that their identity as squash rind was excluded.

It appears that this feature was originally dug and filled with rocks. It later collapsed, and some of the FCR was buried in that collapse. Subsequently it was redug, although not completely, and experienced its heaviest use. It is unclear if the final infilling was purposeful or the result of natural processes. In the opinion of Dr. Johnson, who performed the ceramic analysis (Appendix 8N), the presence of fired prepared clay surface fragments in both Features 238 and 243 represent remnants of specially prepared surfaces for the processing of nuts. Further, he states that this data documents a new feature type for the lower Upper Ohio Valley.

Feature 240

Feature 240 was a disturbed pit, probably the remains of an indeterminate function hearth. It was located in Unit N85 E228 at the base of the disturbed Ap horizon (field designation F3), at the top of the AB horizon. Like the overlying sediments, this feature shows evidence of disturbance. It had a top elevation of 214.61 NGVD and a closing elevation of 214.47 NGVD. It measured 67 cm north-south by 45 cm east-west; however, the feature extended past the west wall of the excavation block and its entire east-west width is unknown. Only the portion of the feature in this unit was excavated, but based on the plan view it was probably approximately 80 cm across east-west. The feature was roughly oval in plan view, and was bowl-shaped in profile. The feature consisted of large FCRs (n = 23) and darker soils, with minute fragments of coal in the fill. The matrix was described as three separate soils arranged in overlapping pockets and thick lenses (Figure 8.86). A dark yellowish brown (10YR 3/6) mottled with brown (10YR 4/3) sandy loam with ash and occasional coarse grit, generally overlies a very dark gray (10YR 3/1) ashy silt and fine sand and a dark yellowish brown (10YR 4/6) sandy loam.

In profile there appeared to be separate parts to this feature. This could be the result of separate but overlapping pits of unknown use, or evidence for episodic re-use of the same pit separated by fill episodes. One non-diagnostic highly eroded prehistoric ceramic was recovered.

Feature 242

This indeterminate pit feature was located in Unit N59 E231. Its elevation was 215.22 NGVD at the opening and 215.01 NGVD at the closing. It was identified as a 'probable' cultural feature, due to its irregular appearance and disturbance. It first appeared as an irregular, amorphous stain with visible FCR fragments. It was oval in plan view and had an irregular dish shape in profile (Figure 8.87). It was extensively disturbed, however, by root penetration and consequent transport of artifacts from their original location. No charcoal or reddened soil was present in the feature. The matrix was described as a smaller basin of dark brown (10YR 3/3), silt loam to clay, centered within a larger basin of dark yellowish brown (10YR 3/4), sandy loam to clay. Feature 242 contained two proximal flake fragments, two lithic debris fragments, and 15 FCR fragments. Two unidentifiable pottery fragments with eroded exterior surfaces were also recovered. Plant remains were recovered from the floated soil samples. These were limited to five unidentifiable wood fragments and one porous, amorphous plant fragment. Although the disturbed nature of this feature hinders an interpretation of use, based in part on the absence of any charcoal, it may represent the remnant of a storage pit.

Feature 243

Feature 243 is the remains of a nut processing station. It was stratified and one of the most complex features excavated in the Area 3-South block. It was first identified in Unit N60 E231, and extended into Units N60 and N61 E230, and N61 E231. It had an opening elevation of 215.13 NGVD and a closing elevation of 214.40 NGVD. It measured 1.60 m north-south by 1.50 m east-west. The feature was roughly circular in plan view and basin-shaped with a flat bottom in profile (Figures 8.87 through 8.90). It was first identified as a cluster of small flakes and pottery in a reddish soil anomaly. The soil then became slightly darker and more compact, with a concentration of charcoal flecking and small flakes and flake fragments.

As excavation continued, the profile revealed that the feature was the result of multiple separate use events. The apparent periods of use were reconstructed based on soil color and texture, and presence of artifacts. First, working from bottom to top of the feature fill, the pit appeared to have been opened and exposed to the elements before initial use, or used and abandoned. The feature fill at this lowest level was described as a lens (field designation F152a) of highly organic, dark yellowish brown (10YR 3/4), loose, fine sandy loam, with abundant charcoal, overlying a layer (field designation F152b) of more compacted, dark yellowish brown (10YR 4/4), fine sandy silt, with less charcoal. Capping this was a layer (field designation F141g) that resembled the soil surrounding the feature, described as dark brown–brown (7.5YR 3/4-4/4), compact, silt loam to sandy loam. Soil texture and shape of the feature profile near the base suggest the original pit was also partially in filled with slumped soil from the edges. In addition, artifact counts were low in this part of the feature. The recovery of a limestone tempered smooth ceramic sherd (Adena

Plain) and a hematite tempered cord-marked sherd (possibly related to Middle Woodland Adena Plain or early Watson Cord-Marked) suggest a use date of the late Early Woodland or initial Middle Woodland, respectively.

Second, the original in-filled pit was redug to a more shallow depth and slightly reduced width. The sediment package at this mid-level was described as a relatively thick highly organic layer (field designation F141e) of dark brown–brown (7.5YR 3/3-4/2), slightly compact, loam with fine sands and increased charcoal flecking, overlain by an equally thick layer (field designation F141f) of dark brown (10YR 3/2-3/4), loam to silt loam with fine sands. This is all capped by another thick layer (field designation F141c) of slightly organic, dark yellowish brown-dark brown (10YR 3/4-7.5YR 3/4), compact, silt loam. In this use period the cultural material differs greatly from the lower level. Lithic debitage increases in count and large pottery fragments are present, along with a dense concentration of cobbles at the base of this sediment package. Additionally, numerous fragments of an apparent prepared clay surface (similar to Feature 238) were recovered from this sediment package. It is likely that this use represents some sort of roasting pit with the rocks placed within or below the fire to maintain a long steady heat. This use of Feature 243 can be dated by the presence of one late Early Woodland Adena Plain sherd and one probably initial Middle Woodland mixed shale, siltstone and chert tempered cord-marked sherd of an unnamed type. In the opinion of Dr. Johnson, who performed the ceramic analysis (Appendix 8N), the presence of fired prepared clay surface fragments in both Features 238 and 243 represent remnants of specially prepared surfaces for the processing of nuts. Further, he states that this data documents a new feature type for the lower Upper Ohio Valley.

Finally, the third use is represented by sediments (field designation F141a) described as brown (7.5YR 4/3-4/2), fine sandy silt, with minor charcoal flecking, and a pocket (field designation F141b) of brown (10YR 4/3) silt loam, finely mottled with yellowish brown (10YR 5/4) fine sand, with larger charcoal flecking and voids. Feature fill F141a was equal in thickness to two of the sediments combined from the mid-level package. Material from this last use included small flakes and flake fragments, twice as much FCR as from other levels, and burnt nutshell. Additionally, a few fragments of an apparent prepared clay surface (similar to Feature 238) were recovered from this sediment package. This final use can be dated by the presence of a hematite tempered cord-marked sherd that is possibly related to the Middle Woodland Adena Plain or early Watson Cord-Marked types. Given the number of artifacts and only minor charcoal flecking, it is possible that the last use of Feature 243 was as a refuse pit.

Overall, finds included 186 pieces of lithic debris, including 72 whole and proximal flakes; seven cores; four groundstone tools; charcoal fragments; faunal material; 609 FCR fragments; 52 pottery fragments; and one reduction-stage-three biface fragment of Onondaga chert. Faunal material consisted of unidentified bone fragments (NISP=155). They were all small in size, with an average weight of 0.09 g. The groundstone artifacts consisted of three whole unmodified pebbles (collective catalog nos. 3515 and 3520) and one whole pitted stone artifact (also catalog no. 3520, weighing 456.9 g). One mica fragment, one hematite fragment, and one possible steatite fragment were also recovered.

Two hand-collected botanical samples from Level 1 were submitted for paleobotanical analysis. The results were as follows: three unidentifiable fragments had been recovered; 88 fragments were nutshells, including one hickory (*Carya* spp.) nutshell fragment, 28 black walnut (*Juglans nigra*) fragments, 33 butternut (*Juglans cinerea*) fragments, and 26 walnut/walnut family (*Juglans* spp./Juglandaceae) fragments. Two wood fragments were recovered, one honeylocust (*Gleditsia triancanthos*), and one red oak (*Quercus* spp., red group) fragment. One radiocarbon date was calculated for a carbon sample from Level 1. The date was a conventional date of 1860 ± 70 B.P., or cal A.D. 5 to 340 (1945 to 1610 cal B.P.).

Level 2 yielded 61 nutshells, identified as 21 black walnut (*Juglans nigra*) fragments, 24 butternut (*Juglans cinerea*) fragments, and 16 walnut/walnut (*Juglans* spp./Juglandaceae) family fragments. Two wood charcoal fragments, one maple (*Acer* spp.) and one from the elm family (*Ulmaceae*), were also identified in the paleobotanical analysis. Charcoal from Level 2 was submitted for standard radiocarbon dating. The resulting conventional date was 1760 ± 60 B.P., or cal A.D. 120 to 415 (1830 to 1535 cal B.P.).

Level 3 yielded one nutshell, identified as a black walnut (*Juglans nigra*). In addition to the hand pulled material, plant remains were recovered from the floated soil samples from Levels 1 through 3 and Level 6.

Remains from flotation samples from Level 1 include wood fragments—six hickory (*Carya* spp.) fragments, 23 black walnut (*Juglans nigra*) fragments, 12 honeylocust (*Gleditsia triacanthos*) fragments, three cherry (*Prunus* spp.) fragments, 13 bitternut hickory (*Carya cordiformis*) fragments, one maple (*Acer* spp.), one ash (*Fraxinus* spp.), two white Oak (*Quercus* spp. white group), eight elm (Ulmaceae) family, two hop hornbeam (*Ostrya virginiana*) and eleven unidentifiable fragments; nutshell fragments—887 walnut/thick-shelled hickory (Juglandaceae), 904 black walnut (*Juglans nigra*), 191 butternut (*Juglans cinerea*), and 108 thick-shelled hickory (*Carya* spp.); seeds—eight erect knotweed (*Polygonum erectum*), eight goosefoot (*Chenopodium* sp.), 23 unknown Type K, four unknown Type L (a seed measuring ca. 8 mm, interior regular honeycomb-type cellular structure, with exterior fine wavy lines), one honeylocust (*Gleditsia triacanthos*), and 17 unknown seeds. Finally, other unidentifiable plant remains included 44 porous amorphous fragments, one rind-like fragment, and six "honeycomb" amorphous fragments. One ^{14}C date was calculated for Level 3, using the AMS dating technique. The result was a conventional date of 1890 ± 40 B.P. (cal. A.D. 40 to 230).

Remains from Level 2 flotation include six black walnut (*Juglans nigra*) wood fragments, two honeylocust (*Gleditsia triacanthos*) wood fragments, one cherry (*Prunus* spp.) wood fragment, one maple (*Acer* spp.) wood fragment, and 10 unidentifiable wood fragments. Nutshells included one thick-shelled hickory (*Carya* spp.), nine walnut/thick-shelled hickory (Juglandaceae), and 12 black walnut (*Juglans nigra*) fragments.

Level 3 flotation yielded two honeylocust (*Gleditsia triacanthos*) wood fragments, one cherry (*Prunus* spp.) wood fragment, four bitternut hickory (*Carya cordiformis*) wood fragments, three fragments from the elm family (Ulmaceae), one bark fragment and nine

unidentifiable wood fragments. Nutshells included 36 walnut/thick-shelled hickory (Juglandaceae) fragments, nine black walnut (*Juglans nigra*) fragments, three butternut (*Juglans cinerea*) fragments, and 13 thick-shelled hickory (*Carya* spp.) fragments. Finally there were two erect knotweed (*Polygonum erectum*) seeds, one mustard (*Brassica* cf. *juncea*) seed, and two unknown seeds.

Level 6 flotation yielded two black walnut (*Juglans nigra*) wood fragments, five ash (*Fraxinus* spp.) wood fragments, one white oak (*Quercus* spp., white group) fragment, and 11 unidentifiable wood fragments. Nutshells were limited to five walnut/thick-shelled hickory (*Carya* spp.) fragments. Finally, there were five porous amorphous plant fragments found in Level 6.

Feature 258

This was an FCR cluster probably representing a hearth of indeterminate function. The feature was identified in Unit N58 E230, and extended into Units N59 E230, N58 E229, and N59 E229. It was identified in the AB horizon during the mechanical step back task, and was not excavated. The feature had a top elevation of 215.20 NGVD. It measured 100 cm southeast-northwest by 45 cm southwest-northeast. It was oblong in plan view, and had no distinguishable depth (Figure 8.91). The feature matrix was described as AB horizon soils with a small amount of charcoal flecking. This feature essentially consisted of a loose FCR (n = 17) cluster. Its boundaries were based on the distribution of the FCR. No artifacts were recovered from this feature.

Non-Cultural Anomalies

Thirteen non-cultural anomalies encountered in the AB horizon were given feature numbers during the fieldwork. They are shown in Table 8.31.

Table 8.31. Non-Cultural Soil Anomalies Identified in the AB Horizon.

Feature Number	Unit Location	Dimensions	Comments
155	N65 E237/238	Top elevation: 214.93 NGVD; bottom elevation: 214.85 NGVD	Cluster of pottery above a root and rodent disturbance.
160	N63 E237	Top elevation: 215 NGVD; bottom elevation: 214.89 NGVD	*In situ* tree burning; linear and curved plan view; half-round profile. Three FCR fragments; charcoal flecking, burnt earth
167	N67 E229	Top elevation: 214.96 NGVD bottom elevation: 214.89 NGVD. 7 cm thick; 60 cm x 75 cm across	Natural circular stain; five FCR fragments recovered
173	N66 E237	–	Rodent burrow
178	N74 E226	Top elevation: 214.86; bottom elevation: 214.84; 2 cm thick; 45 cm x 35 cm across; oblong plan view; irregular profile	Tree root

Feature Number	Unit Location	Dimensions	Comments
183	N66 E234	Top elevation: 214.76; bottom elevation: 214.67; 9 cm thick; irregular plan view and profile	Root ball
189	N62 E232	Top elevation: 215.19 NGVD bottom elevation: 215.08 NGVD. 3 cm thick, 9 cm x 10 cm across	No distinct morphology, no artifacts.
190	N66 E239	11 x 19 cm; 20 cm deep	Rodent burrow; some charcoal flecking
191	N66 E 230/231	Opening elevation: 214.85	Root stain, no artifacts
193	N80 E232	Oblong in plan view; dish-shaped profile, straight sides.	Amorphous soil discoloration, 15 cm thickness; light charcoal, unidentifiable wood fragments, one piece FCR and one piece of lithic debitage
236	N62 E230	Top elevation: 215.10 NGVD, bottom elevation: 214.94 NGVD; 80 cm x 71 cm across	Rodent burrow with prehistoric and historic artifacts
239	N66 E241	–	Cluster of a few artifacts with discolored soil due to decomposing brick
241	N58 E231; extended into N57.92 E231.26	Opening elevation: 215.08; bottom elevation: 214.99; oval in plan view; asymmetrical in profile	Amorphous natural isolated burn, no artifacts. Small amount of charcoal flecking

AB Horizon Feature Discussion

Because the following discussion is intended to examine patterns of features associated with the Early Woodland occupations, Features 166 and 172 are not included here, as it was shown above that they are most likely associated with the underlying 2BC horizon Terminal Late Archaic occupation. Most of the features associated with the Early Woodland had very few artifacts except for FCR fragments or cobbles, to indicate that most of the activities during this occupation were either shallow hearths or shallow cooking fires. Fires may also have been used to deliberately heat worked stone or wood to facilitate tool manufacture. Six features (17 percent) show varying amounts of stratification. Three have distinct levels of fill (Features 238, 240, 243) suggesting repeated use. Three others (Features 171, 176, 184) contain distinct pockets of fill, but not in continuous layers across the feature and may simply be the result of differential deposition resulting from a single use. The deeply stratified features indicate that length of occupation allowed for reuse of what appear to be cooking and nut roasting or processing pits. The remaining features, with the exception of five possible post molds (Features 154, 157, 158, 169, 170) and three indeterminate pits (Features 175, 181, 195), appear to be hearth-related, but do not show the same intensity or length of use as the stratified examples.

As discussed in the methods chapter, in an attempt to attribute functions to features as well as to examine occupation surfaces for degree of contemporaneity, features were analyzed using a variety of simple statistical methods that can be used to group them.

Features from the Early Woodland occupation were examined using stem-and-leaf diagrams to search for groups based on feature widths and thickness (Figure 8.92). The feature widths show a small isolated group at the low end, comprised solely of post molds. The rest of the widths are widely scattered and show no apparent pattern. The thicknesses generally show a pattern of one main group with a trending upward in measurement into near outliers and eventually far outliers.

A second visual approach was to examine the relationship between feature thickness and width. Figure 8.93 illustrates these two measurements plotted against one another. Additionally, basic feature types were labeled to examine if any patterns exist between features with similar content. While a relationship between thickness and width seems evident, the goal here was to search for any clusters that might be visible. Ignoring feature types, what is revealed by this scatter plot is basically a confirmation of the thickness stem-and-leaf chart. The features are clustered into one main group, and then trend outwards in both width and thickness into scattered outliers. Examining this plot with assigned feature types shows a not too surprising pattern of post molds clustered at the small end of the measurements. The remaining features show broad clusters of each assigned feature type, but all the cluster almost completely overlap each other. From this there does not appear to be any pattern of feature morphology versus use, at least based on the widths and thicknesses of non-post features. Even the more intensively utilized features (Features 238, 240, and 243) are spread across the scatter plot. As discussed above, an attempt was made to evaluate the significance of specific feature attributes and to further delineate the features into separate statistical clusters that would have cultural meaning, using a principal components analysis, and a *k*-means cluster analysis. These two analyses considered all the identified feature attributes, including dimensions, evidence of burning, and contents. The results of these statistical tests were inconclusive. The principal components analysis indicated a high degree of inter-relationships among the different attributes. For example, cumulatively, seven of the 13 attributes explained only half of the total variance. No single attribute provided a high degree of explanatory power. Results of the *k*-means cluster analysis were similarly inconclusive.

Finally, the features were examined using Petraglia's categories of 'evident' and 'latent.' Indicators of these categories that were used included the presence of a distinct intact boundary or an amorphous feature boundary; and a dispersed, scattered distribution of FCR across the larger unit in which the feature was located. Of the features examined (excluding possibly non-cultural features), 10 (29 percent) had diffuse or amorphous boundaries, to indicate they fell within Petraglia's 'latent' category; the remainder can be classed as 'evident.' The presence of the large number of 'evident' features and the number of them that were stratified, to indicate reuse, suggest that some of the Early Woodland occupations of Area 3-South were more long-term. In addition, the survival of the post molds grouped in Units N65 E236, N65 E237 and N66 E238 indicates a higher degree of spatial intactness of this horizon at the site. The width of the posts, approximately 7 cm, suggests saplings or large branches were placed in the soil in an arced pattern. The post molds could be the partial remains of a residential structure, a wind break, or a construction used to roast or prepare food. Finally it is worth noting that the shallow depths of the post

molds that were identified could mean that there were others that either did not survive post-depositional processes, or were not identified during excavations.

Spatial Analyses

The different analyses that were conducted for the AB horizon artifact assemblage yielded some interesting patterns. Five interesting patterns were identified by the complementary spatial analytical techniques that were employed.

First, all of the various artifact classes were distributed over much of the excavation block. Furthermore, they seem to lie in two broadly defined clusters. Bipolar artifacts represent the only class of artifact that exhibited more than two clusters. Despite the four-cluster bipolar artifact configuration, however, the distribution is basically similar to the distribution of the other artifact classes.

Second, FCR was most densely concentrated on the extreme northern and southern edges of the excavation block. The same two clusters that characterize the other artifact classes also seem to apply to the FCR distribution; however, the highest FCR densities do appear to lie towards the periphery of the other artifact distributions.

Third, there is a clearly significant correlation between bipolar artifacts and groundstone artifacts in all three correlation analyses that were implemented. This suggests a close association between the activities associated with each of these artifact categories.

Fourth, flakes and FCR were by far the most abundant artifacts. Their absolute densities are fairly high across the entire excavation block. As a result, there is a correlation between the absolute densities of flakes and FCR. There is also a very strong correlation between the relative densities of flakes and FCR, but the correlation is *negative*. As mentioned above, this results from the fact that where relative flake densities are highest, FCR densities are lower, and vice versa. This correlation and the contour plots reveal that FCR does in fact tend to be concentrated, in a relative sense, away from the concentration of other artifacts and the activities associated with them.

Fifth, features tend to be located in areas where relative FCR densities are highest. Because of the association with FCR, most features probably were hearth-related. By extension, as FCR tends to be most dense where other artifact classes are less dense, hearth-related features seem to be located adjacent to (rather than superimposed over) areas in which flaked stone tool use, manufacture and maintenance took place.

Artifact Distributions and Contouring

To search for intrasite patterning at Area 3-South, both statistical spatial analysis and refit studies were conducted. Figure 8.94 presents the absolute and relative density contour plots for bifaces/tools recovered in the AB horizon. The two plots reflect virtually the same pattern, though we must note that bifaces/tools comprise only a maximum of seven percent of the artifact composition at any single grid point. Absolute densities are also low. It seems from Figure 8.94 that, in contrast to the concentrated distribution of bifaces/tools for the Late Archaic (see below), bifaces/tools from the AB horizon were scattered across much of the

excavation block in very small quantities. The eastern portion of the block lacks bifaces/tools, however.

Projectile point/knives were distributed similarly across much of the excavation block with fewer artifacts occurring on the eastern half of the block (Figure 8.95). There are more pp/ks than bifaces/tools, but still only a total of 20 were found in the AB horizon. The relative density contour plot illustrates the impact of small sample size quite clearly, as the majority of the relative density values lay below five percent. It is noteworthy, however, that the distribution of pp/ks reflects the distribution of bifaces/tools in the AB horizon.

Absolute flake densities were highest in the areas where bifaces/tools and pp/ks tended to be located (Figure 8.96). The relative density contour plot in the figure is very interesting. The highest densities of flakes relative to other artifact classes lie in the northeastern portion of the excavation block, an area that reflects low absolute densities for flakes. In fact, flakes comprise nearly 90 percent of the artifacts in that location within the block. Conversely, where absolute flake densities are their highest, relative flake densities are rather low. This suggests that the relative densities of other artifact classes, particularly FCR, are high in those locations.

Absolute and relative density contours of bipolar artifacts are presented in Figure 8.97. As is evident in the contour plots, bipolar artifacts are distributed in low densities across most of the excavation block. The one notable location where there is a general lack of bipolar artifacts includes several units around the grid point N73 E236, the same area where flakes were absent.

Groundstone artifact distribution in the AB horizon is also reflective of the other artifact classes discussed thus far: bifaces/tools, pp/ks, flakes, and bipolar artifacts (Figure 8.98). Again, the sample size of groundstone artifacts recovered from the AB horizon is quite small, as it is with most of the other artifact classes. It should be noted that a number of the specimens included as groundstone in the spatial analysis have little evidence of use, and may in fact be unmodified cobbles; however, even removing those from the assemblage does not change the basic distributional pattern of the groundstone category.

Finally, the FCR absolute and relative density contour plots are presented in Figure 8.99. The absolute density contour plot reveals that the highest densities of FCR occur on opposite ends of the excavation block, one in the northern end and one in the southern end. The relative density plot, however, indicates that across the majority of the excavation block, FCR comprised the majority of the artifacts recovered.

Variant of K-Means Cluster Analysis

A variant of the *k*-means cluster analysis was applied to each of the artifact classes recovered from the AB horizon in order to 'objectively' define the nature of spatial distribution. For each class of artifact the percent SSE plot is discussed first, then the cluster solution that, for various reasons, was determined to be most appropriate is identified.

Figure 8.100 (above) presents the percent SSE plot for bifaces/tools, and in this case, the original plot actually lies above the random plots. This suggests that the distributional data for bifaces/tools tend toward an even distribution. Reexamining the absolute density map, presented again in Figure 8.101, reveals that a fairly even distribution does characterize the data. For comparative purposes, however, various clustering solutions were examined, and the two-cluster solution was subjectively determined to be a relatively good representation of the data. As will become evident below, a similar two-cluster configuration is evident for a number of other artifact classes. It must be noted again, however, that the data tend toward an even rather than a clustered distribution.

Figure 8.102 presents the percent SSE plot for pp/ks from the AB horizon. In this case there is a very clear indication that the data tend to cluster as the original plot lies well below the random plots. The sharpest elbow in the original curve lies at the two-cluster solution, and the two clusters that are represented in the data are shown in Figure 8.103. The provenience of the two clusters corresponds closely with that of the two clusters identified for bifaces/tools.

As is evident in Figure 8.104, flakes also tend to cluster, but not quite to the degree that pp/ks do. Here again, the sharpest elbow on the original plot lies at the two-cluster solution, which is presented in Figure 8.105. The two-cluster solution does reflect the data nicely, and again, corresponds closely to the two-cluster configurations evident for the artifact classes discussed thus far for the AB horizon.

Bipolar artifacts, on the other hand, seem to be characterized by a different cluster configuration than the previously discussed artifact classes. Figure 8.106 indicates a slight tendency toward clustering, and the four-cluster (as opposed to the two-cluster) configuration appears to reflect the data best (Figure 8.107).

Groundstone artifacts tend to cluster only very slightly. The original plot lies below most of the random plots, but intersects a couple of them as well, suggesting it is not far from a random distribution (Figure 8.108). Determining exactly how many clusters are evident based on the original plot is difficult. The two-cluster configuration was subjectively determined to reflect the data most appropriately (Figure 8.109). Notably, the two-cluster configuration corresponds to the two-cluster configurations of bifaces/tools, pp/ks, and flakes.

Finally, the percent SSE plot for FCR recovered from the AB horizon indicates that the FCR tends very slightly toward a clustered distribution. The original plot lies just below the random plots, and the sharpest elbow along the original plot lies at the two-cluster solution (Figure 8.110). The two-cluster configuration appears to fit the data very nicely, as is evident in Figure 8.111. The denser concentrations on the northern and southern ends of the excavation block constitute the two clusters. Again, this two-cluster configuration corresponds to the spatial distribution of the other artifact classes that are being considered, with the exception of groundstone artifacts.

Artifact Class Correlation Analysis

Three different representations of the data for the various artifact classes were analyzed using Pearson's *r* correlation coefficient: raw artifact counts, absolute artifact densities, and relative artifact densities. The results of these correlation analyses are presented in Tables 8.32 through 8.34.

Table 8.32 presents the correlation analysis conducted AB horizon artifact counts. As is reported in the table, there were several very significant correlations (at the 0.005 level or below); however, none of the correlations were very strong. In fact, they were all fairly weak. The strongest correlation was between flakes and the FCR ($r = 0.468$, $p < 0.001$, $n = 254$). This makes sense, as flakes and FCR are the only two artifact classes that were found across the entire excavation block in appreciable frequencies.

Table 8.32. AB Horizon Correlation Matrix for Artifacts Counts by Excavation Unit.

		Bifaces/ Tools	**PP/Ks**	**Flakes**	**Bipolar Artifacts**	**Groundstone Artifacts**	**FCR**
Bifaces/ Tools	Pearson's *r*	1					
	Significance	.					
	N	254					
PP/Ks	Pearson's *r*	-.050	1				
	Significance	.427	.				
	N	254	254				
Flakes	Pearson's *r*	-.032	.139*	1			
	Significance	.614	.027	.			
	N	254	254	254			
Bipolar Artifacts	Pearson's *r*	-.072	-.023	**.271****	1		
	Significance	.253	.717	.000	.		
	N	254	254	254	254		
Groundstone Artifacts	Pearson's *r*	.146*	-.011	.113	**.182****	1	
	Significance	.020	.866	.071	.004	.	
	N	254	254	254	254	254	
FCR	Pearson's *r*	**.174****	.151*	**.468****	**.317****	**.257****	1
	Significance	.005	.016	.000	.000	.000	.
	N	254	254	254	254	254	254

* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.

The other significant correlations also are related to the fact that flakes and FCR are distributed across the entire excavation block. Five of the six very significant correlations are between various artifact classes and FCR or flakes. Basically what this tells us is that the various artifact classes are located in areas where there are flakes and/or FCR. The one exception to this is a very weak correlation between groundstone artifacts and bipolar artifacts ($r = 0.182$, $p = 0.004$, $n = 254$).

Table 8.33 presents the correlation matrix of absolute densities for the various artifact classes recovered in the AB horizon. Absolute densities reveal a similar pattern of correlation, but since more data points have values associated with them (larger sample size) the correlations are slightly stronger, though none exceed a 0.6 r-value. Six out of eight of

the significant correlations ($p < 0.01$) are between various classes of artifacts and FCR or flakes. Again, these correlations result from the fact that where pp/ks, bipolar artifacts, and groundstone artifacts are, there are also flakes and FCR. The two exceptions represent weak correlations between pp/ks and bipolar artifacts ($r = 0.188$, $p = 0.008$, $n = 197$) and bipolar and groundstone artifacts ($r = 0.330$, $p = < 0.001$, $n = 197$).

Table 8.33. AB Horizon Correlation Matrix for Absolute Densities of Artifact Classes at Grid Points.

		Bifaces/ Tools	**PP/Ks**	**Flakes**	**Bipolar Artifacts**	**Groundstone Artifacts**	**FCR**
Bifaces/ Tools	Pearson's *r*	1					
	Significance	.					
	N	197					
PP/Ks	Pearson's *r*	-.026	1				
	Significance	.718	.				
	N	197	197				
Flakes	Pearson's *r*	-.025	.365**	1			
	Significance	.723	.000	.			
	N	197	197	197			
Bipolar Artifacts	Pearson's *r*	.020	.188**	.371**	1		
	Significance	.784	.008	.000	.		
	N	197	197	197	197		
Groundstone Artifacts	Pearson's *r*	.103	.009	.174*	.330**	1	
	Significance	.151	.897	.014	.000	.	
	N	197	197	197	197	197	
FCR	Pearson's *r*	.037	.300**	.554**	.445**	.320**	1
	Significance	.602	.000	.000	.000	.000	.
	N	197	197	197	197	197	197

* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.

The strongest correlation evident in Table 8.33 is a moderate correlation between FCR and flakes ($r = 0.554$, $p < 0.001$, $n = 197$). This is reflected in the contour plots. Both artifact classes have relatively high densities throughout the excavation block, with concentrations in the northern and southern portions of the block (Figures 8.105 and 8.111). Furthermore, FCR and flakes share a similar cluster configuration.

Table 8.34 presents the correlation matrix for relative densities between classes of artifacts recovered from the AB horizon. This shows some interesting patterns. First, the significant positive correlation between bipolar and groundstone artifacts evident in the two previous correlation matrices is even stronger in the relative density matrix. Though not clearly evident in the contour plots (Figures 8.107 and 8.109), it is clear that the two classes of artifact do correlate in terms of their distribution. As previously discussed, bipolar artifacts stood out somewhat among the contour plots, as it was the only artifact class that exhibited more than the typical two-cluster configuration. The correlation analysis seems to

indicate that the bipolar artifact distribution is not so different, at least when compared to the groundstone artifact distribution.

Table 8.34. Correlation Matrix for AB Horizon Relative Densities of Artifact Classes at Grid Points.

		Bifaces/ Tools	**PP/Ks**	**Flakes**	**Bipolar Artifacts**	**Groundstone Artifacts**	**FCR**
Bifaces/ Tools	Pearson's *r*	1					
	Significance	.					
	N	197					
PP/Ks	Pearson's *r*	-.055	1				
	Significance	.442	.				
	N	197	197				
Flakes	Pearson's *r*	.155*	.032	1			
	Significance	.029	.655	.			
	N	197	197	197			
Bipolar Artifacts	Pearson's *r*	.052	-.102	-.038	1		
	Significance	.465	.153	.595	.		
	N	197	197	197	197		
Groundstone Artifacts	Pearson's *r*	.021	-.023	.039	.439**	1	
	Significance	.765	.749	.584	.000	.	
	N	197	197	197	197	197	
FCR	Pearson's *r*	-.205**	-.107	-.987**	-.077	-.133	1
	Significance	.004	.135	.000	.283	.063	.
	N	197	197	197	197	197	197

* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.

The other two significant correlations are associated with FCR, and they are both negative. The weaker negative correlation between FCR and bifaces/tools (r = -0.205, p = 0.004, n = 197) is not surprising, nor is it very interesting. The correlation simply indicates that, in a very weak sense, where bifaces/tools are located, there tends to be a slightly lower density of FCR.

The most interesting pattern revealed, however, is the extremely strong negative correlation between flakes and FCR (r = -0.987, p < 0.001, n = 197). Some of the stronger direct correlations in the two previous correlation matrices (Tables 8.33 and 8.34) were between flakes and FCR. The strong *negative* correlation evident among FCR and flakes tells us that FCR occurs in its lowest densities where flakes are most densely concentrated, and vice versa. This substantiates what was evident in the relative density contour plots (Figures 8.96 and 8.99).

Relationship between Artifact Distribution and Cultural Features

Most of the features that were encountered in the AB horizon were associated with FCR. In a general sense, as evident in Figure 8.112, there seems to be a concentration of

features in the southern half of the excavation block, and a loosely scattered concentration towards the northern half of the block. A relatively sterile southeast-northwest band that goes from N65 E229 to N76 E237 divides these two concentrations. Interestingly, this is the precise location where the two-cluster configurations identified in the *k*-means analyses were divided. Thus, the common two-cluster configuration seems to be a factor of feature distribution.

Refit Analysis for the AB Horizon

Although the AB horizon stone artifacts were second in number only to those of the 3Bw horizon, this horizon provided the smallest quantity of refits among the three horizons analyzed. The only refits discovered among the lithic artifacts of the AB horizon were secondary refits (matching raw material characteristics only) involving a large core and lithic debitage from a distinctive bright yellow chert stone with a smooth brown cortex, identified as Onondaga chert in the raw material analysis. These secondary refits do not cross-mend, but based on shape, size, color, and cortex, almost certainly come from the same cobble. Though the excavation units in which fragments of this original object stone were found are located several meters apart in all directions, the stone is so distinctive as to assure that the secondary refit is accurate. One very large core was found in the F14 Field Designation within Unit N77 E222 (Level 1), and secondary refits with that core were observed among small whole and proximal flakes from Units N75 E230 (Level 1), N77 E224 (Level 1), and N79 E231 (Level 2). Two adjoining units also exhibited secondary refits with this core, Units N72 E228 (Level 1) and N73 E227 (Level 2). There were several large negative flake scars evident on the core, but the large cortical flakes that must have been removed from that core could not be found within the artifact assemblage from the AB horizon.

2BC Horizon (Terminal Late Archaic)

Summary

Stratigraphy

The 2BC horizon in Area 3-South comprised two field designations—F8 and F10. The designations were made during initial control units excavations. Subsequent trenching and consultation with the geomorphology team identified the F8 and F10 soils as a single 2BC soil horizon. The 2BC horizon was located at 0.42 m to 0.69 m below datum and had a maximum thickness of 0.27 m thick. The 2BC horizon was in some places capped by and separated from the overlying AB horizon by a flood deposit designated F6 (C horizon). The 2BC horizon extended across the entire excavation area. In texture it was a sandy loam and color was described as brown (7.5YR 4/4).

Artifacts, Ecofacts and Features

Artifact recovery totaled 3,319 pieces as summarized in Table 8.35. A total of 18 feature numbers was assigned during 2BC horizon excavations; however, subsequent analyses revealed only 14 of the identified anomalies to be cultural features. The remaining four were determined to be non-cultural. Feature number assignments and final analysis are summarized in Table 8.36. Types of features identified include 13 hearths and an indeterminate function pit.

Table 8.35. Summary of Artifact and Ecofact Recovery from the 2BC Horizon.

Artifact	**Count**
Flaked Stone Tools	
PP/K	13
Biface	4
Expedient tools	1
Cores	7
Debitage	505
Groundstone	3
Other stone	7
FCR	2,204
Ceramic vessel sherds	1
Faunal Remains	1
Floral Remains	573
Total	**3,319**

Table 8.36. Summary of 2BC Horizon Feature Designations.

	Count	**Feature Numbers**
Prehistoric cultural feature	14	152, 187, 196, 197 206, 207, 208, 209, 210, 211, 212, 214, 215
Non-cultural anomalies	4	186, 188, 213, 216

Artifacts and features found in this horizon indicate short term general purpose small group visits to this site. Like the remains found in the AB horizon, it is suggested that cobble and pebble cores, firewood, and some nuts were collected nearby and used on site. The implied activity set is stone tool manufacture, maintenance, and use; and food preparation and consumption. The same reduction strategies are in use for the tools. Use-wear studies indicate that all of the pp/ks were used as knives for general cutting and slicing tasks. This layer lacks ceramics and early cultigens indicating technological changes and changes in resource exploitation occurred in the time that elapsed between 2BC and AB horizon occupations.

Chronology

The 2BC horizon, artifacts, ecofacts, and features found therein are associated with the Terminal Late Archaic Period. This is based on stratigraphic positioning, diagnostic projectile points, and radiocarbon dating. Weed (2002) provides a date range of 3,000 to 1,000 B.C. for the Late Archaic Period. A majority of the recovered diagnostic materials found in the 2BC horizon fit well with a Late Archaic ascription to this horizon, although there were some items not traditionally ascribed to that period that were recovered from the 2BC. However, considering the preponderance of Late Archaic diagnostic artifacts and

radiocarbon dates, the 2BC horizon seems to contain predominantly Terminal Archaic Period deposits. Diagnostic materials are summarized in Table 8.37.

Table 8.37. Diagnostic Artifacts Recovered from the 2BC Horizon.

Point Type	Date	Cultural Affiliation
Adena Ovate (possible)	ca. 455 to 190 B.C.	Early Woodland
Kramer/Adena	ca. 640 to 400 B.C.	Early Woodland
Merom-Trimble	ca. 1710 to 1010 B.C.	Terminal Archaic
Lehigh Broad	ca. 2060 to1580 B.C.	Terminal Archaic

This Terminal, or Transitional Period is not well known within the region; only two sites with this component have been identified (GAI Consultants, Inc. 2003). Three uncalibrated dates from Meadowcroft Rockshelter date to the Terminal Archaic: 1140 ± 115 B.C. (2975-3205 B.P); 1150 ± 90 B.C. (3010 to 3190 B.P); and 1165 ± 70 B.C. (3045 to 3185 B.P). Radiocarbon dates were obtained (using the AMS techniques) from two features within the 2BC horizon—Features 196 and 209. Results are consistent with those uncalibrated dates from Meadowcroft Rockshelter as shown in Table 8.38.

Table 8.38. 2BC Horizon ^{14}C Dates.

Feature/Sample	Conventional ^{14}C Date	Calibrated Date
196/ Beta-182453	3100 ± 40 B.P.	1440 to 1280 B.C.
209/ Beta-176116	3090 ± 40 B.P.	1430 to 1270 B.C.

The artifacts recovered from the 2BC horizon included four diagnostic varieties of pp/ks and other non-diagnostic pp/k fragments, and a small number of biface fragments, groundstone tools, cores, and debitage material. The small amount of material recovered suggests limited Terminal Archaic occupation(s) at the site. The larger number of features (n = 14) is somewhat inconsistent with this conclusion, however, to suggest either longer occupation(s) or a greater number of occupations at the site as a whole, than is represented by the lithics recovered. It is possible that the lithic material generated from those occupations was either lost through post-depositional processes, or is located at other parts of the site outside of the Area 3-South excavations.

Artifact and Ecofact Recovery and Analyses

As previously summarized, the total number of artifacts recovered in the 2BC horizon is 3,319 This number includes 25 flaked stone tools and cores, 505 pieces of debitage, three groundstone items, seven other stone fragments, and 2,204 pieces of FCR. One ceramic sherd was found in this horizon (thought to be out of context). Ten botanical artifacts were hand collected during excavations; an additional 563 floral remains were found as a result of flotation. A single piece of bone was also recovered.

Flaked Stone Tools

Flaked stone tool recovery for the 2BC horizon includes pp/ks (n = 13), bifaces (n = 4), a single expediency tool, and cores (n = 7).

Projectile Point/Knives

A total of 13 pp/ks were recovered from the 2BC horizon (Figures 8.113 (a-c) and 8.114 (a-f)). Figure 8.115 shows the distribution of the pp/ks and lithic tools. Four of these artifacts dated to the Terminal Archaic period, two were of different chronological periods, and seven of the pp/k artifacts recovered from the 2BC horizon were not diagnostic to a particular period. Detailed descriptions and measurements for all pp/ks are given in Appendix 8K.

Of the four pp/k artifacts recovered from the 2BC horizon that dated to the Terminal Archaic period, one was identified as a Merom-Trimble pp/k of Onondaga chert (Catalog no. 2153). The Merom-Trimble ascription includes two closely related forms. The Merom is a small side-notched to expanding stem point with a triangular blade. The Trimble is similar and its notching characteristics overlap those of the Merom. The blade of the Trimble is usually longer and narrower than the Merom, and often has straighter blade edges. They are typically found in the central Ohio River Valley (Justice 1987).

The other recovered Terminal Archaic points are one Lehigh Broad pp/k of Onondaga chert (Catalog no. 2247.1), one Lehigh Broad-like pp/k of Upper Mercer chert (Catalog no. 2321), and one blade and haft fragment of a Lehigh Broad pp/k of quartzite (Catalog no. 2377). Of note is the fact that this latter Lehigh Broad blade and haft fragment conjoined with a Lehigh Broad blade and haft fragment recovered from the 3Ab1 horizon (Catalog no. 2680). Lehigh Broad pp/ks are linked to the Broadspear/Susquehanna tradition, and are considered by some researchers (e.g., Justice 1987) to be strong morphological correlates with Snook Kill points of the Genesee cluster. The blade edges are straight to slightly convex and the stem is straight to slightly contracting. There is usually grinding on the stem and base. This pp/k form is usually found in the eastern half of Pennsylvania and into New Jersey and Delaware, but the Snook Kill and Genesee correlates are found across Pennsylvania and into Ohio, New York and the Great Lakes region.

Two other pp/k artifacts recovered from this horizon were attributed to a transitional period of the Late Early Woodland/Early-Middle Adena period. One of these was a haft fragment of a possible Adena Ovate Base pp/k of Onondaga chert (Catalog no. 2201). The other of these transitional pp/k artifacts (Catalog no. 2209) was identified as an Adena pp/k (Later Early Woodland/Early-Middle Adena period) or a Kramer pp/k (Early Woodland period), though it is possible that the two classifications are merely geographical names for the same form. Kramer points have lanceolate blades with straight to excurvate sides, a long straight stem, and sloping shoulders. The stem edges are usually straight but may be slightly excurvate (Justice 1987). They are found across the Midwest, including Ohio.

The remaining seven pp/k artifacts recovered from the 2BC horizon were not diagnostic; that is, they were untyped pp/ks with unidentifiable cultural and chronological contexts. Three of these (Catalog nos. 2198, 2218.1, 2157), all of Onondaga chert, were identified as being similar to Fairchance Notched pp/ks, but none of them fit well with the typical metrics of that type. Fairchance Notched pp/ks date to the Middle Woodland period. One other pp/k was an untyped, wide, thin corner-notched pp/k of Upper Mercer chert (Catalog no. 2158.1). Another was an unidentified pp/k base fragment of quartzite (Catalog

no. 2320). The last untyped pp/k artifact recovered from within the 2BC horizon was an untyped midsection pp/k fragment of Onondaga chert (Catalog no. 2229).

One additional pp/k artifact was recovered from the interface of the underlying C horizon (field designation F6) and the 2BC horizon. This was an untyped pp/k of Onondaga chert (Catalog no. 2120). As noted in the discussion of the AB horizon, one other pp/k artifact dating to the Terminal Archaic period (the Genesee pp/k) was recovered from the AB horizon, and was discussed in that section.

Bifaces

One whole and three biface fragments were found during 2BC horizon excavations. All were made from Onondaga chert. No evidence of thermal alteration or heat treatment was noted. None of the pieces displayed any evidence of use. Two of the fragments appear to have been discarded due to lateral fracture. None of these artifacts was recovered from feature context. Biface descriptive data are presented in Table 8.39.

Table 8.39. 2BC Horizon Bifaces—Catalog Numbers and Descriptive Data.

Catalog Number	Reduction Stage	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Cortex
2160	UID	UID	12	6	4	0.4	No
2186	2	Lateral	13	12	6	1.2	No
2192	3	Lateral	12	24	9	2.9	No
2328	2	Whole	60.4	38.6	23.4	44.5	Yes

Expedient Tools

Only one expedient tool was found in the 2BC horizon—Catalog no. 2337. It was made on Onondaga chert. It bore no cortex or evidence of heat treatment. Manufacturing stage could not be determined nor is it clear if this is the whole tool or a fragment. It measures 29.7 mm long, 38.3 mm wide, and was 4.3 mm thick. It weighed 5.5 g. The tool was unifacially utilized and exhibited bilateral modification.

Cores and Core Fragments

Of the artifacts recovered from the 2BC soil horizon, seven were classified as cores. These seven consisted of one bifacial core, one bipolar core fragment, three split piece cores, and two split cobbles. None of these artifacts was thermally altered, four retained less than 50 percent cortex, two had more than 50 percent cortex, and the remaining artifact (the biface core) retained no cortex. All of the cores and core fragments of the 2BC horizon were of Onondaga chert except for one split piece core of quartzite. All of the artifacts were exhausted cores except for the biface core and the quartzite split piece. The other attributes for the 2BC core artifacts, including weights, axial dimensions, and numbers of flake scars are given below in Table 8.40.

Table 8.40. 2BC Horizon Cores and Core Fragments—Descriptive Data.

Field Designation	Core Type	Material source	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	No. of Flake scars	Percent cortex	Exhausted
F10	Biface Core	Onondaga	34	27.2	10.5		35	0	No
F10	Bipolar Core Frag	Onondaga	17.1	15.8	7.6	2.09	9	1-49	Yes
F10	Split Cobble	Onondaga	51	47.5	24.3	62.69	9	50-99	Yes
F10	Split Cobble	Onondaga	44.6	29.5	11.8	17.03	4	1-49	Yes
F10	Split Piece	Onondaga	34.4	20.5	17	10.9	6	50-99	Yes
F10	Split Piece	Onondaga	29.1	30.9	15.5	16.44	16	1-49	Yes
F8	Split Piece/ Frost Spall	UID/ Quartzite	73.8	68	42.5	183.81	0	1-49	No

Cores are indicative of reliance on local materials and reduction (both direct and bipolar) on site. The low density of materials suggests a short term or small scale visit.

Debitage

A total of 505 debitage artifacts was recovered from the 2BC horizon, weighing a total of 530.8 g. The debitage assemblage was subjected to both the mass analysis and detailed analysis, in order to reconstruct the manufacturing technologies that were used during the Terminal Archaic time period. The spatial distribution of the debitage is shown in Figure 8.115.

Mass Analysis

Size Grade. All debitage from this horizon was sorted according to size categories as previously described for the mass analysis. The majority of the debitage was classified as measuring between < 0.5 in and > = 0.25 in. The second most frequent grade measured < 0.25 in. Figure 8.116 illustrates the distribution by percent for each size grade.

Raw Material. Data on raw material type was also collected as part of the mass analysis. Almost all the artifacts were Onondaga chert (*n* = 491; 97 percent). Other materials appeared in much smaller amounts. They included seven fragments of Upper Mercer flint; one fragment that was completely cortex from a chert cobble; and one fragment that was unidentifiable. Table 8.41 presents the information on raw material type, and weight.

Table 8.41. 2BC Horizon Raw Material.

Material Type	Count	Percent of Count	Weight (g)	Percent of Weight
Onondaga chert	491	0.972	343	0.646
Cortex	3	0.006	0.8	0.002
Flint Ridge/Vanport chert	7	0.014	0.9	0.002
Upper Mercer chert	3	0.006	2.2	0.004
Unidentified material	1	0.002	183.9	0.346
Total	**505**	**100**	**530.8**	**100**

Cortical Material. Cortex was present on 220, or 44 percent, of the total number of debitage artifacts recovered for the 2BC horizon.

Thermally altered Material. Some degree of thermal alteration was present on 173 artifacts, or 34 percent of the total number of debitage artifacts.

Detailed Analysis of Whole and Proximal Flakes

All the whole flakes and proximal flake fragments recovered from the 2BC horizon were subjected to detailed analysis, amounting to a total of 236 flakes and flake fragments. To reconstruct reduction methods, data were collected on flake reduction stage (primary, secondary, or tertiary), presence of bulb of percussion, and platform. Table 8.42 lists their division by reduction stage.

Table 8.42. 2BC Horizon Whole and Proximal Flake Reduction Stages.

Reduction Stage	Count	Percent of Count
Primary	52	22.0
Secondary	140	59.3
Tertiary	44	18.6
Total	**236**	**100.0**

Data were collected on platform shape, angle, and thickness for all whole flakes and proximal flake fragments. Platform shapes were identified as flat, lipped, cortical, or faceted (Table 8.43). Of the 236 total, 86 (36 percent) platforms were flat, 39 (17 percent) were lipped, 45 (19 percent) were cortical, and 66 (28 percent) were faceted. Platform angles are shown in Table 8.44.

Table 8.43. 2BC Horizon Platform Shapes.

Platform Shape	Count	Percent of Count
Flat	86	36.4
Lipped	39	16.5
Cortical	45	19.1
Faceted	66	28.0
Total	**236**	**100.0**

Table 8.44. 2BC Horizon Platform Angles.

Platform Angle	Count	Percent of Count
0-4°	0	0
5-9°	0	0
10-14°	0	0
15-19°	0	0
20-24°	0	0
25-29°	0	0
30-34°	2	0.85
35-39°	2	0.85
40-44°	6	2.54
45-49°	3	1.27
50-54°	9	3.81
55-59°	11	4.66
60-64°	14	5.93
65-69°	10	4.24
70-74°	16	6.78
75-79°	16	6.78
80-84°	11	4.66
85-89°	15	6.35
> 90°	7	2.97
Indeterminate	114	48.31
Total	**236**	**100.00**

Types of lithic reduction were reconstructed using data from the mass analysis and the detailed flake analysis. These analyses, along with information from the cores and groundstone tools, indicate that a number of different strategies were used to reduce local cobbles. As in the AB horizon, the presence of all stages of the lithic reduction sequence, including cores of local cobbles; primary, secondary, and tertiary stage reduction flakes; and completed bifaces and pp/ks of the local Onondaga chert, indicates that the entire reduction

sequence was performed on site during this occupation period. Two bipolar core and core fragments were recovered, as were stone anvils, to indicate that technique was used to reduce the cobbles in addition to direct percussion. The fact that the finished tools were of the same material as the cobbles and reduction debitage suggests they were manufactured on site.

Striking platform data collected provides additional information regarding the reduction technology. Of the 236 whole and proximal flake fragments examined, flat platforms were the most common (36 percent), with the second most common type of striking platform being faceted (28 percent). Lipped (17 percent) and cortical (19 percent) platforms were represented in lower proportions. However, again, the presence of all types of platform shapes suggests that different percussors were used to reduce cores. Almost all the flakes (93 percent) had a bulb of percussion to indicate that most of the flakes were removed using either a hard or soft hammer percussor, but with enough pressure and force in the blow to create the bulb. Platform angles could not be determined for almost half the platforms examined. For the remainder, the three highest numbers fell within the 70° to 74° class, the 75° to 79° class, and the 85° to 89° class. The wide angles provide additional evidence that most of the flakes were removed with a hard hammer percussor, and most likely represent a wide range of general reduction activities. Platform thicknesses averaged 1.52 mm. Cortex was present on 39 percent of the flakes with 1-49 percent (30 percent) covered being the most common, 50-99 percent (6 percent) covered the next most common, and 100 percent (3 percent) the least most common. The only type of cortex present was cobble.

Groundstone

Three lithic artifacts falling under the category of groundstone were recovered from the 2BC horizon. Examples are shown in Figures 8.117 (a-c) and 8.118. Spatial distribution is shown in Figure 8.119. None of the artifacts within this classification for the 2BC horizon exhibited evidence of thermal alteration. The groundstone artifacts for this horizon are comprised of one whole hammerstone, one whole lithic anvil, and one fragment of a lithic anvil (Table 8.45).

Table 8.45. 2BC Horizon Groundstone Artifacts—Catalog Numbers and Descriptive Data.

Catalog Number	Artifact	Portion	Material type	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
2540	Hammerstone	Whole	Igneous	87	43.1	30.5	174.4
2136.01	Lithic Anvil	Whole	Sandstone	210	89.7	59.7	1665
2440	Lithic Anvil	Fragment	Sandstone	96.3	54.4	37.8	254.8

The hammerstone implement (Catalog no. 2540) was derived from a waterworn igneous stone, and weighed 174.4 g. The plan view shape of the stone was irregular, its profile was bi-convex, and its cross-section was triangular. The whole anvil implement (Catalog no. 2136) weighed 1,665 g, was comprised of water-worn sandstone, and was triangular in plan view and sub-rectangular in profile and cross-section. This anvil showed signs of pitting and pecking, the latter characteristic resulting from lighter blows causing a more diffuse pattern of depressions on the surface of the implement. The other lithic anvil object found within the 2BC horizon was a waterworn sandstone anvil fragment (Catalog no.

2440) weighing 254.8 g, and was of irregular shape in plan view and profile and oval in cross-section, and exhibited pitting.

Other Stone Artifacts

Two whole unmodified cobbles and four whole unmodified pebbles were also recovered from this horizon. One additional stone artifact was categorized as unidentifiable as to specific material and type. The unmodified cobbles and pebbles are all comprised of waterworn sandstone (Table 8.46). The two whole unmodified cobbles were found within the C horizon (F6 Field Designation), one rectangular in profile and plan view, and the other oval in profile and cross-section and triangular in plan view. The four whole unmodified pebbles were all oval in shape along all three axes. Given the general paucity of waterworn stones throughout the 2BC horizon, these items potentially represent manuports.

Table 8.46. 2BC Horizon Other Stone Artifacts—Catalog Numbers and Descriptive Data.

Catalog Number	Artifact	Portion	Material Type	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
2477	Unidentified						
2118.01	Unmodified Cobble	Whole	Sandstone	120.8	103.6	49.9	839
2137.01	Unmodified Cobble	Whole	Sandstone	306	117.8	121	5463
2328	Unmodified Pebble	Whole	Sandstone	44.7	40	13.7	33.4
2342	Unmodified Pebble	Whole	Sandstone	48	32.8	12.8	26.5
2417	Unmodified Pebble	Whole	Sandstone	48.6	37.1	13.1	158.4
2417	Unmodified Pebble	Whole	Sandstone	72.9	47	35.1	158.4

Fire-Cracked Rock

The 2BC horizon contained the second largest component of FCR of the soil horizons of Area 3-South. This horizon contained 2,204 fragments of FCR, for a total weight of 144,277.9 grams. Figure 8.119 illustrates their spatial distribution.

Prehistoric Ceramics

One prehistoric ceramic sherd was recovered from the 2BC horizon, in an open context. It is a limestone-tempered cord-marked sherd that appears to be of the Early Woodland Watson Cord-Marked type. This sherd is assumed to have originated within the AB horizon but migrated downward due to natural processes. It was recovered directly below a larger cluster of sherds present in the AB horizon that cross-cut the levels, suggesting that at the time the vessels represented by the AB horizon sherd cluster were broken and discarded, the sediments in this area were not well consolidated. This may have facilitated the vertical movement of the sherds in this area.

Faunal Remains

A single unburnt large mammal bone fragment was recovered from the 2BC horizon, Unit N80 E225.

Floral Remains

Floral remains from the 2BC horizon (Terminal Archaic occupation) included both hand collected and floated material. Hand-collected floral material (*n* = 11) came from general excavation levels, and from Features 207, 209, 211, and 212. This consisted of black walnut (*Juglans nigra*), butternut (*Juglans cinerea*), walnut/walnut family (Juglandaceae) and acorn (*Quercus* spp.) nutshell fragments; and one red oak (*Quercus* spp., red group) wood fragment.

Floral remains collected via flotation of soil samples total 562. Identifiable floated material from features consisted of black walnut (*Juglans nigra*), maple (*Acer* spp.), white oak (*Quercus* spp., white group), and ash (*Fraxinus* spp.) wood fragments; walnut/thick-shelled hickory (Juglandaceae), black walnut (*Juglans nigra*), butternut (*Juglans cinerea*), thick-shelled hickory (*Carya* spp.), acorn (*Quercus* spp.), and hazelnut (*Corylus americana*) nutshell fragments; and mustard (*Brassica* cf. *juncea*) seeds.

Feature Identification and Analysis

A total of 14 definitive prehistoric features was identified in the 2BC horizon (F8/10 Field Designation) at Area 3-South. One other disturbance (Feature 213) was most likely a non-cultural feature (anomaly) despite the presence of FCR, thus it is discussed only in the non-cultural anomaly table. The four non-cultural soil anomalies identified are presented at the end of this feature discussion. Figure 8.120 illustrates the feature locations from this soil horizon. Feature function, type, provenience, and radiocarbon dating results are provided in Table 8.47.

Table 8.47. 2BC Horizon Feature Summary.

Feature Type and Number	Dimensions (L x W x Th)	Unit Location(s)	Opening Elevation	Radiocarbon Date
Hearth				
Feature 152	87 x 72 x 8	N75 E235	214.33	
Feature 187	72 x 58 x 25	N60 E236	214.69	
Feature 196	97 x 64 x 22	N70 E233	214.53	3090±40 B.P.
Feature 197	71 x 68 x 11	N80 E232	214.46	
Feature 206	90 x 40 x 35	N66 E230	214.75	
Feature 207	60 x 50 x 10	N71 E235	214.49	
Feature 208	35 x 30 x 6	N79 E231	214.37	
Feature 209	60 x 50 x 27	N63 E235/E236	214.63	
Feature 210	25 x 25 x 11	N69 E229	214.57	
Feature 211	52 x 46 x 22	N71/N72 E233	214.37	

Feature Type and Number	Dimensions (L x W x Th)	Unit Location(s)	Opening Elevation	Radiocarbon Date
Feature 212	35 x 30 x 11	N79 E232	214.39	3100±40B.P.
Feature 214	95 x 64 x 18	N72 E235/E236	214.30	
Feature 215	102 x 84 x 10	N67 E231/E232	214.55	
Pit				
Feature 259	87 x 66 x 9	N68 E227	214.64	

Hearths were prevalent and ranged in size from 25 cm in diameter to 1.02 m by 0.84 m in plan. Depth varied from 6 m to 35 cm. Surface hearths (evidenced by burnt soil and FCR scatters in the absence of an excavated pit), shallow, and deep basin-shaped pits hearths were found. All of the hearths contained FCR; some of them also contained a combination of debitage and botanical remains. Radiocarbon dating was conducted for two of the features—Feature 196 and Feature 209. The results place the features in the Terminal Archaic Period and are as follows:

- Feature 196—3100 ± 40 B.P. (1440 to 1280 B.C.)
- Feature 209—3090 ± 40 B.P. (1430 to 1270 B.C.).

Feature Descriptions

Feature 152

This thermal feature was a probable hearth remnant. It was located in Unit N75 E235, and extended into Unit N75 E234. It had an opening elevation of 214.30 NGVD and a closing elevation of 214.22 NGVD. It measured 87 cm north-south by 72 cm east-west. Feature 152 was semi-ovoid in plan view and dish shaped in profile (Figure 8.121). The feature was located northeast of Feature 195, and it was observed that there was FCR in the same quadrant of the unit in the overlying level. The feature consisted of homogenous soils, and was disturbed by root casts. The matrix was described as reddish brown (5YR 4/3) – brown (7.5YR 4/4), friable, fine, sandy silt, with charcoal flecking. It first appeared as the reddened soil area, and had inclusions of charcoal flecking, which disappeared after about 5 cm. No cultural material was recovered in this feature.

Feature 187

Feature 187 was a pit with FCR interpreted as an indeterminate hearth. This feature was located in Unit N60 E236. It had a top elevation of 214.69 NGVD and a closing elevation of 214.44 NGVD. It measured 58 cm north-south by 72 cm east-west. It was roughly circular in plan view and basin-shaped in profile (Figure 8.122). The feature fill was described as a pocket of brown (7.5YR 4/4) sandy loam with charcoal flecking, overlying a more compact brown (7.5YR 4/4) sandy loam with charcoal flecking. This feature was identified as a possible fire pit. Artifacts recovered included 30 fragments of FCR, and one flake fragment.

Feature 196

Feature 196 was a pit with FCR that probably served as a general purpose and cooking hearth. This feature was located in Unit N70 E233. It had a top elevation of 214.53 NGVD and a closing elevation of 214.31 NGVD. It measured 97 cm north-south by 64 cm east-west. It was an irregular ovoid shape in plan view, and somewhat basin-shaped in profile (Figure 8.123). The feature fill was described as brown (10YR 4/3), sandy loam, with charcoal flecking. The only artifacts recovered were 10 fragments of FCR, and one whole flake. Plant remains were recovered from the floated soil sample. They consist of one black walnut (*Juglans nigra*) wood fragment, two maple (*Acer* spp.) wood fragments, 17 unidentifiable wood fragments, and two thick-shelled hickory (Juglandaceae) nutshell fragments. One ^{14}C date was calculated for this feature, using the AMS technique. The date was 3100 ± 40 B.P.

Feature 197

Feature 197 was an FCR cluster probably representing the remains of a hearth. It was identified in Unit N80 E232 within the 2BC horizon. It had a top elevation of 214.46 NGVD and a closing elevation of 214.35 NGVD. It measured 71 cm north-south, and 68 cm east-west across the initial top opening, and widened to 73 cm north-south and 70 cm east-west at the bottom. The shape was irregular in plan view and roughly rectangular in profile (Figure 8.124). This feature was a rock cluster (n = 17) that was stained with charcoal flecking. It was defined by the presence of several rocks at the interface of the C/2BC horizon, with the charcoal staining concentrated around the rocks. The matrix was described as brown (10YR 4/3) loam, with a moderate amount of charcoal. A layer of dense charcoal also lay beneath the rocks. Plant remains were recovered from the floated soil sample, including nine white oak (*Quercus* spp., white group) wood fragments and 11 unidentifiable wood fragments. This feature has been interpreted as a remnant of a hearth.

Feature 206

Feature 206 was a pit that probably served as a general purpose and cooking hearth. This feature was located in Unit N66 E230, and extended into Unit N66 E231, N65 E230, and N65 E231. It had a top elevation of 214.75 NGVD and a closing elevation of 214.37 NGVD. It was approximately 40 cm east-west by 40 cm north-south, but with an additional 50 cm drag zone to the east. The main body of the feature was roughly circular in plan view and deeply basin-shaped with straight sides in profile (Figure 8.125). This feature first appeared as a darkened charcoal and burnt, red soil stain, located in Unit N66 E230. More of the feature, although diffuse and with less charcoal and slightly lighter staining, was found in N66 E231. The western half of the feature appeared as a flat-bottomed pit with no internal stratigraphy. The feature fill was described as dark yellow brown (10YR 4/6) loose sand, with yellowish red (5YR 5/8) burnt earth. As the feature was excavated the initial indications of burning lessened, to indicate a lack of significant remains of burning or charcoal. Five FCR fragments were recovered in this feature. Plant remains were recovered from the floated soil sample. They included four black walnut (*Juglans nigra*) wood fragments, 16 unidentifiable wood fragments, and one walnut/thick-shelled hickory (Juglandaceae) nutshell. There was no other cultural material. The lateral 'scatter' identified in the field as a

‘pull’ from the main feature area to the east, and to a lesser extent, to the north of the feature, indicates that this feature falls into Petraglia’s ‘latent’ category.

Once the surrounding soil was excavated, an additional scatter of 33 FCR (field designation F90) was identified at elevation 214.63 NGVD. It measured approximately 110 cm north-south and 80 cm east-west, and was roughly oval in shape. There was no recorded soil discoloration or charcoal flecking. It is unclear if this scatter is related to Feature 206 or remnants of a slightly older scatter that was disturbed by the creation of Feature 206.

Feature 207

This feature was located in Unit N71 E235. It had a top elevation of 214.49 NGVD and a closing elevation of 214.39 NGVD, and measured 50 cm north-south by 60 cm east-west. The feature was roughly circular with indistinct boundaries in plan view and had an indeterminate profile shape (Figure 8.126). It was an FCR scatter consisting of 13 FCR fragments. The soil matrix was described as brown (7.5YR 4/3) sandy loam, with charcoal flecking, not unlike most of the 2BC horizon. One fragment of butternut (*Juglans cinerea*) nutshell was recovered from Feature 207.

Feature 208

Feature 207 was an FCR cluster and probably the remains of a hearth. This feature was identified in Unit N79 E231. It had a top elevation of 214.37 NGVD and a closing elevation of 214.31 NGVD. It measured 35 cm east-west and 30 cm north-south, and was roughly circular in plan view and basin-shaped with a mounded base in profile (Figure 8.127). The feature fill was described as dark brown (7.5YR 3/4), loam, with abundant charcoal flecking The feature contained four pieces of FCR, associated with a small amount of charcoal and burned soils. Feature 208 is identified as a hearth.

Feature 209

Feature 209 was a pit with FCR that probably served as a general purpose and cooking hearth. This feature was located in Unit N63 E235 and extended into Unit N63 E236. It had a top elevation of 214.63 NGVD and a closing elevation of 214.42 NGVD. It measured 60 cm east-west by 50 cm north-south. It was ovoid in plan view and had an irregular basin-shape in profile (Figure 8.128). A diffuse boundary of charcoal flecking was identified to the south, and was evident at both the surface and in profile. If included in the feature, adding the diffuse charcoal flecking creates an evenly rounded plan view and a regular basin-shaped profile. Three walnut/walnut family (*Juglans* spp.) nutshell fragments were identified within this feature. Apart from 10 FCR fragments and nutshell fragments, no other cultural material was recovered. One carbon sample was sent for AMS dating from this feature; the date received was 1430-1270 cal B.C., or a conventional date of 3090 ± 40 B.P.

Feature 210

This pit feature was probably a hearth remnant and was located in Unit N69 E229. It had a top elevation of 214.57 NGVD and a closing elevation of 214.46 NGVD. It was 25 cm in diameter, round in plan view, and basin-shaped in profile (Figure 8.129). The feature fill was described as dark reddish gray (5YR 4/2), silt loam. It was a small, fairly shallow pit,

with two FCR fragments at the base of the feature. No other cultural materials were recovered.

Feature 211

This pit feature was probably used for processing or roasting nuts. It was located in Unit N71 E233 and extended into Unit N72 E233. It had a top elevation of 214.37 NGVD and a closing elevation of 214.15 NGVD. It measured 46 cm east-west by 52 cm north-south. The feature was irregular and somewhat oblong in plan view, with basin-shaped profile across the short axis (Figure 8.130). It was widest at the top and narrowed towards its base. Charcoal staining and a slight change in soil defined the feature. The matrix was described as brown (7.5YR 4/3) sandy loam with charcoal flecking. Cultural material recovered during the excavations included 16 FCR fragments, in the southwestern portion of the feature; nut fragments; and two lithic debitage pieces. The nuts that were hand-collected during excavation were later identified as one black walnut (*Juglans nigra*) fragment and a walnut family nutshell fragment (*Juglans* spp). One red oak (*Quercus* spp., red group) charcoal fragment was also hand-collected. In addition to the plant remains that were hand-excavated, plant remains were recovered from the floated soil sample. They included 20 ash (*Fraxinus* spp.) wood fragments, 170 walnut/thick-shelled hickory (Juglandaceae) nutshell fragments, 21 black walnut nutshell fragments (*Juglans nigra*), 25 butternut (*Juglans cinerea*), 10 thick-shelled hickory (*Carya* spp.), eight acorn (*Quercus* spp.), and eight hazelnut (*Corylus Americana*) nutshell fragments; and three mustard (*Brassica* cf. *juncea*) seeds.

Feature 212

Feature 212 was a pit that probably served as a general purpose or cooking hearth. This feature was located in Unit N79 E232. It had a top elevation of 214.39 NGVD and a closing elevation of 214.28 NGVD. It measured 30 cm north-south, and 35 cm east-west, but the eastern extent was not defined because the feature extended beyond the extent of the excavation block. The feature was roughly ovoid in plan view, with an indistinct boundary, especially at its top, and was saucer-shaped in profile (Figure 8.131). The feature fill was described as dark yellowish brown (10YR 4/6), silt loam, with a slightly reddened appearance. Feature 212 may be a hearth, as there was light charcoal flecking throughout the feature. No cultural material was recovered other than floral remains. One acorn (*Quercus* spp.) was hand-collected. Plant remains were also recovered from the floated soil sample. They were limited to five unidentifiable wood fragments and three mustard (*Brassica* cf. *juncea*) seeds.

Feature 214

Feature 214 was a pit with FCR that probably served as a hearth. It was located in Unit N72 E235 and extended into Unit N72 E236. It had an opening elevation of 214.30 NGVD and a closing elevation of 214.12 NGVD in the western half of the feature, and 214.22 NGVD in the eastern half of the feature. It measured 95 cm north-south by 64 cm east-west, before being excavated. It was an irregular oval shape in plan view, and irregular with a mounded base in profile (Figure 8.132). The matrix was described as dark yellowish brown (10YR 4/4), sandy silt. This was a somewhat amorphous and difficult to discern

feature, whose size and depth were revised during excavation. As excavation continued, it appeared that the southern half of the feature was actually the 3Ab1 horizon (field designation F15) rather than a continuation of the feature. Artifacts recovered were 11 FCR fragments, and one fragment of lithic debitage.

Feature 215

Feature 215 was an FCR cluster; probably the remains of a hearth. It was identified in Unit N67 E232 and extended into Unit N67 E231. It had a top elevation of 214.55 NGVD. It measured 84 cm north-south by 102 cm east-west. It was an irregular oval in plan view, and had no discernable profile (Figure 8.133). The soil was described as brown (10YR 4/3), fine silt loam, the same as the surrounding horizon only felt slightly more compacted. The only artifacts recovered from this feature were five FCR fragments.

Feature 259

This indeterminate pit feature with FCR was located in Unit N68 E227 during the mechanical stripping task, and had a top elevation of approximately 214.64 NGVD and a closing elevation of 214.55 NGVD. This depth is approximate, as the top of the feature may have been truncated during mechanical stripping, prior to being identified. It measured 87 cm northeast-southwest by 66 cm northwest-southeast, and was roughly ovoid in plan view and shallow basin-shaped in profile (Figure 8.134). It appeared in the field to be a remnant of a storage pit, with no *in situ* burning. The soil matrix was described as dark brown (7.5YR 3/4), loose, fine loam, with charcoal flecking. Apart from a small amount of FCR (n = 10), no cultural material was recovered.

Non-Cultural Anomalies

Four non-cultural anomalies encountered in the 2BC horizon were given feature numbers during the fieldwork. They are shown in Table 8.48.

Table 8.48. Non-Cultural Anomalies Identified in the 2BC Horizon.

Feature Number	Unit Location	Dimensions	Comments
186	N73 E235	Top elevation: 214.45; bottom elevation: 214.32. 55 cm x 41 cm	No artifacts. Irregular oval shape in plan; basin-shaped profile
188	N78 E228		Remains of tree
213	N73 E233, N74 E232/233	Top elevation: 214.32; bottom elevation: 214.09	Root disturbance
260	N63 E241, N64 E242, N64 E241, N62 E241	Top elevation: 213.52; bottom elevation: 212.72 1.5 m southwest-northeast x 0.5 m southeast-northwest	Exposed during mechanical stripping; remains of burnt tree root; charcoal concentration and reddened soil. Oval in plan view and ‘Y’ shaped in profile. No artifacts.

2BC Horizon Features Analysis

Because the following discussion is intended to examine patterns of features associated with the Terminal Late Archaic occupation in the 2BC horizon, Features 166 and 172 are included here. These two features were initially identified during excavations as being part of the overlying AB horizon associated with Early Woodland occupations, but subsequent analysis (see above) has shown that those features are most likely associated with the Terminal Late Archaic occupations. All of the identified features associated with this horizon and the Terminal Late Archaic appear to be hearths.

All cultural features were analyzed using a combination of statistical analyses and functional interpretation. The principal components analysis, and a *k*-means cluster analysis were inconclusive. Figures 8.135 and 8.136 illustrate the stem-and-leaf diagrams and scatter plot used to search for groups of features based on dimensions alone (greatest thickness and greatest width). The stem-and-leaf diagrams suggest that feature widths do not cluster and that thicknesses show a small possible cluster centered on the 10-11 cm range.

The scatter plot hints at some possible clustering, if the assigned feature types are ignored. Features 172, 196, and 214 form a tight group in the middle of the plot, and Features 187, 209, and 211 seem to show a group of features that are smaller across but slightly thicker. Features 208, 210, and 212 seem to show another group of overall smaller features. The remaining features are either clearly outliers or do not seem to form a distinct cluster. All this having been said, when examining the feature types in each possible cluster in the plot, only the first cluster is consistent in its inclusion of feature type. Further, in each cluster, including the first cluster, there is no apparent commonality of feature content, shape, or soil description. Essentially, there does not appear to be any meaningful pattern in the comparison of feature types and their dimensions. Most, if not all, of these features are probably simple fire features that served much the same purposes as each other; thus, despite some slight variations they do not show any meaningful distinctions.

Spatial Analyses

The different analyses that were conducted for the 2BC horizon artifact assemblage yielded some interesting patterning. Some patterns were more evident in different analyses; however, the different analyses that were conducted generally yielded very complementary results. Overall, four interesting patterns were identified by the combination of the methods that were implemented.

First, there seemed to be a relatively tight concentration of bifaces/tools, pp/ks, and groundstone artifacts in roughly the central portion of the excavation block. Additionally, in the area in which these artifact classes were generally concentrated, absolute flake and FCR densities were also fairly high. Therefore, it seems the concentration of activities from the 2BC horizon was concentrated in this location, particularly activities associated with stone tool use, manufacture, and maintenance/retouch. The cluster analysis identified a finer resolution of clustering within each of these artifact classes. Whether these clusters represent specific activity areas within the concentrated occupation is not clear. However, it does

indicate that patterning is evident, and that patterning is likely associated with behavioral patterns of the site's Terminal Archaic occupants.

Second, bipolar artifacts were distributed differently than the other artifact classes, though one of the clusters identified for groundstone artifacts is coincident with the distribution of bipolar artifacts in the northern half of the excavation block. This suggests that activities associated with bipolar artifacts were somehow segregated from activities associated with the other artifact classes. Furthermore, it suggests that groundstone artifacts may have been, at least to some degree, associated with these activities as well.

Third, flakes and FCR were by far the most abundant artifacts. Their absolute densities are fairly high across the entire excavation block. As a result, there is a correlation between the absolute densities of flakes and FCR. There is also a very strong correlation between the relative densities of flakes and FCR, but the correlation is *negative*. This results from the fact that where flake densities are highest, FCR densities are lowest (though may still be high compared to other artifact classes). This correlation and the contour plots reveal that FCR does in fact tend to be concentrated, in a relative sense, away from the concentration of other artifacts and the activities associated with them.

Fourth, features tend to be located in areas where relative FCR densities are highest. This is understandable since most features are associated with concentrations of FCR. Because of the association with FCR, most features probably were hearth-related. By extension, since FCR tends to be most dense where other artifact classes are less dense, hearth-related features seem to be located adjacent to (rather than superimposed over) areas in which flaked stone tool use, manufacture and maintenance took place.

Artifact Distribution and Contouring

As was described above, two types of contour plot were generated for each artifact class for the 2BC horizon (defined as the Terminal Archaic component). Absolute and relative artifact density contour plots were generated. Though in many cases the absolute and relative density plots for each artifact class are similar, they are actually reflective of two different phenomena. The absolute density contours are a straightforward reflection of the actual distribution of each artifact class. Peaks represent high densities and valleys represent low densities.

The relative density contours, on the other hand, reflect the distribution of densities of each artifact class *relative* to the densities of all other classes of artifact. Thus, a peak represents the location where the plotted artifact class has a high density relative to all other artifact classes. Conversely, valleys represent low densities of the plotted artifact class relative to the other artifact classes. By examining both, some very interesting and subtle patterning is revealed in the data, as will be shown below.

As with the AB horizon analysis, the absolute and relative artifact densities were calculated following Whallon (1984) and Blanckholm (1991). For absolute densities, the total of each class of artifact for the four adjoining excavation squares was calculated, and then this total was divided by four square meters. This resulted in a vector of density values

for each of the artifact classes analyzed at each grid point intersection within the established excavation grid. Relative densities for each artifact class at each grid point were then calculated by adding the vector of densities at each grid point, then dividing each individual artifact class density by the sum of all densities at that point. The resultant values represent the relative proportions of the various artifact classes represented in the four adjoining excavation squares. This data was then used to generate the absolute and relative density contour plots presented below.

Figure 8.137 presents the absolute and relative densities of bifaces/tools from the 2BC horizon. As can be seen in the absolute density contour plot, bifaces/tools are tightly concentrated in one area of the excavation block. The high peaks in the absolute density contour are somewhat misleading in that they actually reflect relatively low densities, as is evident in the scale provided. In fact, each peak is associated with a single artifact.

The relative density plot in Figure 8.137 shows the same general distribution; however, it contains more subtle information regarding the distribution of bifaces/tools relative to the other artifact classes. The peaks are not as accentuated, suggesting that other artifact classes are represented in similar proportions in the locations where bifaces/tools are found. In fact, in the locations where bifaces/tools were recovered, bifaces/tools comprise only between 1 and 4 percent of the total artifacts identified in those locations.

The most interesting aspect of the maps presented in Figure 8.137 is that they clearly indicate a relatively tight concentration of bifaces/tools in the 2BC horizon. As we shall see below, this is the location where several artifact classes, with the notable exception of bipolar artifacts, are also concentrated. It is understandable, then, that the relative density contour plot indicates a relatively muted presence of bifaces/tools in that location.

Figure 8.138 presents the contour plots for pp/ks recovered from the 2BC horizon. Though pp/ks reflect a slightly different distribution than bifaces/tools, the two artifact classes are concentrated in roughly the same area. As with bifaces/tools, the maximum quantity of pp/ks in any unit in the 2BC horizon is one. Thus, the peaks in the absolute density plot reflect the locations of each of those artifacts. The relative density contour similarly reflects the fact that where pp/ks are located, several other artifact classes are also found in appreciable frequencies. The frequency of pp/ks range from only 0.5 to 4.5 percent.

Figure 8.139 presents the contour plots for all flakes recovered from the 2BC horizon. Again, an examination of the absolute contour plot reveals that flakes also are most densely concentrated in the same area as bifaces/tools and pp/ks, though flakes have a much broader distribution beyond that high-density concentration.

The relative density contour for flakes reveals some additional interesting patterning. The highest concentrations of flakes relative to other artifact classes occur in the same location where bifaces/tools and pp/ks are concentrated. Flakes are also densely concentrated in the southernmost portion of the excavation block, as well as along the North 75/76 line of excavation units. Overall, the majority of the excavation block is characterized by the presence of relatively high proportions of flakes relative to other artifact classes.

Figure 8.140 shows the relative and absolute distributions of bipolar artifacts. Interestingly, it is clear that bipolar artifacts reflect a very different distribution than all other artifact classes discussed thus far. They are primarily concentrated in the northern half of the excavation block. Each peak in the absolute density contour plot basically represents a single artifact. Here again we are dealing with a relatively small number of artifacts. Despite this fact, however, relatively higher percentages of bipolar artifacts with respect to other artifact classes are evident in the relative density plot. This results from the lack of various artifact classes in the portion of the site where bipolar artifacts are found.

Figure 8.141 presents the absolute and relative densities of groundstone tools. Yet again, due to the recovery of a limited number of artifacts, each peak in the absolute density plot reflects the presence of a single groundstone artifact. In general, the distribution of groundstone artifacts is similar to the distribution of bifaces/tools and pp/ks, though there were two groundstone artifacts found in the extreme northern edge of the excavation block. It should be noted that a number of the specimens included as groundstone in the spatial analysis have little evidence of use, and may in fact be unmodified cobbles; however, even removing those from the assemblage does not change the basic distributional pattern of the groundstone category.

The relative density of groundstone artifacts is high in the extreme northern portion of the block, but fairly low in the core of the block where the other artifact classes (with the exception of bipolar artifacts) are concentrated.

Finally, absolute and relative density contour plots of FCR are presented in Figure 8.142. FCR was clearly the most abundant artifact class, and this is reflected in both the absolute and relative density contour plots. Interestingly, the absolute density contour plot reveals that the highest concentration of FCR, though located near the core concentration of most other artifact classes, is located slightly to the north and east of that core concentration. As a result, the locations where bifaces/tools, pp/ks, groundstone artifacts, and flakes were most densely concentrated (roughly around N66 E233 and N69 E230) are locations where FCR density was low, relative to the density of FCR elsewhere in the excavation block. Note that the actual percentages of FCR are higher than the percentages of all other artifact classes in those two areas; however, it is still notable that these are the same locations where the lowest densities of FCR were found.

Variant of K-Means Cluster Analysis

Following the technique outlined in the methodology section, a variant of the *k*-means cluster analysis was applied to each of the artifact classes in order to ‘objectively’ delimit distributional clusters within each artifact class for the 2BC horizon. For each class of artifact the percent SSE plot is first presented, then the cluster solution that, for various reasons, was determined to be most appropriate is presented and discussed.

Figure 8.143 presents the percent SSE plot for bifaces/tools from the 2BC horizon. As is evident, the original plot is not clearly separate from the random data plots. This tells us that in the area where bifaces/tools were recovered, they reflect something close to a random distribution. However, the first segment of the original plot (between the one- and

two-cluster solutions) does lie slightly below the random data, reflecting a very slightly clustered distribution. The location of the most marked elbow indicates that the two-cluster solution is the most appropriate for the bifaces/tools data.

Figure 8.144 superimposes the two-cluster solution over the absolute density plot. The two clusters do seem to fit the data, but considering the excavation block as a whole, assigning the bifaces/tools to a single cluster is probably most appropriate. The division of the data into two clusters, however, may provide a sharper delineation of the behavioral processes that led to the distribution of bifaces/tools.

Figure 8.145 presents the two-cluster solution for pp/ks. The percent SSE plot is not presented here because the original plot could not be distinguished from the random plots. By examining various cluster solutions, however, it was subjectively determined that the two-cluster solution was most reflective of the data. Most of the pp/ks are concentrated in the center of the excavation block, with the exception of one that is 'isolated' in the southeastern corner of the block. Again, as mentioned above, the most notable aspect of pp/k distribution in the 2BC horizon is that pp/ks are rather tightly concentrated in a relatively small area near the center of the excavation block.

Figure 8.146 presents the percent SSE plot for flakes. The original plot is located just below the random plots, suggesting a clustered distribution. There are arguably three relatively marked elbows in the original plot, located at the four-, five- and nine-cluster solutions. Of these three possible solutions, the five-cluster solution appeared to reflect the data configuration evident in the absolute density contour plot most appropriately. The five-cluster solution is superimposed over the absolute flake density plot in Figure 8.147. As with the cluster configuration for bifaces/tools, the five-cluster configuration may provide a finer resolution of intra-site behavioral patterning than the pattern evident in the density plots, which suggest a generalized concentration of flakes towards the center of the block.

Figure 8.148 presents the percent SSE plot for bipolar artifacts. Again, the original plot does not deviate from the random plots by much, but it does lie below them indicating that there is a slight tendency towards clustering. The clear solution in this case is the two-cluster solution. Figure 8.149 presents the two-cluster configuration for 2BC horizon bipolar artifacts. The two clusters do seem to be nicely reflected in the data.

Figures 8.150 and 8.151 indicate that the groundstone artifacts do tend towards a slightly clustered distribution, and that the two-cluster solution is most appropriate. In this case, the two clusters are actually fairly widely separated, one located in the central core of the block and the other on the northern edge of the site.

Finally, Figure 8.152 indicates that there is a very slight tendency towards clustering of FCR in the 2BC horizon. The sharpest elbow occurs at the two-cluster solution, although it does not seem to fit very nicely with the absolute density contour plot pictured in Figure 8.153. In fact, none of the clustering solutions are intuitively desirable. In the two-cluster solution, the major concentration of FCR in the center of the excavation block is crosscut by the boundary between the two clusters that the *k*-means analysis delineated.

This seemingly inappropriate cluster solution probably resulted from the fact that the FCR is fairly densely scattered across the entire site (at least in relative terms), and slight concentrations in the extreme northern and southern ends of the block led to the pulling apart of the two clusters at the center of the block. In this case, the *k*-means analysis seems to obstruct rather than illuminate the most important and behaviorally significant patterns. Those patterns, as discussed above, are: 1) high absolute densities of FCR occur near the center of the excavation block; and 2) the lowest relative densities of FCR occur where most other artifact classes are most densely concentrated.

Artifact Class Correlation Analysis

As mentioned above, three different representations of the data for the various artifact classes were analyzed using Pearson's r correlation coefficient: raw artifact counts, absolute artifact densities, and relative artifact densities. The results of these correlation analyses are presented in Tables 8.49 through 8.51.

Table 8.49 presents the correlation analysis conducted on 2BC horizon artifact counts. As is evident in the table, there were four very significant correlations (at the 0.01 level or lower); however, none of the correlations was very strong. In fact, they were all fairly weak. The strongest correlation was between flakes and FCR ($r = 0.337$, $p < 0.001$, $n = 200$). This makes intuitive sense, as flakes and FCR are the only two artifact classes that were found across the entire site in appreciable frequencies.

Table 8.49. Correlation Matrix for 2BC Horizon Artifacts Counts by Excavation Unit.

		Bifaces/ Tools	**PP/Ks**	**Flakes**	**Bipolar Artifacts**	**Groundstone Artifacts**	**FCR**
Bifaces/ Tools	Pearson's *r*	1					
	Significance	.					
	N	200					
PP/Ks	Pearson's *r*	-.042	1				
	Significance	.553	.				
	N	200	200				
Flakes	Pearson's *r*	.156*	.214**	1			
	Significance	.027	.002	.			
	N	200	200	200			
Bipolar Artifacts	Pearson's *r*	-.029	-.048	-.008	1		
	Significance	.682	.500	.905	.		
	N	200	200	200	200		
Groundstone Artifacts	Pearson's *r*	.131	-.054	-.045	-.037	1	
	Significance	.065	.449	.526	.602	.	
	N	200	200	200	200	200	
FCR	Pearson's *r*	.059	.238**	.337**	.237**	.018	1
	Significance	.403	.001	.000	.001	.803	.
	N	200	200	200	200	200	200

* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.

The other significant correlations are related to the fact that flakes and FCR are distributed across the entire excavation block. All four very significant correlations are between various artifact classes and FCR or flakes. Basically what this tells us is that the various artifact classes are located in areas where there are flakes and/or FCR.

Table 8.50 presents the correlation matrix of absolute densities for the various artifact classes recovered in the 2BC horizon. Absolute densities reveal a similar pattern of correlation, but since more data points have values associated with them (i.e., larger sample size) the correlations are slightly stronger. All significant correlations ($p < 0.01$), with the exception of one, are between various classes of artifacts and FCR or flakes. Again, these correlations are resulting from the fact that where bifaces/tools, pp/ks, and bipolar artifacts are, there are also flakes and FCR. The one exception is a weak correlation between bifaces/tools and pp/ks ($r = 0.215$, $p = 0.006$, $n = 165$). Recalling the very similar distributions of bifaces/tools and pp/ks in Figures 8.137 and 8.138, this makes sense. The reason the correlation is not stronger is due to the very small sample sizes of the two artifact classes.

Table 8.50. Correlation Matrix for 2BC Horizon Absolute Densities of Artifact Classes at Grid Points.

		Bifaces/ Tools	**PP/Ks**	**Flakes**	**Bipolar Artifacts**	**Groundstone Artifacts**	**FCR**
Bifaces/ Tools	Pearson's *r*	1					
	Significance	.					
	N	165					
PP/Ks	Pearson's *r*	.215**	1				
	Significance	.006	.				
	N	165	165				
Flakes	Pearson's *r*	.472**	.422**	1			
	Significance	.000	.000	.			
	N	165	165	165			
Bipolar Artifacts	Pearson's *r*	-.115	-.018	-.043	1		
	Significance	.142	.815	.581	.		
	N	165	165	165	165		
Groundstone Artifacts	Pearson's *r*	.111	.041	.041	-.064	1	
	Significance	.158	.602	.602	.415	.	
	N	165	165	165	165	165	
FCR	Pearson's *r*	.155*	.517**	.436**	.286**	.030	1
	Significance	.047	.000	.000	.000	.706	.
	N	165	165	165	165	165	165

* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.

The strongest correlation evident in Table 8.50 is a moderate correlation between FCR and pp/ks ($r = 0.517$, $p < 0.001$, $n = 165$). This, too, is reflected in the contour plots presented in Figures 8.138 and 8.142.

Table 8.51 presents the correlation matrix for relative densities. This shows some interesting patterns. All significant correlations are associated with FCR, but the correlations are *negative*. The weaker negative correlations between FCR and bifaces/tools (r = -0.207, p = 0.008, n = 165) and FCR and groundstone artifacts (r = -0.249, p < 0.001, n = 165) are not surprising, nor are they very interesting. The correlations simply indicate that, in a very weak sense, where bifaces/tools and groundstone artifacts are located, there tends to be a slightly lower density of FCR.

Table 8.51. Correlation Matrix for 2BC Horizon Relative Densities of Artifact Classes at Grid Points.

		Bifaces/ Tools	**PP/Ks**	**Flakes**	**Bipolar Artifacts**	**Groundstone Artifacts**	**FCR**
Bifaces/ Tools	Pearson's *r*	1					
	Significance	.					
	N	165					
PP/Ks	Pearson's *r*	.118	1				
	Significance	.132	.				
	N	165	165				
Flakes	Pearson's *r*	.136	.104	1			
	Significance	.082	.183	.			
	N	165	165	165			
Bipolar Artifacts	Pearson's *r*	-.097	-.108	-.069	1		
	Significance	.216	.165	.377	.		
	N	165	165	165	165		
Groundstone Artifacts	Pearson's *r*	.036	-.074	.053	-.037	1	
	Significance	.646	.343	.497	.637	.	
	N	165	165	165	165	165	
FCR	Pearson's *r*	-.207**	-.177*	-.969**	.004	-.249**	1
	Significance	.008	.023	.000	.963	.001	.
	N	165	165	165	165	165	165

* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.

The most interesting pattern revealed, however, is the extremely strong negative correlation between flakes and FCR (r = -0.969, p < 0.001, n = 165). As you recall, some of the stronger direct correlations in the previous correlation matrices were between flakes and FCR. The strong *negative* correlation evident among FCR and flakes with respect to relative density tells us that FCR occurs in its lowest densities where flakes are most densely concentrated, and vice versa. This substantiates what was found in the contour plots above.

Finally, since bipolar artifacts seem to have a distribution quite different from most other artifact classes, we might expect some stronger negative correlations between bipolar artifacts and other classes. Though there are no significant negative correlations between bipolar artifacts and other classes of artifact, almost all r-values associated with bipolar artifacts are negative. The results lack strength and significance due to the small samples of the various artifact classes, particularly the bipolar artifact class.

Relationship Between Artifact Distribution and Cultural Features

Most of the features that were encountered in the excavation block for the 2BC horizon are apparently hearth-related. Interestingly, there is a relative lack of features (except for one generic pit feature) in the location within the excavation block where bifaces/tools, pp/ks, and flakes are most densely concentrated (Figure 8.154). This is the same area in which FCR densities were lowest. Conversely, though there are not many features, the features that are present tend to be located in areas where FCR density was highest.

Refit Analysis for the 2BC Horizon

Artifacts from the 2BC horizon (F10 Field Designation) were found to exhibit limited secondary refits between neighboring excavation units and between two distinct blocks of units within the overall excavation area. In addition, three primary refits between two levels of one specific excavation unit were found. The secondary and primary refits discovered come from units in the eastern portion of the excavation area. The first block of neighboring units displaying secondary refits is comprised of N72 E233 (Levels 3 and 4), N73 E234 (Level 3), N74 E233 (Level 3), and N74 E235 (Level 3). Level 1 of Unit N71 E228, five meters to the west and two meters to the south of this block, also shared a secondary refit with the flakes and cores from the units listed above. Within the lithic artifacts from Unit N72 E233 there was a primary refit between a core and a whole flake from Level 4 and a core fragment from Level 3.

The block of neighboring units discussed above shared secondary refits with another block of units in the excavation area to the south. These units are N67 E235 (Level 2), N68 E236 (Level 3), and N68 E238 (Level 3). A large whole flake from Unit N67 E230 (Level 1) to the west of these units also shared secondary refits with flakes from this block of units. A large core fragment from Unit N65 E239 (Level 1), two meters south of this block of units, also shared secondary refits with artifacts from the units listed above. This last secondary refit is surprising, since that provenience belongs to the 3Ab2 soil horizon (Later, Late Archaic [2]). Perhaps the presence of this last refit is due to a process of bioturbation or root disturbance. The secondary refits among the units above in both blocks of units involve a black Onondaga chert stone with a grayish brown cortex, white mineral impurities, and fossilized inclusions. It is not surprising that some of the refits occurred between different excavation levels within units (Levels 1, 2, and 3, for instance), for the excavation of each stratum within individual units was divided into arbitrary levels of 10 cm each in many instances

3Ab1 Horizon (Later, Late Archaic [1])

Summary

Stratigraphy

The 3Ab1 horizon at Area 3-South was designated F15 during excavations. It was situated directly beneath the 2BC at 0.65 m to 0.80 m below datum. It ranged in thickness from 0 to 38 cm and was discontinuous across the excavation block. It has been further interpreted as a buried A horizon. It was described as a dark brown (7.5YR 3/3) sandy loam.

Artifacts, Ecofacts and Features

Artifact recovery totaled 2,904 individual items as summarized in Table 8.52. Five feature numbers were assigned during 3Ab1 excavations; however, two of the features were determined to be non-cultural during analysis. Cultural and non-cultural features associated with the 3Ab1 horizon are identified in Table 8.53. Hearths are the only type of feature identified.

Table 8.52. Summary of 3Ab1 Horizon Artifact and Ecofact Recovery.

Artifact	**Count**
Flaked Stone Tools	
PP/Ks	2
Bifaces	1
Expedient tools	2
Cores	6
Debitage	108
Groundstone	3
Other stone	3
FCR	1,961
Ceramics	
Faunal	
Floral	818
Total	**2,904**

Table 8.53. Summary of 3Ab1 Horizon Feature Designations.

	Count	**Feature Numbers**
Cultural features	3	202, 219, 220
Non-cultural anomalies	2	218, 221

The artifact and feature assemblage of the 3Ab1 horizon indicates a very small scale or short term visit to the site. Like the AB and 2BC horizons, local procurement of lithic material and wood is suggested. Tool manufacture and use is also indicated; however, the 3Ab1 horizon excavations produced no bipolar lithic artifacts. Only the direct percussion technique of lithic reduction is evidenced in the assemblage. Other on site activities included nut processing as evidenced my shells and nut stones.

Chronology

The 3Ab1 horizon was assigned to the Later, Late Archaic (1) Period, based on recovered artifacts and ^{14}C dates. One Steubenville Lanceolate pp/k (ca. 2400 to 1580 B.C.) was recovered from this soil horizon. No other diagnostic artifacts were recovered from this soil horizon.

Two ^{14}C dates were obtained through the AMS technique, from carbon samples (Table 8.54). No sites in the vicinity of 36AL480 have radiocarbon dates from this Late Archaic (1) Period.

Table 8.54. 3Ab1 Horizon ^{14}C Dates.

Feature/Sample	Conventional ^{14}C Date	Calibrated Date
219 / Beta-176118	3870 ± 40 B.P.	2470 to 2210 B.C.
220 / Beta-182454	3780 ± 40 B.P.	2310 to 2120 B.C. and 2090 to 2050 B.C.

Artifact and Ecofact Recovery and Analysis

Artifact recovery for the 3Ab1 horizon is limited to 2,086 items including 11 flaked stone tools and cores, 108 pieces of debitage, three groundstone tools, three other stone artifacts, and 1,961 pieces of FCR. This section discusses 3AB1 horizon artifacts.

Flaked Stone Tools

Flaked stone tools consist of two pp/ks, one biface, two expedient tools, and six cores.

Projectile Point/Knives

Two projectile point/knife artifacts were recovered from the 3Ab1 horizon; dimensions and descriptions for these artifacts are elaborated in Appendix 8J. Figure 8.155 (a-b) illustrates the two artifacts. Their spatial distribution is shown in Figure 8.156. One of these pp/k artifacts was identified as a small variant of a Steubenville Lanceolate pp/k (Catalog no. 2609) dating to the range of the late Late Archaic to Terminal Archaic periods. These are broad lanceolate point forms. Typically the base is slightly concave and the blade edges are excurvate or slightly recurvate. It is found in the Upper Ohio Valley, especially in the West Virginia Panhandle, and in central New York, the Susquehanna River Valley, and the Upper Delaware Valley of New Jersey, Pennsylvania, and New York (Ritchie 1971a). The other pp/k artifact from the 3Ab1 horizon is a blade and haft fragment of a Lehigh Broad pp/k of quartzite, dating to the Terminal Archaic period, of the Broadspear/Susquehanna tradition (Catalog no.2680). As mentioned earlier in the 2BC horizon discussion, this artifact conjoined with another Lehigh Broad blade and haft fragment that was recovered from the 2BC horizon (Catalog no. 2377).

Bifaces

One whole biface (Catalog no. 2692) was recovered from the 3Ab1 horizon. The biface was Stage 2, on Onondaga chert with cortex, and had signs of thermal alteration. Its length was 32.9 mm, its width was 23.7 mm, and its thickness was 12.7 mm. It weighed 9.4 g.

Expedient Tools

Two whole expedient tools were found in the 3Ab1 horizon. Both expedient tools were made of Onondaga chert and neither was heat-altered. Descriptive data for both is presented in Table 8.55.

Table 8.55. 3Ab1 Horizon Expedient Tools—Catalog Numbers and Descriptive Data.

Catalog Number	Length (mm)	Width (mm)	Thickness (mm)	Use Evidence	Cortex Present	Material Source	Weight (g)
2587	25.1	22	8.1	Unifacially utilized, lateral edge	Yes	Onondaga	4
2716	34.4	19.3	11.3	Unifacially utilized, lateral edge	Yes	Onondaga	5.9

Cores and Core Fragments

Six lithic artifacts from the 3Ab1 horizon were cores and core fragments (Table 8.56). These included two spheroid cores, two split piece cores, one split cobble, and one quartzite cobble exhibiting only one flake scar. None of the core artifacts was thermally altered, and all were from Onondaga chert source stone except the quartzite cobble. None of the cores exhibited bipolar characteristics. The spheroid cores both retained less than 50 percent cortex, and one contained 12 flake scars while the other had only three flake scars. Three of the six artifacts retained more than 50 percent cortex. Both of the spheroid cores and the two split piece cores were identified as exhausted cores, while the two cobble artifacts were not exhausted cores. The smaller of the spheroid cores exhibited further modification along its distal edge, suggesting later use or modification of the artifact for a purpose other than the harvesting of raw material for tool production.

Table 8.56. 3Ab1 Horizon Core and Core Fragments—Descriptive Data.

Core type	Material Source	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	No. of Flake scars	Percent Cortex	Exhausted
Cobble	Unidentified/ Quartzite	64.9	60	44.8	200	1	50-99	No
Spheroid Core	Onondaga	22.1	12.1	6.3	1.74	12	1-49	Yes
Spheroid Core	Onondaga	46.3	23.4	13.6	14.85	3	1-49	Yes
Split Cobble	Onondaga	52.4	39.2	34.1	84.14	4	50-99	No
Split Piece	Onondaga	33.2	19	19.5	13.2	5	50-99	Yes
Split Piece	Onondaga	26.2	17.2	13.6	6.02	7	1-49	Yes

Debitage

A total of 108 debitage artifacts was recovered from the 3Ab1 horizon, weighing a total of 803.2 g. Figure 8.156 illustrates their spatial distribution. As with the debitage from the previously discussed soil horizons, the artifacts were subjected to both the mass analysis and the detailed analysis.

Mass Analysis

Size Grade. All debitage from this horizon was sorted according to size, as discussed above. One half of the debitage measured between < 0.5 in and > = 0.25 in. The second most frequent grade measured < 0.25 in. Figure 8.157 illustrates the distribution by percent for each size grade.

Raw Material. As with the other occupations, almost all the lithic artifacts recovered from the 3Ab1 horizon were Onondaga chert (*n* = 105; 97 percent). The remaining stone artifacts were all unidentifiable as to particular origin. Table 8.57 presents the information on raw material type, and weight.

Table 8.57. 3Ab1 Horizon Raw Material.

Material Type	Count	Percent of Count	Weight (g)	Percent of Weight
Onondaga chert	105	97.2	245.9	30.6
Unidentified quartzite	1	0.9	212.4	26.4
Unidentified sandstone	1	0.9	337.5	42.0
Unidentified; possibly igneous stone	1	0.9	7.4	0.9
Total	**108**	**100.0**	**803.2**	**100.0**

Cortical Material. Cortex was present on 80 debitage artifacts, or 74 percent of the debitage. This high percent provides additional evidence to support the interpretation that tools were manufactured from smaller, locally available river cobbles.

Thermally Altered Material. All debitage was examined for presence of burning. Some form of thermal alteration was present on 27 artifacts, or 25 percent of the debitage.

Detailed Analysis of Whole and Proximal Flakes

All the whole flakes and proximal flake fragments recovered from the 3Ab1 horizon were subjected to detailed analysis, amounting to a total of 28 flakes and flake fragments. To reconstruct reduction methods, data were collected on flake reduction stage (primary, secondary, or tertiary), presence of bulb of percussion, and platform. Table 8.58 lists their division by reduction stage.

Table 8.58. 3Ab1 Horizon Whole and Proximal Flake Reduction Stages.

Reduction Stage	Count	Percent of Count
Primary	2	7
Secondary	23	82
Tertiary	3	11
Total	**28**	**100**

Data were collected on platform shape, angle, and thickness for all whole flakes and proximal flake fragments. Platform shapes were identified as flat, lipped, cortical, or faceted (Table 8.59). Of the 28 total, six (21 percent) platforms were flat, two (7 percent) were lipped, 14 (50 percent) were cortical, and six (21 percent) were faceted. Results for platform angles are as follows: angles could not be determined for 17 flakes; of the remaining 11 flakes, one (9 percent) had a platform angle of less than 30 degrees; three (27 percent) flakes had platform angles of between 30 and less than 60 degrees; six (55 percent) had platform angles of greater than 60 degrees and less than 90 degrees, and one flake (9 percent) had a platform angle of greater than 90 degrees (Table 8.60).

Table 8.59. 3Ab1 Horizon Platform Shapes.

Platform Shape	Count	Percent of Count
Flat	6	21
Lipped	2	7
Cortical	14	50
Faceted	6	21
Total	**28**	**99**

Table 8.60. 3Ab1 Horizon Platform Angles.

Platform Angle	Count	Percent of Count
0-4°	0	0
5-9°	0	0
10-14°	0	0
15-19°	0	0
20-24°	1	3.6
25-29°	0	0
30-34°	0	0
35-39°	0	0
40-44°	1	3.6
45-49°	0	0
50-54°	1	3.6
55-59°	1	3.6
60-64°	2	7.1
65-69°	2	7.1
70-74°	0	0
75-79°	1	3.6
80-84°	0	0
85-89°	1	3.6
> 90°	1	3.6
Indeterminate	17	60.7
Total	**28**	**100**

Reduction technologies utilized during this time period were reconstructed from the mass analysis and detailed flake analysis. Again, the data indicate that the entire range of the reduction sequence took place during this time period. Cores and core fragments, primary, secondary, and tertiary stage flakes, retouched and expedient tools were recovered from this occupation period. The lithic assemblage from this occupation period was small, and included only 108 debitage artifacts, two retouched tools, and two expedient tools, so that conclusions are tentative regarding more specific types of reduction techniques. Platform types were primarily cortical (50 percent), and also included 21 percent each of flat and faceted platforms; the smallest percentage was lipped (seven percent). As with the previous prehistoric component, angles could not be determined on over half (60.17 percent) of the artifacts analyzed. Platform angles were primarily between 60 and 90 degrees (55 percent), followed by angles measuring between 30 and 60 degrees (28 percent). Angles of less than 30 degrees and more than 90 degrees comprised nine percent each of the total. As with the previous occupation periods, the wider platform angles may indicate the choice by the toolmaker of a hard hammer percussor, or the flakes could represent earlier stages of reduction. However, the number of remaining platforms where the angle could be determined was so small that an interpretation cannot be made here. A total of 93 percent of the whole and proximal flakes had visible bulbs of percussion to indicate reduction using either a hard or soft hammer percussor. No evidence of a bipolar reduction technique was recovered from this occupation period. However, this could be because the total assemblage was so small.

Groundstone

Three lithic artifacts from the 3Ab1 horizon were classified within the groundstone category (Table 8.61). Their spatial distribution is shown in Figure 8.158. Of these three artifacts, two were identified as nutting stone fragments, and one was a hammerstone/anvil.

Table 8.61. 3Ab1 Horizon Groundstone Artifacts—Catalog Numbers and Descriptive Data.

Catalog Number	Artifact	Portion	Material type	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
2574	Hammerstone/Anvil	Whole	Sandstone	101.4	67	38.6	337.5
2576	Nutting Stone	Fragment	Sandstone	47	52.4	16.3	59.6
2576	Nutting Stone	Fragment	Sandstone	101.4	94.5	68.1	660

The two nutting stone fragments were recovered from Unit N64 E237, Level 1, within the 3Ab1 horizon. One fragment weighed 59.6 g, while the other fragment was substantially larger, weighing 660 g. The shape of each nutting stone fragment was irregular in plan view, profile, and cross-section. The larger stone measured 101.4 mm in length and 94.5 mm in width, and had a thickness of 68.2 mm. This larger stone was derived from a waterworn sandstone cobble, and was fractured along one edge of the pit. The pit on this large nutting stone fragment was approximately 35 mm in diameter (extrapolated and approximate due to the fracture along the pit), and the depth of the pit was approximately 9 mm. The other nutting stone fragment, the smaller object (39.6 g) was a thin waterworn fragment of sandstone with a portion of a nutting pit along the fractured end. This smaller nutting stone measured 52.1 mm in length, 48 mm in width, and was 15.3 mm thick. The depth of the nutting pit was approximately 7 mm, while the diameter was not obtainable due

to the nature of the fracture along the pit. This smaller nutting stone fragment exhibited heat-alteration, and was thermally fractured.

The hammerstone/anvil implement (Catalog no. 2574) recovered from the 3Ab1 horizon was derived from a waterworn sandstone cobble, was roughly oval in shape, and showed signs of the removal of two large flakes from one longitudinal margin/end. Signs of battering and grinding were also evident within these flake scars and along this entire edge. Traces of pecking were evident on the flat midsection of the obverse face, as well as the midsection of the other flat face, suggesting its use as an anvil.

Other Stone Artifacts

Three other stone artifacts were recovered from this horizon (Table 8.62). Two are unmodified cobble fragments (Catalog nos. 2563 and 2568) composed of waterworn sandstone. The third is an unmodified pebble (Catalog no. 2750) composed of waterworn quartzite, and was triangular in profile and cross-section. Given the general paucity of waterworn stones in the 3Ab1 horizon, these items potentially represent manuports.

Table 8.62. 3Ab1 Horizon Other Stone Artifacts–Catalog Numbers and Descriptive Data.

Catalog Number	Artifact	Portion	Material type	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
2563	Unmodified Cobble	Fragment	Sandstone	116.3	97.9	15	129.5
2568	Unmodified Cobble	Fragment	Sandstone	107.1	79.2	13.3	262
2750	Unmodified Pebble	Whole	Quartzite	54.9	45.7	31.2	105.5

Fire-Cracked Rock

The 3Ab1 horizon contained 1,961 fragments of FCR, weighing 137,082 g collectively. This corresponds to the third largest component of FCR among all soil horizons for Area 3-South. Figure 8.158 shows the spatial distribution of the FCR.

Prehistoric Ceramics

No pottery fragments were recovered from the 3Ab1 soil horizon.

Faunal Remains

No faunal remains were recovered from the 3Ab1soil horizon.

Floral Remains

Floral remains from this occupation period came from hand-collected samples and floated soil. Hand-collected remains totaled 39 and included specimens of black walnut (*Juglans nigra*), butternut (*Juglans cinerea*), and walnut/walnut family (*Juglans* spp./Juglandaceae) nutshell fragments; and one ash (*Fraxinus* spp.) wood fragment. Identifiable material recovered from floated feature fill consisted of 779 specimens including hickory (*Carya* spp.), maple (*Acer* spp.), white oak (*Quercus* spp., white group), beech (*Fagus grandifolia*), conifer, black walnut (*Juglans nigra*), cherry (*Prunus* spp.), and sycamore (*Platanus occidentalis*) wood fragments; and walnut/thick-shelled hickory (Juglandaceae), black walnut (*Juglans nigra*), and butternut (*Juglans cinerea*) nutshell fragments.

Feature Identification and Analysis

Three cultural features and two natural burn episodes were identified in the 3Ab1 (F15 Field Designation) horizon. Figure 8.159 shows the spatial distribution of the features, excluding the burn episode. Features are summarized in Table 8.63. They are all large shallow hearths found within an elevation range of 25 cm. They are between 70 cm and 110 cm long and 7 cm to 13 cm deep.

Table 8.63. 3Ab1 Horizon Feature Summary.

Feature Type and Number	Dimensions (L x W x Th)	Unit Location(s)	Opening Elevation	Radiocarbon Date
Hearth				
Feature 202	70 x 33 x 7	N75 E232/E233	214.14	
Feature 220	100 x 90 x 13	N67/N68 E233	214.39	3780 ± 40 B.P. (2310 to 2120 B.C.; 2090 to 2050 B.C.)
Feature 219	110 x 90 x 10	N71 E233	214.15	3870 ± 40 B.P. (2470 to 2210 B.C.)

Feature Descriptions

Feature 202

This feature was first identified in Unit N75 E232 and later shown to extend into Unit N75 E233. It had a top elevation of 214.14 NGVD and a closing elevation of 214.07 NGVD. It measured 70 cm east-west and 33 cm north-south; however, it appears to have extended further south into the N74 units. An FCR cluster (field designation F105) in N74 E232/233 is probably the southern portion of this feature, which would extend the feature to a total of 70 cm north-south. This feature was circular in plan view, with a saucer-shaped profile (Figure 8.160). It consisted of an FCR cluster with charcoal flecking in soil described as dark brown (7.5YR 3/3), silt loam. The soil matrix immediately surrounding the feature was also flecked with charcoal. Apart from 10 FCR fragments, no other cultural material was recovered. This feature has been identified as a hearth or cooking fire; however its thickness is relatively shallow. Because of the width of the FCR dispersion, this feature falls within Petraglia's 'latent' category to indicate post-depositional degradation of the feature.

Feature 219

This feature was located in Unit N71 E233, at the base of the 3Ab1 horizon. It had an opening elevation of 214.22 NGVD. This feature was a medium to large, shallow bowl-shaped hearth fire pit, and measured 110 cm east-west by 90 cm north-south (Figure 8.161). The profile shape was defined on presence of artifacts and charcoal since there was no visible soil distinction. The feature was a roughly circular organic stain with heavy pockets of charcoal. The feature matrix was described as dark yellowish brown (10YR 4/4), organic, sandy silt, with abundant charcoal, surrounded by a ring of charcoal flecking within 3ab1 soils. Artifacts included 97 FCR fragments and three pieces of lithic debitage. Plant remains were hand-collected and also were recovered from the floated soil sample. One black walnut (*Juglans nigra*) wood fragment and six butternut (*Juglans cinerea*) wood fragments were hand collected. The plant remains recovered from flotation included four hickory (*Carya*

spp.) wood fragments, three maple (*Acer* spp.) wood fragments, two white oak (*Quercus* spp., white group) fragments, two beech (*Fagus grandifolia*), five conifer (gymnosperm or softwood), four bark fragments, and one unidentifiable wood fragment. Identified nutshell fragments included 19 walnut/thick-shelled hickory (Juglandaceae), 12 black walnut (*Juglans nigra*), and three butternut (*Juglans cinerea*) fragments. Based on contents, dimensions, and shape, this feature is identified as a fire pit, probably used for cooking. It is highly likely that the wood fragments found in the feature are what remain of firewood, used along with the rocks (now FCR) to both fuel the fire and retain heat. The feature is relatively large, compared to most of the features in Area 3-South, but is not stratified, indicating single consistent use. The presence of the FCR within the feature and lack of scattered rock or smeared boundaries indicate this feature falls into Petraglia's 'single-state, evident' category.

Feature 220

This feature was first identified in Unit N68 E233 and extended into Units N67 E232 and N67 E233. It had an opening elevation of 214.39 NGVD and a closing elevation of 214.26 NGVD. It measured 90 cm east-west by 100 cm north-south. This feature was circular in plan view and was a shallow basin in profile, with distinct boundaries (Figure 8.162). The feature primarily consisted of a cluster of FCR (n = 57) with high concentrations of charcoal. The soil matrix was described as a brown (10YR 4/3), sandy silt loam over a dark yellowish brown (10YR 4/4), silty sandy loam, with a lens of black (10YR 2/1) silt loam and charcoal at the interface between them. An oval of fire-reddened and hardened soil (field designation F112), measuring 50 cm by 90 cm, extended to the southeast of Feature 220. It is unclear if this is related to the use of the feature, or is simply another natural burn episode as was identified at a number of other locations within this horizon. The FCR fragments were clustered in the east half of the feature. Two nutshell fragments were hand-collected during excavation of this feature: one was a black walnut shell (*Juglans nigra*), and the other was a shell of the walnut family (Juglandaceae). One piece of lithic debitage was also recovered in the feature. In addition to the plant remains recovered in the hand excavations, 145 fragments of plant remains were recovered from the floated soil sample. They included one black walnut (*Juglans nigra*) wood fragment, 11 cherry wood (*Prunus* spp.) fragments, four maple (*Acer* spp.) fragments, one sycamore (*Platanus occidentalis*) wood fragment, and the remaining were unidentifiable wood fragments. One ^{14}C date was calculated for this feature using the AMS technique. The conventional date was 3780 ± 40 B.P. (cal. 2310 to 2120 B.C. and 2090 to 2050 B.C.). Based on contents, shape and dimensions, it has been interpreted as a cooking pit. This feature, similar in size, shape, and contents, to Feature 219, is also categorized as Petraglia's 'single-state, evident' category.

Non-Cultural Anomalies

Two non-cultural anomalies encountered in the 3Ab1 horizon were given feature numbers during the fieldwork. Both seemingly are related to the natural burn episode that was discussed above. They are shown in Table 8.64.

Table 8.64. Non-Cultural Anomalies Identified in the 3Ab1 Horizon.

Feature Number	Unit Location	Dimensions	Comments
218	N69 E233	Top elevation: 214.32; bottom elevation: 214.26; 60 cm x 100 cm across	Part of a larger complex of naturally burned areas found across the 3Ab1.
221	N67 E236	Top elevation: 214.38; bottom elevation: 214.30; 42 cm x 33 cm across	Oval in plan view; basin-shaped profile. Natural, shallow burned area.

Features Analysis

Because there were only three features identified in the 3Ab1 horizon, a statistical analysis was not completed. It is worth noting that all three features are unusually wide and shallow.

Spatial Analyses

No statistical spatial analyses were performed for the 3Ab1 horizon.

Refit Analysis

A refit analysis was performed, but no refits were discovered for the 3Ab1 horizon.

3Ab2 Horizon (Later, Late Archaic [2])

Summary

Stratigraphy

The 3Ab2 horizon field designation was F11. It was located beneath the 3Ab1 horizon in some locations and, because that horizon was discontinuous, beneath the 2BC horizon in other locations (Figure 8.13 and 8.14). The 3Ab2 horizon was uniformly distributed across the site at 0.70 m to 0.95 m below datum. It was 15 cm thick. The 3Ab2 horizon varied in texture from silt loam to sandy loam and color ranged from dark brown (7.5YR 3/3 to 3/4) to brown (7.5YR 4/4).

Artifacts, Ecofacts and Features

Artifact recovery for this soil horizon totaled 2,093 items as summarized in Table 8.65. During excavations 19 feature numbers were assigned to anomalies in the 3Ab2 horizon. Analyses proved revealed that of those, 13 were definitely cultural and six were not. Cultural and non-cultural features associated with the 3Ab2 horizon are identified in Table 8.66. Types of features identified include 12 hearths and an unidentified pit.

Artifacts and features found on site continue the patterns seen in overlying horizons. It appears that lithic material was obtained nearby from Ohio River cobbles and pebbles for use in stone tool manufacture. A diverse assemblage of firewood suggests reliance on varied

tree species that grow well in valleys and forest edges. Grass seeds and nut shells were found. The use or processing of nuts is further supported by the recovery of another nutting stone. Lithic reduction techniques in evidence include both direct and bipolar reduction.

Table 8.65. Summary of 3Ab2 Horizon Artifact and Ecofact Recovery.

Artifact	**Count**
Flaked Stone Tools	
PP/Ks	0
Bifaces	2
Expedient tools	0
Debitage	108
Cores	7
Groundstone	1
Other stone	8
FCR	1,863
Ceramics	0
Faunal Remains	0
Floral remains	104
Total	**2,093**

Table 8.66. 3Ab2 Horizon Feature Overview.

	Count	**Feature Numbers**
Cultural features	13	153, 204, 216, 217, 223, 224, 225, 226, 227, 246, 247, 248, 249
Non-cultural features	6	199, 203, 222, 228, 230, 231

Chronology

No diagnostic artifacts were recovered from this soil horizon. The assignment of the Later Late Archaic (2) Period to this soil horizon is based on two ^{14}C dates that were obtained using the AMS technique, and the location of the occupation level in the 3Ab2 horizon (Table 8.67). No sites in the vicinity of 36AL480 have radiocarbon dates from this Later Late Archaic (2) Period.

Table 8.67. 3Ab2 Horizon ^{14}C Dates.

Feature	**Conventional ^{14}C Date**	**Calibrated Date**
217 / Beta-176117	3830 ± 40 B.P.	2450 to 2140 B.C.
227 / Beta-176119	3790 ± 40 B.P.	2330 to 2130 B.C. and 2080 to 2060 B.C.

It should be noted here that these dates are not inconsistent with those identified for the 3Ab1 horizon. None of the features identified in the 3Ab1 horizon directly overlie those found in the 3Ab2 horizon. However, a number of the 3Ab2 features do occur directly beneath the 3Ab1 sediments, and thus cannot be associated with the 3Ab1 occupations. It is still possible that those 3Ab2 features which do not directly underlie the 3Ab1 sediments could be contemporaneous with the 3Ab1 occupations.

Artifact and Ecofact Recovery and Analysis

As noted earlier, artifact recovery in the 3Ab2 horizon is limited to nine flaked stone tools, debitage (*n* = 108), one groundstone tool, eight items categorized as "other stone" and 1,863 pieces of FCR. Artifacts from this soil horizon suggest a brief occupation or series of brief occupation(s).

Flaked Stone Tools

Projectile Points/Knives

No projectile point/knife artifacts were recovered from the 3Ab2 horizon.

Bifaces

One whole biface and one proximal biface fragment were recovered from the 3Ab2 horizon (Table 8.68). Figure 8.163 illustrates the spatial distribution of the tools. The partial biface was unifacially retouched, and exhibited lateral modification. This fragment was a reduction Stage 2 biface artifact, with cortex, and was likely discarded due to the transverse fracture that created the fragment. Its length was 41 mm, its width 33 mm, and its thickness 12 mm. The whole biface recovered from the 3Ab2 horizon was a Stage 3 biface of Upper Mercer chert, with no cortex. It was not heat altered, and measured 32.2 mm in length, 23.4 mm in width, and 9.7 mm in thickness.

Table 8.68. 3Ab2 Horizon Biface and Biface Fragments—Catalog Numbers and Descriptive Data.

Catalog Number	Reduction Stage	Portion	Length (mm)	Width (mm)	Thickness (mm)	Use Evidence	Material	Weight (g)
2848	2	Proximal	41	33	12	Unifacial retouch, lateral edge	Onondaga	10.5
2886	3	Whole	32.2	23.4	9.7		Upper Mercer	7.1

Expedient Tools

No expedient tools were found during 3Ab2 excavations.

Cores and Core Fragments

Seven core artifacts were recovered from the 3Ab2 horizon, all were of Onondaga chert, and none showed evidence of thermal alteration (Table 8.69). Of these seven whole and partial core artifacts, there were two bipolar cobbles, one bipolar core fragment, three

split piece cores, and one bipolar split cobble. The bipolar core fragment exhibited 10 flake scars, as did the bipolar split cobble and one of the split piece cores. The two bipolar cobbles and the bipolar split cobble retained greater than 50 percent cortex, and the other four core artifacts had less than 50 percent cortex. One bipolar cobble, two split piece cores, and the bipolar core fragment were all identified as exhausted cores.

Table 8.69. 3Ab2 Horizon Core and Core Fragments—Descriptive Data.

Core Type	Material source	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	No. of Flake scars	Percent cortex	Exhausted
Bipolar Core Frag	Onondaga	30.1	22.5	8.2	5.16	10	1-49	Yes
Bipolar/Cobble	Onondaga	48.8	30.8	21.7	34.0	1	50-99	No
Bipolar/Cobble	Onondaga	37	25	21	20.44	1	50-99	Yes
Bipolar/Split Cobble	Onondaga	43.2	49.7	25.2	48.73	10	50-99	No
Split Piece	Onondaga	17.3	11.2	7.2	1.17	2	1-49	No
Split Piece	Onondaga	11.3	18	6	1.26	3	1-49	Yes
Poss Bipolar/Split Piece	Onondaga	17.2	15.7	8.6	2.3	10	1-49	Yes

Debitage

A total of 108 debitage artifacts were recovered in the 3Ab2 horizon, weighing a total of 324.1 g. All of these artifacts were subjected to a mass analysis, and all the whole flakes and proximal flake fragments (n = 36) were subjected to the detailed flake analysis. Figure 8.163 illustrates the spatial distribution of the debitage.

Mass Analysis

Size Grade. All debitage from this horizon was sorted according to size, as discussed above. Slightly over one half of the debitage measured between < 0.5 in and > = 0.25 in. The second most frequent grade measured < 0.25 in. Figure 8.164 illustrates the distribution by percent for each size grade.

Raw Material. Again, almost all the artifacts were Onondaga chert (n = 103; 95 percent). The remaining stone artifacts were limited to a small variety of other types of material. Table 8.70 presents the information on raw material type, and weight.

Table 8.70. 3Ab2 Horizon Raw Material.

Material Type	Count	Percent of Count	Weight (g)	Percent of Weight
Onondaga chert	103	95.4	246.5	76.1
Flint Ridge/Vanport chert	1	0.9	3.4	1.0
Upper Mercer	1	0.9	0.1	0.03
Unidentified quartzite	1	0.9	60.4	18.6
Silicified shale	2	1.9	13.7	4.2
Total	**108**	**100**	**324.1**	**100**

Cortical Material. A total of 64 artifacts, or 59 percent of the total debitage count, bore some cortex. While less cortical artifacts than from the other prehistoric occupation periods, this is still over half of the debitage recovered, to indicate the same procurement pattern persists through time.

Thermally Altered Material. All debitage was examined for presence of thermal alteration. Seventeen artifacts, or 16 percent, of the total number of debitage artifacts, had some sign of thermal alteration.

Detailed Analysis of Whole and Proximal Flakes

All the whole flakes and proximal flake fragments recovered from the 3Ab2 horizon were subjected to detailed analysis, amounting to a total of 36 flakes and flake fragments. To reconstruct reduction methods, data were collected on flake reduction stage (primary, secondary, or tertiary), presence of bulb of percussion, and platform. Table 8.71 lists their division by reduction stage.

Table 8.71. 3Ab2 Horizon Whole and Proximal Flake Reduction Stages.

Reduction Stage	Count	Percent of Count
Primary	9	25.0
Secondary	25	69.4
Tertiary	2	5.6
Total	**36**	**100.0**

Data were collected on platform shape, angle, and thickness for all whole flakes and proximal flake fragments. Platform shapes were identified as flat, lipped, cortical, or faceted (Table 8.72). Of the 36 specimens examined, 11 (31 percent) platforms were flat, two (6 percent) were lipped, 16 (44 percent) were cortical, and seven (19 percent) were faceted. Results for platform angles are shown in Table 8.73.

Table 8.72. 3Ab2 Horizon Platform Shapes.

Platform Shape	Count	Percent
Flat	11	30.6
Lipped	2	5.6
Cortical	16	44.4
Faceted	7	19.4
Total	**36**	**100.0**

Table 8.73. 3Ab2 Horizon Platform Angles.

Platform Angle	Count	Percent of Count
0-4°	0	0
5-9°	0	0
10-14°	0	0
15-19°	0	0
20-24°	0	0
25-29°	0	0
30-34°	0	0
35-39°	0	0
40-44°	1	2.77
45-49°	0	0
50-54°	2	5.56
55-59°	2	5.56
60-64°	0	0
65-69°	2	5.56
70-74°	4	11.11
75-79°	2	5.56
80-84°	4	11.11
85-89°	0	0
> 90°	3	8.33
Indeterminate	16	44.44
Total	**36**	**100.00**

The reduction technology identified for this time period is similar to those discussed above. Cores, primary, secondary, and tertiary stage flakes, and retouched tools (one biface and one biface fragment) were recovered in this soil horizon. Again, the small number of lithic artifacts from this soil horizon limits interpretations regarding reduction technology. However it is worth noting that of the seven cores and core fragments recovered, five were from bipolar manufacture.

Examination of platforms and presence of bulbs of percussion suggest similar reduction methods to those described above. Again, most of the whole and proximal flakes analyzed have prominent bulbs (93 percent) present on the ventral surface. Platform shapes are as follows: again, most of the platforms were cortical (44 percent); followed by flat platforms (31 percent). The remaining platform types appeared in much smaller proportions: 20 percent were faceted, and six percent were lipped. The larger number of faceted platforms indicates biface shaping, while the flat platforms suggest flake removal from flake blanks, or unidirectional cores, to indicate that additional flake removal techniques were being used during this time period. Almost half (44.43 percent) of platforms could not be

identified as to angle. Again, the number remaining is so small that angle cannot be used to draw conclusions about lithic technologies for this time period.

Groundstone

Only one groundstone artifact was found in the 3Ab2 horizon—a nutting stone (Catalog no. 2912). It was a fragment and one of the smaller nutting stones in the assemblage for Area 3-South. It was found in Excavation Unit N79 E225, in Level 1. It was sub-rectangular in plan view and cross-section, and rectangular in profile. The stone measured 48.7 mm long, 60 mm wide, 16.3 mm thick, and weighed 80.9 g. It was made of waterworn sandstone, and the fracture creating the fragment approximately bisected the nutting pit present on one face of the stone. The nutting pit diameter was 23 mm and depth was 4 mm.

Other Stone Artifacts

Seven whole unmodified pebbles and one unmodified cobble were recovered (Table 8.74). None of these lithic artifacts exhibited any signs of thermal alteration. Figure 8.165 illustrates the spatial distribution of these artifacts. The unmodified cobble was a very large unmodified sandstone specimen weighing 4,099 g, and was recovered in Unit N66 E234, Level 1. This artifact was waterworn, and was bi-plano in profile and irregular in plan view and cross-section. Of the seven whole unmodified pebbles recovered, five were waterworn sandstone and one was of unidentified material. One whole quartzite unmodified pebble was found within Feature 226. Given the general paucity of waterworn stones in the 3Ab2 horizon, these items potentially represent manuports.

Table 8.74. 3Ab2 Horizon Other Stone Artifacts—Catalog Numbers and Descriptive Data.

Catalog Number	Artifact	Portion	Material type	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
2798	Unmodified Cobble	Whole	Sandstone	280	240	48.9	4099
2807	Unmodified Pebble	Whole	Sandstone	58.8	40.7	11.7	39.5
2822	Unmodified Pebble	Whole	Sandstone	51.6	42.2	7.3	23.6
2822	Unmodified Pebble	Whole	Sandstone	46.1	33	14.2	38
2825	Unmodified Pebble	Whole	Sandstone	51.1	37.7	14.7	43.9
2949	Unmodified Pebble	Whole	Unidentified	55.1	51.7	9.2	56.5
2971	Unmodified Pebble	Whole	Sandstone	49.9	43.9	17.8	31.3
3452	Unmodified Pebble	Whole	Quartzite	50.1	28.6	15.1	33.69

Fire-Cracked Rock

A total of 1,863 FCR artifacts was recovered from the 3Ab2 horizon, with a total weight of 130,736 grams. Figure 8.165 illustrates the distribution of FCR.

Prehistoric Ceramics

No ceramics were recovered from the 3Ab2 soil horizon.

Faunal Remains

No faunal remains were recovered from the 3Ab2 soil horizon.

Floral Remains

Floral remains from this horizon were recovered in hand excavations and from floatation of soil samples. A total of 104 botanical specimens were recovered. Material recovered in hand excavations (14 items total) included specimens of black walnut (*Juglans nigra*), butternut (*Juglans cinerea*), and walnut/walnut family (*Juglans* spp/. Juglandaceae) nutshells; and maple (*Acer* spp.) and red oak (*Quercus* spp., red group) wood fragments. Material recovered from floated soil samples totaled 90 and included hickory (*Carya* spp.), cherry (*Prunus* spp.), and bitternut hickory (*Carya cordiformis*) wood; walnut/thick-shelled hickory (Juglandaceae) nutshell; mustard seed (*Brassica* cf. *juncea*); seed from the grass family (*Poaceae*); poke seeds (*Phytolacca Americana*); and black walnut (*Juglans nigra*) and red oak (*Quercus* spp., red group) charcoal fragments.

Feature Identification and Analysis

Thirteen prehistoric features were positively identified in the 3Ab2 (F11) horizon. Six other potential features were less conclusive, and after further analysis were determined to be non-cultural. One was possibly partial redeposition of Feature 217, and the remaining five were probable tree burns. Figure 8.166 illustrates the spatial distribution of the definitive prehistoric features.

The features all appear to be hearths, based on the lack of artifacts, the presence of indications of burning (charcoal, soil reddening, and/or FCR), and the floral remains analyzed, which were primarily wood and nutshell fragments (Table 8.75). Only Feature 249 may be a non-hearth pit. Feature 223 may be a result of hearth cleaning as there was no evidence of *in situ* burning observed; it was a collection of FCR and charcoal. Feature 249 is also the smallest of the features identified at only 35 cm long. The largest is 1.65 m by 130 in plan. 3Ab2 horizon features vary in thickness from 0 cm to 17 cm and are located between 214.58 and 214.19 m above NGVD.

Table 8.75. 3Ab2 Horizon Feature Summary.

Feature Number	Dimensions (L x W x Th)	Unit Location(s)	Opening Elevation	Radiocarbon Date
Hearth				
Feature 153	28 x 28 X 7	N65 E235	214.29	
Feature 204	42 x 35 x 14	N65 E233/E234	214.41	
Feature 216	165 x 130	N61 E235/E236	214.44	
Feature 217	118 x 75 x 11	N77/N78 E225/E226	214.25	3830±40 B.P.
Feature 224	63 x 33 x 10	N67 E230	214.50	
Feature 225	64 x 55 x 9	N72 E231	214.21	
Feature 226	70 x 40 x 9	N72 E231	214.19	
Feature 227	71 x 62 x 8	N67 E230/E231	214.53	3790±40 B.P.
Feature 246	70 x 70 x 16	N57 E237	214.43	
Feature 247	80 x 60 x 5	N59 E231	214.58	
Feature 248	48 x 48 x 3	N64 E230	214.47	
Feature 223	45 x 28 x 6	N72 E232	214.19	

Feature Number	Dimensions (L x W x Th)	Unit Location(s)	Opening Elevation	Radiocarbon Date
Indeterminate Pit				
Feature 249	35 x 26 x17	N61/62 E230/E231	214.58	

Feature Descriptions

Feature 153

This feature appears to be the remains of a shallow or surface hearth. It was located in Unit N65 E235. It had a top elevation of 214.29 NGVD and a closing elevation of 214.27 NGVD. It measured 28 cm in diameter, and was circular in plan view and saucer-shaped in profile (Figure 8.167). The feature consisted of a circular ring of concentrated charcoal surrounded by an area of charcoal flecking. The feature soil matrix was described as dark brown (7.5YR 3/3) silt loam. The feature soil was the same consistency as the surrounding soil matrix. No cultural material was recovered from the feature.

Feature 204

This feature was located in Unit N65 E233 and N65 E234. It had an opening elevation of 214.41 NGVD and a closing elevation of 214.27 NGVD. It measured 35 cm north-south by 42 cm east-west. The feature was circular in plan view and bowl-shaped in profile (Figure 8.168). It was identified as a cluster of FCR (n = 76) that also contained scattered charcoal flecking. The soil matrix was described as dark yellowish brown (10YR 4/4), sandy clay loam. No artifacts other than FCR were recovered from this feature; it is interpreted as a hearth.

Feature 216

This feature appears to be the remains of a surface hearth and was located in Units N61 E235 and N61 E236. It consisted of thermal staining that was identified at the top of the 3Ab2 horizon, along the interface line with the 3Ab1 horizon at 214.44 NGVD. It measured 110 cm north-south by 130 cm east-west (Figure 8.169). However, the feature extended into the next unit and the entire north-south measurement is probably 165 cm. The shape is roughly circular in plan view but too amorphous and indistinct to define in profile. The soil matrix was described as reddish brown (5YR 4/4) mottling within 3Ab2 soils. Some FCR and charcoal staining were visible in the feature, though no cultural material was retrieved.

Feature 217

This feature is interpreted as the remains of a shallow hearth. It was first identified in Unit N77 E225, and extended into Units N77 E226, N78 E225, and N78 E226. It had an opening elevation of 214.25 NGVD and a closing elevation of 214.14 NGVD, and was located in the 3Ab2 horizon. It measured 118 cm north-south by 75 cm east-west. It was circular in plan view and basin-shaped in profile (Figure 8.170). The feature was a cluster of FCR (n = 43). The feature soil was not noticeably different in color from the surrounding matrix; a difference was seen in soil compaction—the feature was less compact than the surrounding soils. The FCR was clustered in the center of the feature, but there was almost

no charcoal flecking. The area surrounding the feature also contained small clusters of FCR scatters dispersed in the unit.

Plant remains were recovered from the floated soil sample. They included four bark fragments, 16 unidentifiable wood fragments, and two walnut/thick-shelled hickory (Juglandaceae) nutshell fragments. One carbon sample from this feature was sent for AMS dating. The result was a date of 2450-2140 cal B.C., or 3830 ± 40 B.P., conventional date.

Feature 223

This feature was located in Unit N72 E232. Its top elevation was 214.19 NGVD and its bottom elevation was 214.13 NGVD. It measured 45 cm east-west by 28 cm north-south, and was amorphous in plan view with a basin-shaped profile (Figure 8.171). It was located at the 3Ab1/3Ab2 interface. The feature appeared to be an FCR cluster without any evidence of burning within the feature matrix. It may be the result of a hearth cleaning. The matrix was described as loosely compacted, dark yellowish brown, (10yr 4/3) sandy loam. Twenty-eight FCR fragments were found within Feature 223. Plant remains were recovered from the floated soil sample. They were limited to 12 unidentifiable wood fragments.

Feature 224

This hearth feature was located in Unit N67 E230 and extended into Unit N67 E229. It had a top elevation of 214.50 NGVD and a closing elevation of 214.40 NGVD. It measured 63 cm north-south by 33 cm east-west, and was circular in plan view and bowl-shaped in profile (Figure 8.172). The east-west width dimension is a measurement of only approximately one-half of the feature; it extended into the west wall of the excavation block. The other portion that was in Unit N67 E229 was excavated as part of the 3Ab2 horizon before the feature was identified. The feature was a concentration of 55 FCR fragments with an abundance of charcoal. The feature matrix was also sandy, most likely resulting from extremely decayed sandstone. The southern boundary was distinct, while the northern boundary was more diffuse. One whole flake was recovered in the southern half of the feature.

Feature 225a,b

This hearth feature was located in Units N73 E231 and Unit N72 E231. It had an opening elevation of 214.21 NGVD and a closing elevation of 214.12 NGVD. Feature 225a measured 64 cm northeast-southwest and 55 cm northwest-southeast. Feature 225b measured 25 cm in diameter and 8 cm in thickness, and was located just inside the southwest edge of Feature 225a. Feature 225a was oval in plan view and was a shallow basin in profile (Figure 8.173). It bore no evidence of *in situ* burning, but contained eight pieces of FCR. The soil matrix of the Feature 225a portion was described as dark yellowish brown (10YR 3/4), compact silt loam, with large charcoal fragments, while the Feature 225b portion was brown (7.5YR 4/4), somewhat loose, organic silt loam, with moderate charcoal flecking. Both 225a and 225b yielded very small amounts of FCR and no other cultural material. The feature was initially identified as an amorphous slightly darkened stain of scattered charcoal flecking with a heavy charcoal concentration in the center.

Feature 226

This feature may be the remains of a cooking hearth. It was located in Unit N72 E231. It had a top elevation of 214.19 NGVD and a closing elevation of 214.10 NGVD. It measured 40 cm east-west by 70 cm north-south. Feature 226 was roughly circular in plan view and was an offset basin-shape in profile with the west side being gently sloped and the east side steeply sloped (Figure 8.174). It was identified as a pit remnant with the fill described as dark brown (7.5YR 3/3), sandy loam with charcoal flecking. The feature contained six FCR fragments, one whole unmodified pebble, and a minimal scatter of charcoal. Plant remains were recovered from the floated soil sample. They included one cherry (*Prunus* spp.) wood fragment, one bitternut hickory (*Carya cordiformis*) wood fragment, 16 unidentifiable wood fragments, and one walnut/thick-shelled hickory (Juglandaceae) nutshell fragment.

Feature 227

This hearth feature was located in Unit N67 E230 and extended into Unit N67 E231. It had a top elevation of 214.47 NGVD and a closing elevation of 214.39 NGVD. It measured 71 cm northwest-southeast by 62 cm northeast-southwest. Feature 227 was roughly oval in plan view and saucer-shaped in profile (Figure 8.175). It contained FCR (n = 23) and small amounts of charcoal. The matrix was described as dark brown (10YR 3/3), fine sandy silt, and there were no reddened soils. The feature was interpreted as a shallow pit feature. Plant remains were recovered from the floated soil sample. They were limited to three cherry (*Prunus* spp.) wood fragments and six unidentifiable wood fragments. Carbon samples from this feature were sent for AMS dating. The results were: 2330-2130 cal B.C., and 2080-2060 cal B.C., or a conventional date of 3790 ± 40 B.P.

Feature 246

This feature was stratified and located in Unit N57 E237. It was identified during the mechanical stripping task. It had an opening elevation of 214.43 NGVD and a bottom elevation of 214.27 NGVD. It measured approximately 70 cm in diameter, and was generally round in plan view and basin-shaped in profile (Figure 8.176). It was filled with FCR (approximately 80 percent) in a soil matrix described as black (10YR 2/1), ashy silt (field designation F156a). The entire base and edges of the feature were red (2.5YR 4/6) in color (field designation F156b). Above the F156a was a shallow basin of 3Ab2 soils, slightly infilling the center of the feature. The total number of FCR and rock fragments was 181. No other cultural remains were recovered. The feature appeared to be a single-use hearth.

Feature 247

This feature was located in Unit N59 E231 during the mechanical stripping task. It had a top elevation of 214.56 NGVD and a bottom elevation of 214.51 NGVD. However, the upper portion of this feature may have been truncated by the mechanical stripping before being identified, so the uppermost elevation is probably not the true top of the feature. The feature measured 80 cm east-west by 60 cm north-south. It was circular in plan view and shallow saucer-shaped in profile (Figure 8.177). There was distinct charcoal staining in the feature with FCR clusters above the staining. The soil matrix was described as dark grayish brown (10YR 4/2), ashy loam. The interface along the edges and the base of the feature were

reddish brown (2.5YR 4/4) in color. Paleobotanical analysis identified two fragments of black walnut nutshell (*Juglans nigra*) and four fragments of red oak (*Quercus* spp., red group) charcoal from this feature. A total of 71 FCR fragments were also recovered. Feature 247 was identified as a hearth.

Feature 248

This feature was located in Unit N64 E230, at the 2BC/3Ab2 interface. It was identified during the mechanical stripping task. It had a top elevation of 214.47 NGVD and a bottom elevation of 214.44 NGVD. It was 48 cm in diameter and was circular in plan view and saucer-shaped in profile (Figure 8.178). The feature fill was described as dark reddish brown (5YR 3/4), sandy loam, with minimal charcoal flecking, and a pocket of dark brown (7.5YR 3/2), ashy, silt and silt loam at the base. Two fragments of FCR were found in the feature, and no other cultural material was recovered. Feature 247 is most likely a hearth.

Feature 249

This feature was first identified in Unit N62 E231 during the mechanical stripping task, and extended into Units N61 E230, N61 E231, and N62 E232. The feature appeared as a subtle stain with five FCR fragments visible near the surface, and no charcoal. It was located at the interface of the 2BC and 3Ab2 horizons. Feature 249 had a top elevation of 214.58 NGVD and a bottom elevation of 214.41 NGVD. It measured 26 cm north-south by 35 cm east-west. It was ovoid in plan view and deeply basin-shaped in profile (Figure 8.179). The feature was identified in the field as a roasting pit; however, the paucity of FCR is unlike most roasting pits, unless it had been cleaned out after its last use. Also there was no evidence of heating or burning noted in the surrounding matrix. No cultural material apart from the FCR was found. This feature is interpreted as an indeterminate pit.

Non-Cultural Anomalies

Six non-cultural anomalies encountered in the 3Ab2 horizon were given feature numbers during fieldwork. They are shown in Table 8.76.

Table 8.76. Non-Cultural Anomalies Identified in the 3Ab2 Horizon.

Feature Number	Unit Location	Dimensions	Comments
199	N70 E232	Top elevation: 214.32 NGVD; bottom elevation: 214.18 NGVD; asymmetrical in plan view and in profile.	FCR fragments (n = 8); charcoal appeared as a small dense concentration in the center of the feature; many root disturbances in the surrounding soils; natural root burn
203	N65 E236-237	Top elevation: 214.29 NGVD; bottom elevation: 214.22 NGVD; 13 cm x 23 cm	Surface burn, possibly tree burn.
222	N77 E226	Top elevation: 214.16 NGVD; bottom elevation: 214.13 NGVD; 73 cm x 80 cm	Evidence of root, rodent, and worm activity, as well as redeposition.

Feature Number	Unit Location	Dimensions	Comments
228	N66-67 E230-232	Top elevation: 214.45 NGVD; bottom elevation: 214.35 NGVD; 102 cm x 203 cm	Tree burn
230	N76 E229	Top elevation: 214.03 NGVD; bottom elevation: 213.96 NGVD; 35 cm x 53 cm	Smaller area of tree burn
231	N73/74, E232/233	Not excavated; amorphous stain	Found during mechanical stripping; in 3Ab2 horizon; remains of large tree burn, burned soil, dendritic charcoal staining, and two FCR fragments

Feature Analysis

All of the features identified within the 3Ab2 horizon seem to be fire-related, either pits with FCR or surface clusters of FCR. The features from the 3Ab2 horizon were also the subject of simple statistical analyses. The stem-and-leaf diagram of feature widths (Figure 8.180) shows no pattern, rather a wide array of feature sizes. The plot of feature thicknesses shows a peak centered on 9 cm with a fairly even distribution spreading out in both directions, suggesting that while approximately half are in the tight range of 8-11 cm thick there is overall a wide range of thicknesses. The scatter plot shows a similar pattern. There is a tight cluster of features (Features 224, 225, 226, 227) in the center with a loose scattering surrounding it in all directions. All four of the features within the cluster contained FCR and a fair amount of charcoal, but so did others in the 3Ab2 horizon. Most, if not all, of the features are probably simple fire features that served much the same purposes as each other, thus, despite some variations do not show any meaningful distinctions.

Spatial Analyses

The results of a limited statistical analysis are presented in the feature discussion; no set of formal spatial analyses were performed for the 3Ab2 horizon.

Refit Analysis

A refit analysis was attempted, and there was one primary refit between lithic artifacts from the 3Ab2 horizon. Units N67 E238 (Level 1) and N67 E239 (Level 1) contained two large flakes of debitage from a gray and brown striated stone (identified as Onondaga chert) that fit precisely together. No other refits were discovered for the 3Ab2 horizon.

3Bw Horizon (Earlier, Late Archaic)

Summary

Stratigraphy

The 3Bw horizon was identified as F13 in initial unit excavations at Area 3-South. This stratum was positioned directly beneath the overlying 3Ab2 horizon. Cultural materials, however, were concentrated in the lower 30 cm of this package, F13 Levels 4 to 6. The horizon spanned the entire excavation block, but artifacts and features were recovered primarily in the northeast corner. Soil was described as a dark yellowish brown (10YR 4/4) silt loam.

Artifacts, Ecofacts and Features

A total of 3, 956 artifacts were recovered from the 3Bw horizon and are summarized in Table 8.77. Seventeen feature numbers were assigned during fieldwork. Subsequent analyses revealed eight of these to be definitively cultural while the balance were not. Cultural and non-cultural features associated with the 3Bw horizon are identified in Table 8.78. Hearths were the only type of feature found.

Table 8.77. Summary of 3Bw Horizon Artifact and Ecofact Recovery.

Artifacts	**Count**
Flaked Stone Tools	
PP/Ks	5
Biface	12
Expedient tools	2
Cores	31
Debitage	3,526
Groundstone	1
Other stone	4
FCR	371
Ceramics	0
Faunal Remains	0
Floral Remains	4
Total	**3,956**

Table 8.78. Feature Overview.

	Count	**Feature Numbers**
Cultural feature	8	232, 244, 245, 256, 261, 262, 265, 266
Non-cultural features	9	229, 233, 234, 235, 250, 253, 254, 255, 257

Patterns observed in overlying horizons are present in the 3Bw artifact and feature assemblage. Locally procured cobbles were used to manufacture tools using both direct and bipolar reduction techniques. People on site were using locally available wood types to fuel fires. Nuts were processed and or consumed on site.

Chronology

This soil horizon was assigned to the Earlier Late Archaic Period based on stratigraphy and the data presented below. Two diagnostic pp/ks were recovered in this soil horizon. One was a Bottleneck Stemmed-like pp/k and the other was a Brewerton Side-Notched-like pp/k. Bottleneck Stemmed pp/ks date to approximately 3,770 to 3,000 B.C., while Brewerton Side-Notched pp/ks date to ca. 3,780 to 2,350 B.C. These dates for this time period correspond to dates calculated for the Wiser Site (36CE442), located north of Altoona. There, one date of 5,220 ± 70 B.P. was associated with a Brewerton Side-Notched pp/k. Other sites with similar dates include the Canfield Island Site (36LY37), and the Brown Site, in Armstrong County. Brewerton pp/ks were recovered at both sites.

One ^{14}C date was calculated, with the AMS technique, for the 3Bw horizon using carbon recovered in Feature 244. This resulted in one conventional date but two calibrated dates (Table 8.79).

Table 8.79. 3Bw Horizon ^{14}C Dates.

Feature	Conventional ^{14}C Date	Calibrated Date
244 / Beta-176121	4730 ± 40 B.P.	3460 to 3370 B.C.
	4730 ± 40 B.P.	3640 to 3490 B.C.

Artifact and Ecofact Recovery and Analysis

Only eight features were identified, but over 3,500 artifacts were recovered, including flaked stone tools (*n* = 50), debitage (*n* = 3,526), one groundstone tool, four other stone items, and 371 pieces of FCR.

Flaked Stone Tools

Fifty flaked stone tools were recovered from the 3Bw horizon of Area 3-South. These flaked stone artifacts include projectile point/knife artifacts (*n* = 5), bifaces (*n* = 12), expedient tools (*n* = 2), cores and core fragments (*n* = 31).

Projectile Point/Knives

A total of five pp/k artifacts were recovered from the 3Bw horizon, and detailed descriptions and measurements for these artifacts are included in Appendix 8J. Two diagnostic projectile point/knife artifacts were recovered from the 3Bw horizon (Figure 8.182). One was a Bottleneck Stemmed-like pp/k of Onondaga chert (Catalog no. 3041.1) dating to the Early Late Archaic period. This type commonly has a pressure flaked blade surface and large round notches which constrict the stem. The stem expands from rounded shoulders producing the bottleneck shaped base. There is heavy grinding on the notch and base of the stem. They are found across Ohio and much of the Midwest, but in low

frequency (Justice 1987). The other diagnostic pp/k was a Brewerton Side-Notched-like pp/k of Onondaga chert (Catalog no. 3176.1) dating to the Early Late Archaic period, of the Laurentian tradition. These are usually thick, broad, trianguloid forms. Justice (1987) postulates that the side-notched variety may simply be resharpened variants of the corner-notched typed. The blade edges vary from straight to excurvate, with occasional incurvate edges. The bases are straight to excurvate and occasionally concave. Most exhibit basal grinding. They range in distribution from southern New England throughout the Upper Ohio Valley and west into Illinois (Justice 1987).

Three other untyped projectile point/knife artifacts were recovered from the 3Bw horizon, though the time period and cultural context of the artifacts was unidentifiable. One was an untyped narrow, thin, side-notched pp/k of Onondaga chert (Catalog no. 3131), while another was a narrow ovate knife of Onondaga chert (Catalog no. 3137). The third untyped pp/k artifact recovered from the 3Bw horizon was an unidentifiable pp/k base fragment of Onondaga chert (Catalog no. 3072).

Bifaces

One whole and 11 partial bifaces were found in during 3Bw horizon excavations. All are derived from Onondaga chert. Figure 8.183 illustrates the spatial distribution of the 3Bw horizon bifaces and expediency tools. Descriptive data for all biface fragments are given in Table 8.80. Three of the proximal biface fragments (Catalog nos. 3033, 3111, and 3192) and the whole biface were thermally altered. No thermal alteration was observed on other bifaces. One of the Stage 3 distal fragments (Catalog no. 3135) was broken into two pieces which refit. None of the items in the biface assemblage showed evidence of use or wear.

Table 8.80. 3Bw Horizon Bifaces—Catalog Numbers and Descriptive Data.

Catalog Number	Reduction Stage	Portion	Length (mm)	Width (mm)	Thickness (mm)	Cortex presence	Weight (g)	Comments
3033	2	Proximal	44	35	9	Yes	12.8	Lateral fracture
3061	3	Distal	40	24	6	No	6.5	Lateral fracture
3065	3	Proximal	31	31	8	No	8.6	Lateral fracture
3105	Unident.	Unident.	34.8	19.1	12.3	Yes	8.82	Unident. fracture
3105	2	Whole	46.9	33.6	14.9	No	20.8	Stack
3111	3	Proximal	20	30	6	No	4.4	Lateral fracture
3118	2	Distal	12	20	7	Yes	1.9	Lateral fracture
3125	3	Proximal	37	20	8	No	5.1	Transverse fracture
3135	3	Distal	37	20	10	No	10.2	Lateral fracture
3194	2	Proximal	19	35	9	Yes	6.1	Lateral fracture

Catalog Number	Reduction Stage	Portion	Length (mm)	Width (mm)	Thickness (mm)	Cortex presence	Weight (g)	Comments
3194	2	Proximal	18	27	5	Yes	2	Edge collapse
3192	2	Proximal	25	44	12	Yes	15.9	Lateral fracture

Expedient Tools

Both of the expedient tools recovered from the 3Bw horizon were unifacially utilized, exhibited lateral modification, and were made on Onondaga chert. There was no evidence of heat treatment on either artifact. One of these expedient tools exhibited use-wear and retouching along the lateral aspect, on the ventral surface, and did not contain cortex. The other expedient tool did have cortex. Catalog numbers and additional descriptive data for the expedient tools are provided in Table 8.81.

Table 8.81. 3Bw Horizon Expedient Tools—Catalog Numbers and Descriptive Data.

Catalog Number	Reduction Stage	Portion	Length (mm)	Width (mm)	Thickness (mm)	Cortex presence	Weight (g)
3162	2	Whole	17.2	23	4.1	Yes	1.6
3626	UID	Whole	20	22	2	No	1.1

Cores and Core Fragments

There were 31 whole and partial core artifacts recovered from the 3Bw horizon, the second largest core component of the Area 3-South artifact assemblage. There were four bipolar cores, six spheroid cores, one spheroid core fragment, seven biface cores, two tested cobbles, five split piece cores, three core rejuvenation flakes, one split cobble, and two cores of unidentified typology. All of the core artifacts were Onondaga chert except for the two tested cobbles. For the core component of the 3Bw horizon overall, four of the artifacts retained 50 percent or more cortex, 19 retained less than 50 percent cortex, and eight had no cortex remaining. Overall, 26 of the core and core fragments were exhausted cores, and five were not exhausted. Eight of the 31 core artifacts exhibited thermal alteration.

Of the biface cores, three were bipolar, all were exhausted cores, and the number of flake scars on the cores ranged from six to 30. Of the spheroid cores, two were bipolar, all but two were exhausted, and the number of flake scars ranged from seven to 17. Of the split piece cores, one was bipolar, all were exhausted cores, and the number of flake scars ranged from four to six. Of the core rejuvenation flakes, one was bipolar, all were exhausted, and the number of flakes removed ranged from 10 to 18. The spheroid core fragment had three flake scars, was an exhausted core fragment, and was not bipolar. Both tested cobbles were bipolar, retained greater than 50 percent cortex, and one was sandstone while the other was quartzite. One tested cobble exhibited three flake scars, and the other had one flake scar. The core artifacts from the 3Bw horizon that did exhibit thermal alteration were two biface cores, two core rejuvenation flake cores, two split piece cores, one split cobble, and one tested cobble. Attributes and measurements for the core artifacts are given below in Table 8.82.

Table 8.82. 3Bw Horizon Core and Core Fragments—Descriptive Data.

Core type	Material source	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	No. of Flake scars	Percent cortex	Exhausted
Biface Core	Onondaga	33.6	16.8	13.8	6.31	13	0	Yes
Biface Core	Onondaga	38.3	16.5	19.9	7.07	24	1-49	Yes
Biface Core	Onondaga	37.6	28.5	18.4	9.59	30	0	Yes
Biface Core	Onondaga	36	30.4	11.2	14.75	21	1-49	Yes
Biface Core/Bipolar	Onondaga	37.3	30.7	11.3	11.51	18	1-49	Yes
Biface Core/Bipolar	Onondaga	35.9	14.5	8.2	4.70	17	1-49	Yes
Biface Core/Bipolar	Onondaga	27.5	26.1	8.4	5.92	6	1-49	Yes
Bipolar Core	Onondaga	29.9	19.7	14.2	7.82	16	0	Yes
Bipolar Core	Onondaga	23.9	19.6	17	1.40	11	1-49	Yes
Bipolar Core	Onondaga	24.4	30.3	9.8	7.93	12	1-49	Yes
Bipolar Core	Onondaga	32.5	15.9	8.6	2.70	12	0	Yes
Core Rejuvenation Flake/ Bipolar	Onondaga	31.2	15.1	6.2	2.15	18	0	Yes
Core Rejuvenation Flake/ Poss Bipolar	Onondaga	30.1	25.1	10.8	7.49	10	1-49	Yes
Flake, Proximal/Core Rejuvenation Flake/ Possibly Bipolar	Onondaga	34.6	25	13.3	12.21	16	1-49	Yes
Spheroid Core	Onondaga	36.8	30.3	11.6	11.59	7	1-49	No
Spheroid Core	Onondaga	46.5	56.1	18.2	34.65	11	1-49	Yes
Spheroid Core	Onondaga	44.5	21.8	14.7	9.63	9	1-49	Yes
Spheroid Core	Onondaga	40.1	32.5	13.9	8.06	10	0	Yes
Spheroid Core Frag	Onondaga	36.2	24.5	17.9	11.41	3	1-49	Yes
Spheroid Core/Bipolar	Onondaga	23.1	11.2	11	2.35	7	0	Yes
Spheroid Core/Bipolar	Onondaga	46	40.2	12.2	20.61	17	1-49	No
Split Cobble/Poss Bipolar	Onondaga	42.3	36.4	20.7	40.49	8	50-99	No
Split Piece	Onondaga	17	27.8	8.5	5.56	6	1-49	Yes
Split Piece	Onondaga	12.9	16.2	9.2	1.89	4	1-49	Yes
Split Piece	Onondaga	45.4	26.1	14.8	22.86	5	50-99	Yes
Split Piece	Onondaga	14.2	26.4	11.4	6.12	4	1-49	Yes
Split Piece/Bipolar	Onondaga	32.5	21	10.9	6.63	4	1-49	Yes
Tested Cobble/Bipolar	UID/ Sandstone	84.1	84.5	46.7	331.6	3	50-99	No
Tested Cobble/Bipolar	UID/ Quartzite	121.2	98.1	34.3	524.7	1	50-99	No
UID Core Frag	Onondaga	18	11.6	5.5	0.89	10	0	Yes
UID Core Frag	Onondaga	13	9.2	4.6	0.49	5	1-49	Yes

Debitage

A total of 3,526 debitage artifacts were recovered in this soil horizon, weighing a total of 3,812.8 g. All the debitage was analyzed using the mass analysis method, and a statistical sample of the whole flakes and proximal flake fragments was selected for the detailed flake analysis. Figure 8.183 illustrates the spatial distribution of the debitage.

Mass Analysis

Size Grade. All debitage from this horizon was sorted according to size, as discussed above. Again, over one half of the debitage measured between < 0.5 in and > = 0.25 in, and the second most frequent grade measured < 0.25 in. Figure 8.184 illustrates the distribution by percent for each size grade.

Raw Material. As with debitage discarded during the other occupations, almost all the artifacts were Onondaga chert (*n* = 3,521; 99 percent). One fragment of Flint Ridge/Vanport chert was also collected. The large sandstone and quartzite artifacts were cores. Table 8.83 presents the information on raw material type, and weight.

Table 8.83. 3Bw Horizon Raw Material.

Material Type	Count	Percent of Count	Weight (g)	Percent of Weight
Onondaga chert	3521	99.9	2411.4	63.2
Flint Ridge/Vanport chert	1	0.03	0.1	0.003
Unidentified sandstone	1	0.03	331.6	8.7
Unidentified quartzite	3	0.09	1069.7	28.1
Total	**3526**	**100**	**3812.8**	**100**

Cortical Material. A total of 2,853 debitage artifacts, or 81 percent, had some cortex, following the same procurement pattern as seen in the previously discussed prehistoric components. The use of small, easily available river cobbles is indicated by this high percentage of cortical debitage.

Thermally Altered Material. All debitage was examined for presence of burning. A total of 1,464 artifacts, or 42 percent, of the debitage had some evidence of thermal alteration.

Detailed Analysis of Whole and Proximal Flakes

A 20 percent random sample of the whole flakes and proximal flake fragments from the 3Bw horizon was selected for detailed analysis and consisted of a total of 294 flakes and flake fragments. The sample was generated from the total universe of samples using a random number generator available in the Microsoft Excel software. These 294 flakes and flake fragments are sufficient to be considered representative of the overall universe. To reconstruct reduction methods, data were collected on flake reduction stage (primary, secondary, or tertiary), presence of bulb of percussion, and platform. Table 8.84 lists their division by reduction stage.

Table 8.84. 3Bw Horizon Whole and Proximal Flake Reduction Stages.

Reduction Stage	Count	Percent of Count
Primary	71	24
Secondary	170	58
Tertiary	53	18
Total	**294**	**100**

Data were collected on platform shape, angle, and thickness for all whole flakes and proximal flake fragments. Platform shapes were identified as flat, lipped, cortical, or faceted (Table 8.85). Of the 294 total, 56 (19 percent) platforms were flat, 98 (33 percent) were lipped, 31 (11 percent) were cortical, and 109 (37 percent) were faceted. Results for platform angles are shown in Table 8.86.

Table 8.85. 3Bw Horizon Platform Shapes.

Platform Shape	Count	Percent of Count
Flat	56	19
Lipped	98	33
Cortical	31	11
Faceted	109	37
Total	**294**	**100**

Table 8.86. 3Bw Horizon Platform Angles.

Platform Angle	Count	Percent of Count
0-4°	0	0.00
5-9°	0	0.00
10-14°	1	0.34
15-19°	1	0.34
20-24°	0	0.00
25-29°	1	0.34
30-34°	3	1.02
35-39°	1	0.34
40-44°	12	4.08
45-49°	9	3.06
50-54°	14	4.76
55-59°	13	4.42
60-64°	15	5.10
65-69°	19	6.46
70-74°	15	5.10
75-79°	10	3.40
80-84°	11	3.74
85-89°	7	2.38

Platform Angle	Count	Percent of Count
> 90 ^{o}	14	4.76
Indeterminate	148	50.34
Total	**294**	**1.00**

As with the other time periods discussed, analysis of the lithic assemblage from this time period indicated that the entire manufacturing process took place within Area 3-South. Primary, secondary and tertiary stage flakes were recovered from this soil horizon, as were retouched artifacts and core and core fragments. The presence of bipolar cores indicates that this reduction technology was used during this time period as well. Most of the striking platforms were faceted (37 percent); one-third of the platforms from this time period were lipped (33 percent), followed in frequency by flat platforms (19 percent), and cortical platforms (11 percent). As in the previously discussed time period, almost all (96 percent) of the whole and proximal flake fragments examined exhibited bulbs of percussion, again to indicate that hard hammer percussors, or soft hammer percussors used with enough force to create a bulb were used to reduce cores in addition to the bipolar method.

Groundstone

One lithic artifact falling within the groundstone category was recovered from the 3Bw horizon (Table 8.87). This was a hammerstone fragment of waterworn quartzite. It was irregularly shaped in plan-view and profile, and oval in cross-section. The hammerstone weighed 541.1 g and exhibited evidence of battering on two faces.

Table 8.87. 3Bw Horizon Groundstone Tool—Catalog Number and Descriptive Data.

Catalog Number	Artifact	Portion	Material type	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
3150	Hammerstone	Fragment	Quartzite	93.4	77.7	60.2	541.1

Other Stone Artifacts

One whole steatite cobble, as well as three whole unmodified sandstone pebbles, were found within this horizon (Table 8.88). All are of irregular shape, and none exhibit evidence of thermal alteration. Figure 8.185 illustrates the spatial distribution of the groundstone and other stone artifacts. It is assumed that these items represent manuports.

Table 8.88. 3Bw Horizon Other Stone Artifacts—Catalog Number and Descriptive Data.

Catalog Number	Artifact	Portion	Material type	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
3150	Hammerstone	Fragment	Quartzite	93.4	77.7	60.2	541.1
3154	Unmodified Steatite fragment						
3085	Unmodified Pebble	Whole	Sandstone	54.1	41.6	27.5	43.5
3085	Unmodified Pebble	Whole	Sandstone	37	33.1	29.6	80
3145	Unmodified Pebble	Whole	Sandstone	40.5	35.7	26.8	47

Fire-Cracked Rock

A total of 371 FCR fragments were recovered from the 3Bw horizon. The total weight of these fragments was 21,145 g. Figure 8.185 illustrates the spatial distribution of FCR.

Prehistoric Ceramics

No pottery fragments were recovered from the 3Bw horizon.

Faunal Remains

No faunal remains were recovered from the 3Bw horizon.

Floral Remains

Floral remains were recovered during hand excavations in the 3Bw horizon, Field Designation F13, Levels 5 and 6.Identifiable remains included black walnut (*Juglans nigra*) and walnut/walnut family (*Juglans* spp./Juglandaceae) nutshell.

Feature Identification and Analysis

Eight features were defined as cultural features within the 3Bw horizon (F13, Levels 4 to 6). In addition, nine other anomalies were determined to be non-cultural. Two other "features" (Features 256 and 261) were recorded as cultural items, but may in fact be the result of the tree burn that caused a number of the non-cultural anomalies in this horizon and the underlying 4Bw horizon. Figure 8.186 illustrates the location of the features from this soil horizon. Feature data are presented in Table 8.89; all features are generally interpreted as hearths although Feature 265 contained a substantial amount of debitage and may be related to tool preparation or the associated clean up.

Table 8.89. 3Bw Horizon Feature Summary.

Feature Number	Dimensions (L x W x Th)	Unit Location(s)	Opening Elevation	Radiocarbon Date
Feature 232	90 x 60 x 14	N72 E236	213.43	
Feature 244	57 x 37 x 6	N79 E232	213.33	4730 ± 40 B.P.
Feature 245	32 x 22 x 6	N80 E229/230	213.26	
Feature 256	80 x 50 x 1	N72 E235	213.33	
Feature 261	265 x 125 x 5	N70 E239	213.39	
Feature 262	59 x 59 x 13	N60 E229	214.23	
Feature 265	370 x 150 x 11	N75 E237	213.17	
Feature 266	110 x Unknown x 14	N72/73/74 E239/240/241	213.18	

Feature Descriptions

Feature 232a,b

This feature was located in Unit N72 E234, and possibly extended into Unit N72 E235. It was divided into areas 232a and 232b based on soil differences. Feature 232 had a top elevation of 213.43 NGVD and a closing elevation of 213.31 NGVD for the Feature 232a portion and 213.29 NGVD for the Feature 232b portion. Feature 232a measured 60 cm east-west by 90 cm north-south, and 232b measured 20 cm east-west by 50 cm north-south (Figure 8.187). The feature was somewhat oval-shaped in plan view, and had an irregular profile shape. It consisted of charcoal and reddened soil. The soil matrix was described as brown (7.5YR 4/4), silt loam in the 232a portion, and dark yellowish brown (10YR 4/4), silt loam in the 232b portion. The entire feature had a large amount of charcoal flecking.

The 232a portion contained large charcoal fragments that were evident on the surface, and through its center. A large, reddish, stained area defined Feature 232b. Charcoal was densely packed along the wall of Unit N72 E235 and filtered down approximately 22 cm. The darkest reddening was located in the first 10 cm of the area; this part of the feature appeared to be a surface burn, with limited tree root burning. In sum, Feature 232a appeared to be cultural; however, 232b was inconclusive and could be natural. No cultural material was recovered from this feature. Based on comparisons with other features, 232a was identified as a hearth that was 'latent' in Petraglia's classifications.

Feature 244

This hearth feature was located in Unit N79 E232 and extended into Unit N78 E232, where a portion was excavated as part of the 3Bw, Level 6. That portion was not separately excavated as a feature because it was not originally identified as a separate feature matrix. The feature had a top elevation of 213.33 NGVD and a bottom elevation of 213.27 NGVD. It measured 37 cm north-south by 57 cm east-west. This feature was circular in plan view and shallow basin-shaped in profile (Figure 8.188). It was first identified as a rock cluster with charcoal flecking, located above the 3Bw, Level 6. It may have extended into Unit N78 E232, and up into the 3Bw, Level 5. No staining or burned soil was associated with the feature. The soil matrix was described as dark yellowish brown (10YR 4/4), silt loam, with charcoal flecking. There was only one level of FCR that extended approximately 3 cm into the feature; the charcoal flecking continued for 6 cm to a depth of 213.27 NGVD. Recovered artifacts include nine FCR fragments and one lithic debitage fragment. Two carbon samples were sent for AMS dating from this feature. The resulting dates were 3640-3490 cal B.C., and 3460-3370 cal B.C., for a conventional radiocarbon date of 4730 ± 40 B.P.

Feature 245

This hearth feature was located in Unit N80 E229 and extended into Unit N80 E230. It had a top elevation of 213.26 NGVD and a bottom elevation of 213.20 NGVD and was located in the 3Bw horizon (F13, Level 6 designation). It measured 32 cm north-south by 22 cm east-west. It was ovoid to amorphous in plan view and generally basin-shaped in profile (Figure 8.189). The side and bottom boundaries were undulating. The soil matrix was described as red (10R 4/6) loam. The feature was originally identified as an area of oxidized

soil, and interpreted as a possible surface burn. However, upon excavation, it was revealed to be a basin-shaped feature measuring 6 cm in depth. One debitage fragment was recovered from the west half of the feature.

Feature 256

This feature was located in Unit N72 E235. It had an opening elevation of 213.33 NGVD and a bottom elevation of 213.32 NGVD. It measured 50 cm north-south and 80 cm east-west. It was amorphous both in plan view and profile. The feature was characterized by moderate amounts of charcoal flecking. This feature represented a localized concentration of thermal alterations. Cultural material consisted of two debitage fragments that refit, and three pieces of FCR. Post-depositional disturbance included root casts. It is possible that this feature is simply the result of the burned tree fall.

Feature 261

This feature was located primarily in Unit N70 E239 and extended into Units N69 E239, N68 E239, N69 E240, N70 E238, and N70 E237. It was identified during the mechanical stripping task. The feature had a top elevation of 213.39 NGVD and a closing elevation of approximately 213.34 NGVD, and was located in the 3Bw horizon, Levels 5 to 6. It measured 2.65 m across northwest-southeast, and 1.25 m southwest-northeast. It was linear in plan view, and lens-shaped in profile. The feature was encountered during mechanical stripping at approximately 50 to 60 cm into the F13 designation. It was a carbonized wood log, with two FCR fragments in a partially fire-reddened matrix. One whole expedient tool (Catalog no. 3626) was also recovered, was of Onondaga chert, and was unifacially utilized. No other cultural material was found within the feature, although the soil was not screened.

Feature 265

This feature was located in Unit N75 E237. It was identified during mechanical stripping. It had a top elevation of 213.17 NGVD and a bottom elevation of 213.06 NGVD. It was located approximately in the 3Bw horizon, Level 6. It measured approximately 3.70 m northwest-southeast by 1.50 m northeast-southwest. The feature was amorphous and oblong in plan view and had a shallow, undulating profile (Figure 8.190). Feature 265 was a thin FCR and debitage scatter, with some charcoal flecking. The soil matrix showed no distinction from the 3Bw, except the presence of charcoal flecking. The horizontal and vertical boundaries were defined by the extent of charcoal, FCR, and debitage. In total there were 28 FCR fragments, nine whole flakes, 12 proximal flakes, and 13 fragments of lithic debris. This appears to be a shallow hearth possibly associated with lithic reduction activities based on the presence of debitage.

Feature 266

This hearth feature was located in Unit N74 E239, and extended into Units N73 E240, N75 E239, N72 E240, and N72 E241. It was encountered during the mechanical stripping task, but was only identified in the wall of the excavation block after stripping was complete. It had a top elevation of 213.18 NGVD and a bottom elevation of 213.04 NGVD, and measured 110 cm north-south, and 14 cm thick (Figure 8.191). The soil matrix was

described as dark yellowish brown (10YR 4/3-4/6), clay loam with charcoal flecking. Because this feature was uncovered only in the wall of the excavation block during the mechanical stripping, it was not excavated. However, two liters of soil were collected for a soil sample. The rest of the feature was left *in situ*. Two pieces of FCR, one whole flake, and two fragments of lithic debris were recovered.

Feature 262

One additional probable hearth feature, identified as Feature 262, was found during the mechanical step-back stripping task. It was located in the F13 Field Designation, Levels 2 to 3, in Unit N60 E229. Although this is a couple of excavation levels above what is defined as the 3Bw horizon, Feature 262 is presented here because the sediments in which it was encountered were defined as the same archaeological field designation (F13) as the 3Bw horizon. These upper levels of F13 were generally not excavated, but were mechanically removed, and thus there is no horizon discussion section within which to present this feature. Feature 262 had an opening elevation of 214.23 NGVD and a closing elevation of 213.82. The feature measured 59 cm wide by 13 cm deep, and was a thermally reddened soil lens. The lens appeared to extend approximately 41 cm west from the mechanically stripped wall surface. This feature was not excavated because it was only identified in the wall of the excavation block, but a core sample was taken horizontally through the center of the lens. No cultural material was recovered.

Non-Cultural Anomalies

Nine non-cultural anomalies encountered in the 3Bw horizon were given feature numbers during fieldwork. They are shown in Table 8.90.

Table 8.90. Non-Cultural Anomalies Identified in the 3Bw Horizon.

Feature Number	Unit Location	Dimensions	Comments
229	N61 E233	Top elevation: 214.00 NGVD; bottom elevation: 213.94 NGVD 22 cm in diameter	Tree disturbance
233	N73-75 E231-236	Top elevation: 213.29 NGVD; bottom elevation: 213.25 NGVD	Burned tree fall.
234	N76-77 E230-231	Top elevation: 213.27 NGVD; bottom elevation: 213.25 NGVD	Possibly related to burned tree fall
235	N79 E231	Top elevation: 213.40 NGVD; bottom elevation: 213.35 NGVD	Probably related to burned tree fall
250	N80-81 E233	Top elevation: 213.19 NGVD; bottom elevation: 213.14 NGVD	Probably related to burned tree fall
253	N74 E230		Found during mechanical stripping; large charcoal flecks; was a root disturbance
254	N71-72 E233	Top elevation: 213.43 NGVD; bottom elevation: 213.38 NGVD	Probably related to burned tree fall

Feature Number	Unit Location	Dimensions	Comments
255	N71 E235-236	Top elevation: 213.43 NGVD; bottom elevation: 213.38 NGVD	Probably related to burned tree fall
257	N75 E232	Top elevation: 213.27 NGVD; bottom elevation: 213.15 NGVD	Probably related to burned tree fall

Feature Analysis

In general the features identified within the 3Bw horizon appear to be more amorphous a less well preserved than those of the upper horizons. The features from the 3Bw horizon were examined by simple statistical analyses. The stem-and-leaf diagrams suggest the same basic patterns as those seen in the 3Ab2 data. The widths show no peak or evidence of clustering, but the thicknesses show a focus on the 5-7 cm range with a trend toward slightly thicker features (Figure 8.192). The scatter plot (Figure 8.193) shows a fairly wide distribution with two outliers of noticeably larger widths. Features 232 and 262, both seemingly simple surface burns, appear to cluster but two other surface burns are spread far from them. Essentially no meaningful pattern is discernable, based on dimensions.

Spatial Analyses

No statistical spatial analyses were conducted for the 3Bw horizon.

Refit Analysis

To examine intrasite patterning, a refit analysis was completed for this occupation level also. Three large fragments of lithic debitage from the 3Bw horizon refit precisely in a primary refit. These flakes were heat-altered, pink-hued, black-speckled Onondaga chert flakes recovered from the northeastern portion of the excavation area in Units N78 E232 (Level 6), N78 E234 (Level 4), and N75 E233 (Level 5), respectively. There was a secondary refit of these flakes with another flake in Level 5 of neighboring Unit N78 E232 as well. There were three other secondary refits with these lithic artifacts in Units N77 E234 (Level 6), N77 E233 (Level 6), and N74 E233 (Level 5). The interior texture, coloring, and mineral inclusions within these flakes, relative to the other flakes from that soil horizon, were highly distinctive and thus ensured the validity of the secondary refits.

The primary refits described above for the 3Bw horizon provide evidence of a possible link between two subterranean features found within that block of excavation units. Unit N78 E232 contained a portion of one oval feature, designated Feature 244. This feature was identified as such during excavation of Unit N79 E232, but the field notes for that unit link the F13 Field Designation, Level 6 of N78 E232 directly with this feature, a “rock cluster with charcoal flecking . . . at the top of F13 Level 6.” This is the precise level from which one flake of the primary refit was recovered. Unit N75 E233, south of this unit, contained a primary refit with a flake from N78 E232, as discussed above. This Unit, N75 E233, contained a portion of Feature 233, a large elongated feature composed of light to heavy concentrations of charcoal and a high concentration of heat-altered lithic debitage. The field notes describe a “lithic reduction cluster” and lithic scatter associated with the feature. A portion of this feature occurred in the same unit and the same soil horizon as the flake that refit with the flake from Unit N78 E232. Therefore, the presence of direct primary

refits between units and levels containing these two features may suggest a relationship in time and potentially in habitation activities between those two features. No statistical spatial analyses were performed for this soil horizon however, so this conclusion cannot be augmented by additional information.

4Bw Horizon (Terminal Middle Archaic/Early Late Archaic)

Summary

Stratigraphy

The 4Bw horizon was designated F13 Levels 7 and 8 during fieldwork, as it was initially thought to be a continuation of the overlying 3Bw horizon. The geomorphology team later identified it as a separate stratum. It was located between 1.35 m and 1.7 m below datum and was roughly 35 cm thick. The soil was a dark yellowish brown (10YR 4/4) silt loam.

Artifacts, Ecofacts, and Features

Artifact and ecofact recovery in the 4Bw horizon totaled 417 items including 312 paleobotanical materials. The rest of the 4Bw assemblage comprised a pp/k, 29 pieces of debitage, two groundstone tool fragments, four other stones, and 69 pieces of FCR. Five feature numbers were assigned during excavations; however, analyses revealed only two of these to be definitively cultural. These two features were large shallow hearths. One contained two nutting stones and the other produced copious amounts of an unidentified plant remain.

Chronology

This soil horizon was assigned to the Terminal Middle Archaic/Early Late Archaic Period based on stratigraphy and diagnostic artifacts. One pp/k, an untyped expanding stem pp/k made of Onondaga chert, was recovered from this soil horizon. No ^{14}C dates were calculated for this time period. This horizon's stratigraphic position, directly underlying the 3Bw (Earlier Late Archaic), supports a possible Terminal Middle Archaic/Early Late Archaic age ascription.

Artifact Recovery and Analysis

Artifact recovery in the 4Bw horizon was limited to 416 items, the preponderance of which was floral remains. Lithic artifacts included a single pp/k, 29 pieces of debitage, two groundstone tool fragments, four other stones, and 69 pieces of FCR.

Flaked Stone Tools

Only one flaked stone tool was recovered during 4Bw excavations—an untyped expanding stem pp/k of Onondaga chert (Catalog no. 2979) that was unidentifiable with reference to cultural context and temporal period. It was basally ground and had a morphology similar to a Chesser Notched pp/k. No bifaces, expedient tools, or cores were recovered from the 4Bw horizon.

Debitage

A total of 29 debitage artifacts was recovered in the 4Bw horizon, with a total weight of 27.8 g. Figure 8.194 illustrates the spatial distribution of the lithic debitage.

Mass Analysis

Size Grade. All debitage from this horizon was sorted according to size, as discussed above. Again, over one half of the debitage measured between < 0.5 in and > =0.25 in, and the second most frequent grade measured < 0.25 in. Figure 8.195 illustrates the distribution by percent for each size grade.

Raw Material. All the debitage, with the exception of one unidentifiable fragment that may be an igneous stone, was Onondaga chert (*n* = 28; 97 percent). Table 8.91 presents the information on raw material type, and weight.

Table 8.91. 4Bw Horizon Raw Material.

Material Type	Count	Percent of Count	Weight (g)	Percent of Count
Onondaga chert	28	96.6	27.3	98.2
Unidentified, possibly igneous stone	1	3.4	0.5	18
Total	**29**	**100**	**27.8**	**100**

Cortical Material. A total of 22 of the artifacts, or 76 percent, of the debitage assemblage, had cortex. The pattern again indicates the choice of easily available river cobbles for use in manufacturing stone tools.

Thermally Altered Material. All debitage was examined for presence of burning. A total of 11 debitage artifacts, or 38 percent of the total, had some evidence of thermal alteration.

Detailed Analysis of Whole and Proximal Flakes

All the whole flakes and proximal flake fragments from the 4Bw horizon were analyzed for the detailed analysis, consisting of 11 flakes and flake fragments. To reconstruct reduction methods, data were collected on flake reduction stage (primary, secondary, or tertiary), presence of bulb of percussion, and platform. Table 8.92 lists their division by reduction stage.

Table 8.92. 4Bw Horizon Whole and Proximal Flake Reduction Stages.

Reduction Stage	Count	Percent of Count
Primary	4	36
Secondary	6	55
Tertiary	1	9
Total	**11**	**100**

Data were collected on platform shape, angle, and thickness for all whole flakes and proximal flake fragments. Platform shapes were identified as flat, lipped, cortical, or faceted. Of the 11 total, three (27 percent) platforms were flat, two (18 percent) were lipped, none were cortical, and six (55 percent) were faceted. Platform angles could not be determined for six flakes, and the remaining five flakes all had platform angles between 30 and less than 60 degrees.

Only 29 debitage artifacts were recovered from this occupation period. Of these, 11 whole and proximal flake fragments were examined as part of the detailed flake analysis. These flakes were almost evenly divided between primary (n = 4) and secondary (n = 6) flakes, with only one tertiary flake represented. Because the sample size is so small, no conclusions can be drawn based on the detailed analysis. No cores were recovered, and no retouched or finished tools were recovered, with the exception of one pp/k. No direct evidence for percussors, in the form of hammerstones, was present, either.

Groundstone

Two lithic objects classified as groundstone artifacts were recovered from the 4Bw horizon (Table 8.93). Figure 8.196 illustrates the spatial distribution of groundstone and other stone artifacts. Interestingly, both of these artifacts were recovered from Feature 252 within Unit N72 E240, Level 1. These lithic implements were both nutting stones, and were the largest nutting stones in weight and dimensions of the whole artifact assemblage of Area 3-South. One of these two nutting stones was split into four fragments, which refit to form a single stone weighing 2,635 g and having an overall length of 190 mm, a width of 145 mm, and a thickness of 84 mm. This nutting stone was composed of waterworn tabular sandstone (Figure 8.197). There was one large nutting pit on one face of this nutting stone, with a diameter of 38 mm and a depth of 17 mm. This stone tool exhibited evidence of thermal alteration, suggesting that it may have served a secondary or later function as a hearthstone; this heat alteration subsequently may have been the genesis of the breaking of the stone into four fragments.

The second largest nutting stone artifact of the whole lithic assemblage also came from Feature 252 within Unit N72 E240, Level 1. This tabular sandstone nutting stone fragment weighed 1,095 g, and had two nutting pits on one face. One pit was 32 mm in diameter and 11 mm deep, while the other pit had a diameter of 14 mm and a depth of 7 mm. The fragment had a length of 139.6 mm, a width of 109.7 mm, and a thickness of 58.6 g. This latter nutting stone showed no evidence of thermal alteration. Both nutting stones were of irregular shape in plan-view, profile, and cross-section.

Table 8.93. 4Bw Horizon Groundstone Artifacts—Catalog Number and Descriptive Data.

Catalog Number	Artifact	Portion	Material type	Length (mm)	Width (mm)	Thicknes s (mm)	Weight (g)
3602	Nutting Stone	Fragment	Sandstone	139.6	109.7	58.6	1095
3602	Nutting Stone	Fragment	Sandstone	190	145	84	2635

Other Stone Artifacts

The four artifacts classified as "other" stone artifacts were all recovered from Unit N78 E230, Level 7, within the F13 designation (Table 8.94). These items were whole unmodified pebbles, two of sandstone and two of igneous rock. Two specimens, one of each material, were oval-shaped in all three views, while the other two were irregular in shape. None of these unmodified pebbles exhibited evidence of thermal alteration. These items potentially represent manuports.

Table 8.94. 4Bw Horizon Other Stone Artifacts—Catalog Numbers and Descriptive Data.

Catalog Number	Artifact	Portion	Material type	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
3205	Unmodified Pebble	Whole	Sandstone	35.4	28	24.6	44.5
3205	Unmodified Pebble	Whole	Igneous	49.1	46.4	34	111.9
3205	Unmodified Pebble	Whole	Sandstone	39	38.8	21.9	127.4
3205	Unmodified Pebble	Whole	Igneous	64.7	43.2	35.3	30.7

Fire-Cracked Rock

Excavation of the 4Bw horizon of Area 3-South produced 69 fragments of FCR, for a total weight of 20,407.7 g. This represents the smallest FCR component for Area 3-South. Figure 8.196 illustrates the spatial distribution of the FCR.

Prehistoric Ceramics

No pottery fragments were recovered from the 4Bw horizon.

Faunal Remains

No faunal remains were recovered from the 4Bw horizon.

Floral Remains

Flotation of Feature 251 soil samples produced wood fragments (n = 41), a single nut shell fragment, one seed, and 268 pieces of a reed-like material. Additional details are provided in the feature discussion.

Feature Identification and Analysis

Two features were identified within the 4Bw horizon (Field Designation F13, Levels 7 through 8) and found with certainty to be cultural in nature. In addition, three soil anomalies were initially identified as features but were later shown to be non-cultural. Figure 8.198 illustrates the spatial distribution of the features in the 4Bw horizon.

Data for each feature are presented below. The first, Feature 251, contained no artifacts and a curious concentration of mixed woods, nutshell, seed, and an abundance of an unidentified plant remains that most closely resembled the stem of grass or reedy plants. Whatever occurred here, this feature is associated with nut processing and/or consumption

and something involving the unidentified plant, as grass and reeds are unlikely to have been used as fuel.

Feature 252 was larger, measuring over a meter long. It contained copious amounts of FCR, charcoal, and heat affected soil. It contained two nutting stones as indication to purpose.

Feature Descriptions

Feature 251

This feature was located in Unit N68 E237, in the 4Bw horizon (Field Designation F13, Levels 6 to 7). It was identified during the mechanical stripping task. The feature had a top elevation of 213.24 NGVD and a bottom elevation of 213.16 NGVD. It measured 34 cm north-south by 36 cm east-west. Feature 251 had an oval shape in plan view, and was shallow basin-shaped in profile (Figure 8.199). It appeared to be the remnant of a fire pit, with almost no FCR. It contained two identifiable layers but did not appear to be stratified as to periods of use. The basal layer was described as reddish black (2.5YR 2.5/1), moist, ashy silt-silt ash. Above that, within the center of the feature, was reddish brown (2.5YR 6/3-4/4), clay silt-clay loam, mottled with dusky red (2.5YR 3/3) clay loam and charcoal. The relatively thick ash layer implies that this fire pit may have been used more than once over a short concurrent period, but there is no particular evidence to suggest that it was cleaned out or utilized over an extended period of time. Apart from one fire-reddened cobble, no cultural material was recovered.

Flotation processed samples of Levels 1 and 2 of Feature 251 recovered 311 fragments of plant remains. Remains recovered in Level 1 include one hickory (*Carya* spp.) wood fragment, one unidentifiable bark fragment, 31 unidentifiable wood fragments, one thick-shelled hickory (*Carya* spp.) nutshell fragment, one unidentified seed, and 18 “Type J” plant remains. Type J remains were classified as such during the paleobotanical analysis and were characterized as thin flat flakes of a material with fine braided interior striations, most likely the remains of the stems of reed or grass-like plants. Level 2 of this feature had abundant charred remains of this Type J plant material: 250 fragments of Type J in all. Other floral remains from Level 2 were three hickory (*Carya* spp.) wood fragments, four beech (*Fagus grandifolia*) fragments, and one unidentifiable wood fragment. Given the types of remains recovered from this feature, it is likely that this was a roasting/cooking pit. It is presumed that it once contained FCR that was removed prior to being abandoned.

Feature 252

This feature was first identified in Unit N72 E240 and extended into Units N71 E240, and N72 E239 (Figure 8.104). This feature was identified during the mechanical stripping task. It was found in approximately the F13 Levels 7 to 8. The feature had a top elevation of 213.06 NGVD and a bottom elevation of 212.96 NGVD. It measured 110 cm northwest-southeast by 69 cm southwest-northeast. It was an irregular oval in plan view and a shallow basin shape in profile (Figure 8.200). The feature consisted of a dense concentration of large to medium-sized FCR fragments, charcoal, including large charcoal fragments, and thermally reddened soils. Fifty-eight FCR fragments were found, as well as two nutting stones (both

Catalog no. 3602). One of the nutting stones lay inverted within the stone concentration, and the other was exposed during subsequent mechanical excavation. Because of the contents and shape, this feature is identified as a roasting/cooking pit.

Non-Cultural Anomalies

Three non-cultural anomalies encountered in the 4Bw horizon were given feature numbers during fieldwork. They are shown in Table 8.95.

Table 8.95. Non-Cultural Anomalies Identified in the 4Bw Horizon.

Feature Number	Unit Location	Dimensions	Comments
263	N74 E232	Top elevation: 213 NGVD; bottom elevation: 212.92 NGVD. 140 cm by 90 cm across. Amorphous ovoid plan view; truncated undulating profile	Found during mechanical stripping; determined to be a natural occurrence
264	N72 E237	Top elevation: 212.83 NGVD; closing elevation: 212.60 NGVD. 20 cm by 30 cm in width; conical in plan view and ovoid in shape	Found during mechanical stripping; determined to be a root burn. No cultural material recovered
267	N80 E225	Top elevation: 212.71 NGVD. 33 cm by 60 cm across. Extended into side of excavation block. Amorphous shape.	Found during excavations, amorphous reddening of soil with slight charcoal flecking and no artifacts or FCR.

Feature Analysis

Because the number of features is so small for this occupation period, no statistical analysis was completed. However, it is worth noting the unusually large size of Feature 252. Also, based on the density of the artifacts, it would fall within Petraglia's 'evident' category.

Spatial Analyses

No statistical spatial analyses were performed for the 4Bw horizon.

Refit Analysis

Debitage from the 4Bw horizon was examined for refits, yet the refit analysis did not focus extensively on this level due to the small sample size. No refits were discovered for this time period. Because the number of lithic artifacts was so small, and the area excavated with this horizon spatially limited, it is difficult to draw conclusions regarding intrasite spatial patterns for this time period based on the refit analysis.

5Bw Horizon

Summary

Stratigraphy

The 5Bw horizon was located at 1.7 m below datum and was 0.70 m to 1.2 m thick. This horizon was defined by the geomorphologists after it had been sampled by the archaeological team, thus it is subsumed by the lower levels of field designation F13 and the upper levels of field designation F167. It was a dark yellowish brown (10YR 4/4) silt loam.

Artifacts, Ecofacts and Features

Only a paucity of artifacts was recovered, and those were from the F13. This most likely represents minor natural downward migration of the cultural material from the upper levels of the F13, which contained more substantial evidence of prehistoric occupation in the form of cultural features and a small number of artifacts.

Chronology

No diagnostic artifacts of charcoal suitable for radiocarbon dating were found in association with 5Bw excavations.

Artifacts

The flaked stone artifacts recovered from the 5Bw horizon include a small number of debitage artifacts (n = 5) and one projectile point/knife fragment.

Flaked Stone Tools

One pp/k was recovered after mechanical stripping below the 4Bw horizon, in Field designation F13, Level 13. This artifact was a blade fragment of an untyped stemmed or notched Onondaga chert pp/k (Catalog no. 3233).

Debitage

Five debitage artifacts were recovered in the 5Bw horizon, with a total weight of 0.9 g.

Mass Analysis

All debitage from this horizon was sorted according to size, as discussed above. Three of the debitage measured < 0.25 in and two measured between < 0.5 in and > = 0.25 in. All the debitage was made of Onondaga chert. A single flake exhibited cobble cortex; no other cortex was present in this assemblage. Another one of the flakes exhibited evidence of thermal alteration.

Detailed Analysis of Whole and Proximal Flakes: Results

All the whole flakes and proximal flake fragments from the 5Bw horizon were analyzed for the detailed analysis, consisting of three proximal flakes. All of these specimens were categorized as secondary reduction. Each exhibited a bulb of percussion;

two had flat platforms with angles of 50 to 54 degrees and 70-74 degrees, while the third has a lipped platform with an angle of 35 to 39 degrees.

5BC Horizon

No cultural materials were recovered from this horizon and no radiocarbon dates were obtained.

6AC Horizon

No cultural materials were recovered from this horizon and no radiocarbon dates were obtained.

6BC Horizon

No cultural materials were recovered from this horizon and no radiocarbon dates were obtained.

7AC Horizon

No cultural materials were recovered from this horizon and no radiocarbon dates were obtained.

7CB Horizon

No cultural materials were recovered from this horizon and no radiocarbon dates were obtained.

8AC Horizon

A single chert flake (Catalog no. 3637.1) was recovered during mechanical trenching within this stratum. Because it was recovered by the backhoe bucket, the provenience is suspect, and the artifact may have originated from an overlying stratum, although the flake did appear to be encased in 8AC horizon soils. No other evidence of cultural activity was encountered in this horizon, and no radiocarbon dates were obtained.

D. DISCUSSION

In this section of the report prehistoric finds, as described in Section C, are discussed again within the context of the research questions posed in the District's DRP and associated Statement of Work.

Site Settlement Patterns

Prior to excavation, it was expected that identification of intrasite and intersite settlement patterns could address internal site arrangement, as well as the patterning of relationships between sites. It was proposed that an understanding of the distribution of sites across the landscape and their functional relationships would be a focus for intersite settlement patterns and that determining the function of the occupations represented would be important for understanding the components of the settlement systems. Specific questions posed in the DRP regarding intrasite settlement patterns are as follows:

- What is the site type?
- What is the size of the occupation surface?
- What types of features and activity areas are present?
- What is the spatial patterning or relationship of features and activity areas?
- Is there evidence of structures or shelters?
- Is there evidence of storage features?
- What is the estimated population size and/or population density?
- Is there evidence of specialization or abundance of certain types of resources?

The following research questions were posed for the intersite settlement theme:

- How does the site compare to other riverine and/or island sites dating to the Archaic Period?
- How does information with this site "fit" with the current settlement pattern models for the region?
- Are the settlement patterns identified at Site 36AL480 similar to other sites in the region of the same time period?

In order to answer these research questions, a broad range of site data was considered. First, the set of known or recognized site types for Late and Terminal Archaic and Early Woodland Period sites was considered. Late Archaic site types include semi-permanent or permanent base camps situated on river terraces, with smaller, shorter-term, more focused seasonal or extractive locations located away from the rivers in uplands and/or along drainages. Examples of smaller short-term site types include quarries and lithic workshops near raw material sources and camps centered around seasonally available food resources, such as fruit, nuts, fish, and game. Similar patterns are seen in the Early Woodland period, with site types increased to include villages and hamlets, earth and rock mound sites, and open lithic scatters; all of which occur in riverine and upland settings (Weed 2002).

The feature and artifact assemblages of each site type were then considered and compared to materials recovered in Area 3-South. Long term settlement sites should be reflected in the archaeological record by multiple structural remains; features associated with food processing, preparation, storage and waste management; and a robust, varied, and generalized tool kit or artifact assemblage possibly including ceremonial materials. Shorter term special purpose sites should be reflected in the archaeological record by specialized tools and features; the quantity of these materials would presumably be less than at a permanent or semi permanent site, as a shorter stay should result in less waste and discard.

Multiple spatial analyses were also carried out to look for patterning in the distribution of artifacts and features across the site. This work was done to confirm that the distribution of materials across Area 3-South was the result of cultural rather than natural processes; to look for evidence of activity areas; and to try to determine if clusters of artifacts and features reflected contemporary occupations by social or functional units or if they in fact represented multiple smaller visits to the site.

The spatial analyses, when combined with refit studies, were also examined to help assess site integrity. Regrettably, very little information could be deduced based on the refit analysis. For both the AB horizon and 2BC horizon lithic components, only secondary refits could be accomplished between excavation units. Secondary refits are classified as refits occurring between fragments that seem to originally have come from the same stone based on unique shared characteristics, but which do not physically join in a reliable fashion. Artifacts were identified as secondary refits for the AB horizon and 2BC horizon occupations based on cortex type and texture, the mineral composition and texture of the interior of the stone, any distinctive mineral or fossil inclusions that were shared by the related lithic fragments, general size and external contour of the stone fragments, and in some cases the physical proximity of the excavation units from which the artifacts were recovered. Within the 3Bw horizon, three secondary stage reduction flakes refit. There was also a primary refit between lithic artifacts from the 3Ab2 horizon. No other refits were discovered for the 3Ab2, 3Ab1, or 4Bw soil horizons. The Woodland component found in the AB horizon provided the smallest quantity of refits among the three horizons on which the refit analysis focused, and the only refits from the AB horizon were secondary refits.

There are three interpretations for the low number of refits from the Area 3-South assemblage: 1) occupation of Area 3-South during all the time periods was intermittent, so that tools shaped from flakes were removed from the site; 2) post-depositional scouring and erosion of the area has disturbed the excavation area to the extent that the connecting artifacts are missing; and/or 3) the prehistoric activities that took place at the site as a whole were conducted in an area that is larger than Area 3-South, and so interstitial flakes that might provide primary refits may be found in other areas of the entire site. It is interesting to note that the prehistoric ceramic analysis (Appendix 8O) also suggests that there was some natural disturbance (e.g., flooding, scouring) of the AB horizon, based on the size and condition of the sherds recovered outside of cultural features.

Intrasite Settlement Patterns

Diachronic Comparison of Intrasite Settlement Patterns

A number of interesting and varied spatial patterns were identified during the spatial analysis. The patterning that was apparent did not seem to reflect the kinds of normal or regular distributions that result from natural formation processes. Natural formation processes result in patterning that is regular, such as sorting by size. This type of patterning did not seem to characterize the Terminal Archaic or Early Woodland assemblages. Therefore, it is clear that the patterning that is evident resulted from behavioral processes.

In the Terminal Archaic period, the focus of activity in the area that was excavated (activities certainly took place beyond the limits of our excavations) was focused in the central portion of the excavation block. These activities were primarily associated with tool use and discard, tool manufacture and retouch. The clusters evident within individual artifact classes *may* reflect an even finer breakdown of activity areas within the larger generalized activity area in the central portion of the excavation block. However, as most of those clusters are not widely separated (they are directly adjacent to one another in most cases),

such a conclusion would be rather tenuous. Furthermore, based purely on basic artifactual and spatial data, the nature of such high-resolution distinctions would be difficult to define.

Another interesting pattern evident in the Terminal Archaic assemblage is the rather distinct distribution of bipolar artifacts. Bipolar artifacts are confined to the northern half of the excavation block, while the other artifact classes are relatively confined to the central and southern portion of the block. A small concentration of groundstone artifacts is coincident with the bipolar artifacts, however. It seems that the northern portion of the block represents an area where a distinct flaking technology was implemented along with the conventional method represented elsewhere within the block. Bipolar artifacts are generated by using anvils, which can be groundstone artifacts, and in fact one of the groundstone artifacts in the northern area was classified as an anvil. It is interesting that there are groundstone artifacts located in the only place where bipolar artifacts are found. It may be that groundstone and bipolar artifact technologies were associated in the Terminal Archaic occupation of the area that was uncovered through excavations.

The distinct distribution of bipolar artifacts and the other artifact classes could have resulted from two possible scenarios. First, this pattern may have resulted from different functional activities taking place at a single temporal occupation. In other words, different activities associated with a single occupation during the Terminal Archaic period may have resulted in the differential distribution of bipolar artifacts and other artifact types. Second, the pattern may have resulted from two different occupations of the area lying within the excavation block. One occupation may have been primarily concentrated in the area lying in the central portion of the excavation block. This occupation would have involved activities primarily associated with stone tool use, manufacture and maintenance/retouch. Another short-term occupation could have involved an individual making and utilizing bipolar flakes.

Two broadly defined clusters of artifacts characterize the Early Woodland component. Again, these two clusters may reflect temporal differences or they may have resulted from patterned behavior during a single occupation. The two clusters are composed of basically the same artifact classes; therefore, functional differences do not seem adequate to explain the clustered distribution of material remains. It is more plausible that the clusters reflect the social composition of the group that was occupying the area. In this case, each cluster would represent a separate social unit. This could be a nuclear family, though it is more likely something less complex, perhaps a single individual or pair of individuals. Short-term temporal differences may also account for the distribution. The two clusters may represent the activities of a single small group, over a period of a few weeks. In this case, each cluster could represent different areas in which activities, conducted by the same social unit, were concentrated for a short period of time. Alternatively, the two clusters may have resulted from natural formation processes, but as discussed above, this seems unlikely.

The portion of the Early Woodland component that was excavated in Area 3-South also seems to indicate the presence of two concentrations of hearth-related features in the northern and southern halves of the excavation block. Coincident with these hearth features are high densities of FCR, which is concentrated in the northern and southern ends of the excavation block. This seems consistent with the idea that the two clusters represent the

short-term occupation of two social units, though not necessarily at the same time. Of course, more clusters may be present beyond the excavation block, so it is difficult to evaluate the full extent of the occupation based on current data.

As with the Terminal Archaic, there is a correlation between groundstone and bipolar artifacts for the Early Woodland component. This raises an interesting and provocative interpretation. Perhaps groundstone and bipolar tool technologies were somehow linked within the cultural groups living in the upper Ohio Valley during the Terminal Archaic and Early Woodland periods. The linkage between the technologies could be functional in nature, or social. What is clear is that there is a correlation between bipolar and groundstone artifact distributions for both the Terminal Archaic and Early Woodland components. Some of the groundstone artifacts were in fact interpreted as anvil stones; however, many of the other specimens appear to more closely resemble nutting stones. Any interpretation regarding this linkage must be made with caution, however, since it rests on very small samples.

A much stronger relationship in artifact patterning between the Terminal Archaic and Woodland components was identified. This is the very strong, highly significant negative correlation between flakes and FCR for both the Terminal Archaic ($r = -0.969$, $p < 0.001$, $n = 165$) and Early Woodland ($r = -0.987$, $p < 0.001$, $n = 197$) components. Therefore, as one increases in density relative to other artifact classes, the other tends to decrease in density relative to other artifact classes. Furthermore, features in both the Terminal Archaic and Early Woodland components tend to be located in the same areas where FCR density was highest. Thus, hearth-related features tend to be located near, but not superimposed over, areas where tool use, manufacture, and maintenance/retouch took place.

No matter what conclusions the reader may take away from this analysis, the spatial analysis does strongly suggest that the Terminal Archaic and Early Woodland components both represent very short-term occupations. The small sample sizes are direct testament to this. Also, since there is very little overlap between hearth-related features and the various classes of artifacts (except, of course, for the FCR), it seems a short occupation characterizes each component. Finally, given the striking similarities between patterning evident in the Terminal Archaic and Early Woodland components, it is reasonable to suggest that the ways in which Terminal Archaic and Early Woodland populations exploited this area of the Ohio Valley were similar. Moreover, it seems that there was cultural continuity in their perception of space as they utilized and structured their living space on a short-term basis in a very similar way.

What is the site type?

In summary, artifacts and features found at Area 3 South are not strongly diagnostic of a specific site function or type. They may be one of two things—the remains of activity areas on the periphery of a large semi-permanent to permanent base camp or village; or the remains of small short-term focused activity areas.

Archaeological remains identified within Area 3-South are affiliated primarily with the Late Archaic and Early Woodland Periods. As discussed in Weed (2002), Archaic period site types generally are thought to have consisted of permanent or semi permanent base

camps located on river terraces and smaller hunting or extractive camps focused on seasonal or diffuse resources in other settings. Similar patterns are seen in the Early Woodland period with site types increased to include villages and hamlets, earth and rock mound sites, and open lithic scatters, all of which occur in riverine and upland settings.

Generally speaking, materials found in Area 3-South are not indicative of a permanent or semi-permanent base or macro band camp as would be expected based on the riverine setting. Permanent or semi permanent occupation would be suggested by:

- Structural remains as indicated by recognizable patterns or configurations of post holes or post molds along with other features
- Storage pits, trash pits, or middens, particularly with stratification or evidence of multiple and repeated use
- Numerous artifacts, including a diverse tool kit and faunal materials.

The Early Woodland component identified in the AB horizon had five possible post molds, all of which were smaller than 10 cm in diameter and unlikely to support a structure of any magnitude or duration; they more than likely were associated with something more short term or temporary like a wind break or drying rack. No other features interpreted as potentially structural were found. Likewise, pit features, that is, those thought to potentially be something other than a hearth, cooking pit, or post mold, numbered only six out of 78 total identified features and were spread across three of six feature bearing horizons. This does not indicate any sort of long term occupation or use. Features suggesting a focused or longer term stay at Area 3-South are limited to the AB horizon and include two large, multi-use, stratified nut processing pits and a few other deeper hearths with possible stratified fills. Such stratification, however, could have occurred over multiple uses of a feature during a single period of occupation at the site, or as a result of several recurrent occupations of the site over multiple seasons where a feature was still visible and was refurbished and reused, thus creating the stratified nature observed during excavation. A feature that may support such an interpretation is Feature 243 where side-slumping and apparent infilling of the feature was observed, suggesting the feature was abandoned for a period of time and then reused.

The Area 3-South Artifact assemblage was small and not diverse. The District estimated that as many as 30,000 lithic artifacts could be recovered in this location during the data recovery. In fact, only 226 flaked and groundstone tools and 7,865 pieces of debitage were recovered in total. Tool types were limited to pp/ks, none of which actually served as points for hunting; bifaces; eight overtly utilized flakes or expedient tools; and 21 groundstone items comprising seven nutting stones, six hammerstones and anvils, five pitted stones of indeterminate function, and two net weights. Absent from the assemblage were numerous kinds of tools associated with prehistoric life ways during the Late Archaic and Early Woodland periods like scrapers, spokeshaves, pipes, gorgets, adzes, celts, axes, mauls, drills, or awls.

If the materials found in Area 3-South are not the remains of a settlement or village, then it should follow that they are associated with some sort of specialized, short term, or

focused activity, potentially expressed archaeologically by a specialized tool kit and/or distinctive feature types. There is some suggestion of this, specifically with the Early Woodland Period occupation identified in the AB horizon. Features 238 and 243 are large pit features containing fired clay flooring and copious amounts of nutshell and FCR. Additionally, all of the pp/ks found in this horizon have edge angles indicative of scraping tasks as opposed to piercing or slicing, although wear indicates scraped materials range from hard to soft. Two net weights were found in this horizon, which may be the remains of a single fish harvesting event. Tool manufacture, use, and maintenance clearly occurred in Area 3-South but only on a small scale. Late Archaic period results are similar—nut shell and nutting stones were found indicating use or processing of nuts. Stone tool manufacture, use, and maintenance also occurred on site. Use-wear analyses of the pp/ks for the Late Archaic period assemblage indicate generalized use as knives for cutting and slicing as opposed to scraping or piercing.

What is the size of the occupation surface?

Site 36AL480 is 12 acres in size; the Area 3-South excavation block was a 200-m^2 sample of the site. Within this work area, concentrations of artifacts and features were found in five strata as summarized below.

AB horizon containing an Early Woodland component: artifacts and features were found across 254 m^2 of excavations which went beyond the 200 m^2 block on the east, west, and south sides; archaeological deposits associated with this component are likely present exterior to all sides of the excavation block.

2BC horizon containing a Terminal Archaic Period component: artifacts were found across 80 m^2 of excavations executed as a 40 percent sample of the larger block; additional materials may exist outside of block.

3Ab1 horizon containing a later Late Archaic Period component: 116 m^2 of archaeological excavations conducted in this horizon represented a 100 percent sample of the horizon as present in the larger 200 m^2 block; artifacts were found lightly scattered across the horizon and probably extend to the east of the block.

3Ab2 horizon, late Late Archaic Period: 80 m^2 were excavated as a 40 percent block sample; archaeological deposits were found across the 200 m^2 block and probably extend outside of the block on all sides.

3Bw Late Archaic Period: 65 m^2 of excavation, partially outside of the 200 m^2 block; additional materials may exist outside of the block, particularly to the northeast.

4Bw Late Archaic Period: 17 1- m^2 units were excavated in what basically amounts to the northern half of the 200 m^2 block; of these, eight located within a 20 m^2 area produced the majority of the 4Bw artifacts and the two features; the possibility that more temporally affiliated materials may exist exterior to the 200 m^2 excavation block cannot be eliminated, although it is not indicated in the Area 3-South excavations.

What types of features and activity areas are present?

Feature types identified on Area 3-South are limited to hearths (*n* = 63), six indeterminate pits, five possible post molds, and four nut processing stations as summarized in Table 8.96.

Table 8.96. Area 3-South Feature Type and Distribution across Horizons.

Horizon	Hearth	Pit	Post Mold	Nut Processing
AB	24	4	5	3
2BC	14	1		1
3Ab1	3			
3Ab2	12	1		
3Bw	8			
4Bw	2			

Features categorized as hearths included shallow or surface features and excavated pits. Each was characterized by evidence of *in situ* burning combined with FCR and in some cases, additional artifacts. Indeterminate pits lacked evidence of *in situ* burning but appeared to have been excavated and in some cases contained FCR and other artifacts. The possible post molds were all small rounded features in plan view that measured less than 10 cm in diameter with depths that ranged from 4 cm to 34 cm. The nut processing features included two large (Features 238 and 243) and two smaller pits (Features 161 and 211). The larger features were stratified suggesting multiple or repeated uses; and both contained fired prepared clay floors in association with copious amounts of nutshell. They both also included debitage, FCR, ceramics, and varied charred wood fragments, seed remains from early cultigens, and some faunal remains. Feature 243 was large (1.6 m by 1.5 m in plan and 0.73 m deep) and may have seen its final use as a refuse pit. The smaller nut processing pits lacked the clay flooring and were smaller (20 cm to 52 in diameter or length). These, too, contained substantial nutshell, FCR, and evidence of *in situ* burning. An activity area would be suggested by the presence of distinctive features and artifacts within a spatially discreet area.

AB Horizon Possible Activity Areas

Two main clusters of artifacts and features are observed in the AB horizon—one cluster to the north and one to the south. The artifacts and features are similar between the two clusters and suggest a generalized activity set in each location. These artifact and feature clusters may represent the remains of two contemporary social units or two separate visits to the site by a small group of individuals.

A probable nut processing work station is indicated by Features 238 and 243. These features were located within two meters of each other and are both characterized as large multi-use stratified features that included a fired clay floor surface covered by copious amounts of burnt nutshell and FCR. Other remains included edible plant seeds, some faunal material, debitage, and pottery, as well as two pitted stones located in the vicinity (one adjacent to Feature 243 and one within 4 meters east).

An additional nut processing or consumption area in the northwest corner of the excavation block is suggested by the presence of two nutting stones within approximately

four meters of each other in the vicinity of Feature 198, a possible cooking hearth. It is interesting to note that the areas of the excavation block containing the largest features (Features 238 and 243, Feature 177, and Feature 198) each had two pitted stones or nutting stones recovered within four meters of the features. A fishing event may also be indicated by the presence of two net weights in an 8 meter by 10 meter portion of the excavation block. It must be emphasized, however, that the nutting stones and net weights do not suggest intensive, repeated, or focused use of these portion of Area 3-South for nut processing or fishing. These artifacts could be the result of single short-term episodes.

A bipolar reduction workshop or use area may be indicated by the collocation of bipolar cores, debitage and groundstone tools. Groundstone tools identified on site include hammerstones and anvils, which would be used during bipolar reduction. A couple of the pitted stones may also be anvils but were not distinct enough to be assigned to that artifact type. Alternatively, it is possible that bipolar cores, waste flakes, and tools were somehow involved in another activity that also involved the use of groundstone tools.

2BC Horizon Possible Activity Areas

Possible activity areas identified within the 2BC horizon are limited to a single nut processing feature (Feature 211) that contained over 170 nut shell fragments, mixed wood charcoal, two pieces of debitage, and some FCR.

Generalized activity is indicated in the central portion of the excavation block by the presence of a concentration of several artifact classes.

A bipolar reduction area or workshop in the northern end of the excavation block is suggested by the fact that bipolar cores and debitage are clustered with a hammerstone and an anvil in an area separate from other classes of artifacts.

3Ab1 Horizon Possible Activity Areas

In some ways, the 3Ab1 horizon shows a more specialized focus than the overlying cultural horizons. A single concentration of artifacts and features was found. Artifact recovery includes two pp/ks, a biface, two expedient tools, six cores, 108 pieces of debitage, and a hammerstone/anvil. Two nutting stones were recovered from a single unit—N64 E237. Over ten percent of the non-FCR lithic assemblage from this horizon was tools; something not seen in other excavated soil horizons in Area 3-South and possibly indicative of a more focused or specialized activity set. Three features were also found one of which contained significant amounts of nut shell. This when combined with the two nutting stones suggests a focus on nut processing at the site during this occupation. Also, it is worth noting that no bipolar flakes or cores were found in the 3Ab1 horizon. It seems that tool manufacture, use, maintenance, and retouch were less intensive in this horizon than in the overlying AB and 2BC horizons. .

3Ab2 Horizon Possible Activity Areas

Two bifaces, seven cores, one nutting stone and 108 pieces of debitage were found. Unlike the 3Ab1 horizon, bipolar reduction technology was applied on site—five of the seven cores were bipolar. Debitage was concentrated in the southwest corner of the block

and may be indicative of a work area. Otherwise, tools and nut shells were found in low numbers across the site. The distribution of such materials suggests generalized activities occurred across the excavation block.

3Bw Horizon Possible Activity Areas

All of the features and artifact found in the 3Bw horizon were clustered in the northern portion of the excavation block. No formal spatial analyses were conducted for this horizon, and artifacts suggest a generalized activity set that included stone tool manufacture, use, and maintenance. Bipolar reduction techniques were used. Some food preparation is suggested by hearth features; nut shell was found in very small quantity in three of the features.

4Bw Horizon Possible Activity Areas

The remains found in the 4Bw horizon are indicative of an activity area, again, focused on nuts and the possible processing of some other unidentified plant remains. The two largest nutting stones recovered in Area 3-South were found in the 4Bw horizon, in one of two features present (Feature 252). The other 4Bw horizon feature, Feature 251, produced no artifacts, but did produce a curious combination of mixed burnt wood, a single nut shell fragment, and 268 pieces of a reed or grass like plant.

Is there evidence of structures or shelters?

As noted previously, the only indication of structures identified during Area 3-South excavations was five possible post molds found in the AB horizon. Four of these were collocated within a 2 m^2 area and may have been associated with a small structure such as a windbreak or rack of some sort. There were no post holes or larger features encountered that would be indicative of larger more substantial or numerous structures or shelters.

Is there evidence of storage features?

Only six non-hearth pit features were found during Area 3-South excavations, and none of these were overtly used for storage. This includes four AB horizon features—Features 175, 181, 195, and 242; and one each from the 2BC and 3Ab2 horizons (Feature 259 and Feature 249, respectively).

What is the estimated population size and/or population density?

Area 3-South excavations were conducted across a 200 m^2 excavation block on a site measuring 12 acres in size resulting in a sample of roughly 0.004 percent.

Essentially, analyses indicate that the Early Woodland remains found in the AB horizon may well be down to the activities of as few as two or three individuals or as many as two families. Terminal and Late Archaic Period remains associated with the 2BC, 3Ab1, 3Ab2, 3Bw, and 4Bw horizons are also likely to have been the result of a single family unit or even one or two individuals.

Is there evidence of specialization or abundance of certain types of resources?

Evidence of specialization is limited in Area 3-South. Lithic material is almost exclusively locally available Onondaga chert river cobble. This is probably more a result of convenience than "specialization" per se.

In the 2BC horizon, and between the 3Ab1 and 3Ab2 horizons, bipolar artifacts (hammerstones, anvils, and debitage) were spatially segregated from other artifacts on site, a possible indication of specialized activity areas on site.

The two net weights found in the AB horizon suggest that fishing occurred nearby, perhaps as a single event. It is curious that in this setting, no other related artifacts were recovered.

Nutting stones and nut shell fragments were present in nearly every horizon. Two features in the AB horizon, Features 238 and 243 were clearly specialized features associated with foodways—associated botanical materials include walnut and hickory shells and seeds from early domesticates. Some features in other horizons also produced nut shell, but not in sufficient quantity to indicate a specialized industry on site or an abundance of resources.

Intersite Settlement Patterns

How does the site compare to other riverine and/or island sites dating to the Archaic Period?

Occupation periods at Area 3-South broadly include the Late Archaic, Terminal Archaic, and Early Woodland. Models of Late Archaic settlement emphasize the development of a "well-defined schedule of resource exploitation with the increased exploitation of riverine resources…" (GAI Consultants, Inc. 2003:49). It has been proposed that the people of the Late Archaic acted more as collectors than foragers, i.e., groups, probably kin-based, lived at single locations for extended periods. This pattern is suggested to have increased during the Terminal Archaic. These single locations (the base camp) are hypothesized to have been located in alluvial settings near large-order streams or rivers. However, based on the number and types of features in the different Late Archaic and Terminal Archaic horizons, all the Late/Terminal Archaic occupations in Area 3-South appear to be somewhat short occupations. Another line of evidence for this conclusion (in addition to the spatial analyses) is from the small number of retouched tools and cores discarded there at each different time period. Finally, the total weight of the debitage is an indicator of time spent reducing cores and manufacturing either expedient or retouched tools. Table 8.97 presents the number of features, the number of discarded flaked stone tools (pp/ks, bifaces, and expedient tools), the number of cores, and the total debitage weight for each Archaic time period. The assumption here is that the longer a group stays at a site, the more features and retouched tools will be found at the archaeological site, and the greater debitage weight is an indicator of more activity spent manufacturing tools. One caveat regarding debitage weight is that large cores can skew this number. Nevertheless, the rule of thumb that the greater the weight the more activity, would still hold. Two additional assumptions are that each discarded core represents a single manufacturing event (i.e.,

individuals do not hoard reduced cores for future reduction); and that each discarded retouched tool represents a single discard event.

As is evident from Table 8.97, the very small number of flaked stone tools from each soil horizon, especially the Later, Late Archaic (1) and (2) and the Terminal Middle Archaic/Early Late Archaic horizons, suggest brief stays at Area 3-South. This interpretation is tempered in part by the smaller excavation areas for the Terminal Middle Archaic/Early Late Archaic soils. Nevertheless, the two features from that soil horizon could have been constructed and used in as brief a period as two to three days. Similarly, the Later, Late Archaic (1) occupation(s) appear to have been brief, based on the same small numbers of tools, cores and features. Slightly longer stays may be interpreted for the Terminal Archaic and Earlier, Late Archaic Periods. The evidence from the latter, especially, indicates either a longer stay or a number of different occupations took place in Area 3-South. Some of the features appear to have been surface burns or shallow hearths, which may indicate short-term occupations; however, one of the features, Feature 251, was stratified to suggest a longer stay. Fourteen features were identified from the Terminal Archaic Period; however, again the number of flaked stone tools and cores discarded is small. The final line of evidence is the debitage weight. For most of the time periods, the weight is very low; with the exception of the Earlier, Late Archaic Period, the sums are under one kilogram, i.e., approximately equal to or less than one pound of debitage. Again, the calculation for the Earlier, Late Archaic is greater, with the total weight 3.8 kg, just over eight pounds.

In sum, with the exception of the earlier, Late Archaic occupation, the Late/Terminal Archaic occupations at Area 3-South do not appear to fit the model presented above, of longer-term occupations. Instead, they were probably short-term campsites; the walnut shells recovered suggest a fall occupation, although the number recovered is very small.

Table 8.97. Features, Flaked Tools, and Cores Recovered in Late Archaic and Early Woodland Horizons.

Time Period	Number of Features*	Number of Flaked Stone Tools	Number of Cores and Core Fragments	Total Debitage Weight (g)/(Core Weight Included)
Early Woodland	36	36	65	2,922.70 (957.01)
Terminal Archaic	16	18	7	530.8 (292.96)
Later, Late Archaic (1)	3	5	6	803.2 (319.95)
Later, Late Archaic (2)	13	2	7	324.1 (113.06)
Earlier, Late Archaic	8	19	31	3812.8 (1141.08)
Terminal Middle Archaic/Early Late Archaic	2	1	0	27.8 (0)

* Number includes possible and probable cultural features.

The Early Woodland occupation presents a slightly different picture, one of either slightly longer-term occupation(s) or a greater number of short-term occupations (see Table 8.97). The number of features is much greater than the Archaic periods, and a number of features were stratified, to indicate longer periods of use or episodes of reuse. Features include deep features probably used as cooking or roasting 'pits,' as well as hearths, both deep and shallow. The Early Woodland component also yielded a few post molds in close proximity to each other, the only evidence at Area 3-South for some sort of activity requiring a wooden structure, possibly part of a cooking/drying rack or wind break. The number of flaked stone tools is still relatively small, but the presence of 65 cores suggests a more substantial or frequent occupation than was evident in the Archaic Periods. It is interesting to note that despite having more evidence for longer-term occupations (e.g., more tools and cores), the types of formal tools are almost limited to pp/ks and bifaces, a tool assemblage typical of highly mobile groups. Distinctly absent from the tool kit are any kinds of prepared scrapers or drills; however, the microwear analysis did indicate that some of the pp/ks, bifaces, and a sample of flakes were used for scraping or slicing. There were seven pitted stones/nutting stones and two net weights, but these could easily represent highly focused, short-term seasonal extraction camps. The total debitage weight is 2.92 kg, or approximately 6.4 pounds. This weight still represents a very small amount of material, and theoretically could have been used in a small period of time. Finally, 222 ceramic sherds weighing 538.5 g were recovered and appear to be associated with the Early Woodland occupations. The analysis identified 21 different temper types or combinations of temper indicating a minimum of at least 21 different ceramic vessels. It is possible, given the fragmentary nature of an assemblage such as this, that in rare situations more than one defined temper combination could originate from a single vessel given the similarity in some of the temper categories. In sum, the evidence from this time period is markedly different from most of the Late Archaic remains and suggests a longer or more frequent occupation. However, interpretation regarding settlement pattern and comparisons with other Early Woodland sites is difficult since the site has been truncated, and the portion that was excavated, Area 3-South, most likely represents only a portion of what was once a larger Early Woodland component.

How does information with this site "fit" with the current settlement pattern models for the region?

Current settlement models for the Late Archaic Period and Woodland Periods include large semi-permanent or permanent base camps on river terraces and smaller short term resource procurement oriented sites in uplands away from rivers. The materials recovered from Area 3-South are not indicative of long term, large scale settlement as there is very little evidence of structural remains, storage features, or trash pits. Further, the tool assemblage is limited, and the density of artifacts is very light. In sum, Area 3-South remains do not fit well with current settlement pattern models. It must be acknowledged, however, that the Area 3 South remains may represent only activities and events that occurred on the periphery of a larger site and or that features and artifacts associated with longer term settlement did not survive.

If the materials found in Area 3 South are not the remains of a settlement or village, then it should follow that they are associated with some sort of specialized, short term, or focused activity; potentially expressed archaeologically by a specialized tool kit and/or distinctive feature types. Some of the artifacts and features found are clearly associated with nut processing. Others clearly show that stone tool manufacture, use, and maintenance occurred on site. However, no materials were found in large enough quantity or consistently enough to indicate that Area 3-South was particularly appealing as a specific or specialized resource procurement locale.

Are the settlement patterns identified at Site 36AL480 similar to other sites in the region of the same time period?

Patterns of settlement for the Appalachian Plateau have been described in models of settlement systems based on archaeological finds in the region, and ethnographic studies of modern hunter-gatherers and nomads. The model in general use proposes resource procurement sites in upland areas, with base camps on post-Pleistocene terraces and base camps located along rivers at the close of the Archaic Period. In addition, models for associated micro- and macro-band composition have been proposed based on similar data, where changes in group size are related in large part to changes in abundance and availability of food sources. Towards the close of the Archaic Period, there is evidence for an increasing reliance on food storage, longer site occupation, and less group movement throughout the year, and this pattern continues into the Early Woodland Period (Raber et al. 1998). This pattern, of larger base camps along rivers, could hold true for Area 3-South. However, the Archaic Period finds are small in number, suggestive of numerous short-term occupations for those periods, as described above.

In contrast, the Early Woodland component of the site may be the remains of a longer-term occupation(s), based on the number and type of features, especially the stratified multi-use features. Because Area 3-South is only a fragment of a larger site that has been scoured and disturbed due to flooding and other post-depositional processes, a complete picture of the occupation(s) is not possible. It has been suggested that "the prominent settlement pattern for Early Woodland cultures in the Upper Ohio Valley consisted of mortuary/ritual sites on alluvial terraces of major streams and rivers and resource extraction camps in uplands and along smaller streams" (GAI Consultants, Inc. 2003: 69). The presence of the Adena and Half-Moon Cord-Marked sherds associates Area 3-South with the Adena peoples, either directly or through trade. However, no evidence of burials or earthworks, or special artifacts such as copper beads, or pipe fragments, all hallmarks of Adena peoples, were recovered at the site. Instead, the presence of utilitarian tools suggests the site may fall into a category of habitation site, or 'resource extraction camp.' A comparison can be made with the Early Woodland Mayview Depot (36AL124) and Mayview Bend (36AL125) sites, also located in Allegheny County, Pennsylvania, approximately 18 miles southeast of Area 3-South. Both had low artifact densities, with almost no lithic tools recovered at Mayview Bend. A total of 75 hearth and refuse pit features was found at Mayview Depot, which was interpreted as a habitation site, while Mayview Bend was interpreted as a limited activity area (GAI Consultants, Inc. 2003).

An additional comparison can be made with the West Runway Site, located in Boone County, Kentucky, although it is located approximately 300 miles southwest of 36AL480. That site yielded Fayette Thick sherds in association with Kramer pp/ks. Radiocarbon analysis dated the occupation at between 770 B.C. and 390 B.C. Artifact and feature density was low. The site is assumed to predate the Adena culture but provides a comparison in that it is identified as a habitation site that consisted of a small group of people, based on the lithic assemblage and small number of features and ceramics identified (Bergman et al. 1998).

A history of the excavations of Adena sites shows that most of the excavated sites are ritual and mortuary sites, especially mounds. As a result, less is known about these Early Woodland habitation sites. Nevertheless, based on existing data, a model of dispersed settlement for Adena groups in the Ohio Valley has been proposed, with small social units "operating in restricted, internally less diverse territories than those of the Late Archaic" (Bergman et al. 1998: 29). The suggestion is that while Late Archaic peoples were moving towards more sedentary settlement patterns, Adena peoples focused efforts on smaller extractive territories, with the larger 'base camps' of the Late Archaic Period abandoned for more dispersed habitations. It is possible that Area 3-South remains represent such a smaller habitation site.

In sum, findings from Area 3-South suggest the area was used repeatedly as a small occupation camp and resource extraction area during the Archaic Period overall, but that the settlement during the Early Woodland does not fit easily into the current model of mortuary/ritual sites on major rivers with resource extraction camps along smaller streams and upland locales. The Early Woodland component at Area 3-South seems instead to represent a somewhat larger, slightly more long-term habitation site, similar to Mayview Depot, and may fit into a model suggested by Railey (1991), in which the Adena peoples had a dispersed settlement pattern, with smaller groups of people focused on local seasonal resources. The lack of ritual artifacts, and the presence of pedestrian tools and ceramics support this suggestion.

Subsistence and Seasonality Studies

The DRP recognized that undisturbed occupations may yield important subsistence data and that flotation of samples from features might recover plant and other food remains, thereby allowing conclusions to be made regarding paleo-diet, seasonality, and site activities. The DRP stated that discussing the types of food resources in the context of the local environment would add to the information gained from this site, and that recovery of subsistence remains would permit comparisons with other similar sites in the Appalachian Plateau Province and Upper Ohio Valley. Specific research questions posed for this theme include:

- Is there any evidence of a diachronic change in subsistence practices?
- How important are riverine versus non-riverine resources in the diet?
- What specialized food acquisition and/or processing tool types were recovered?
- During what season(s) was each living surface occupied?

- Are there storage pits or other features present, which would indicate longer periods of occupation?
- Is there variability in plant and animal remains between features that may add to our inferences regarding activity areas?
- Is there evidence of site specialization or abundance of certain types of subsistence resources?
- What does the archaeological evidence suggest as to how and where food processing or preparation was performed?

Questions specific to faunal remains include:

- What animal species were present?
- What animals were consumed?
- What is the habitat for these faunal resources?
- During what season are these animals easiest to procure?
- How were these foods processed or prepared?

Questions specific to botanical remains include:

- What types of plants, nuts, and berries were identified?
- What floral remains were possible food sources?
- During what season are these floral remains collected for food?
- Is there evidence of cultigens?
- What wood species were used for firewood?

Questions regarding subsistence and seasonality at Area 3-South were addressed primarily by examining the results of the paleoethnobotanical (Appendix 8P) and faunal (Appendix 8O) analyses, as well as the microwear analysis (Appendix 8M) and the presence of nutting stones. A total of 67 hand-collected and 51 flotation samples were analyzed as part of the paleoethnobotanical analysis. Of the hand-collected samples (1,187 fragments), the majority of plant material recovered from all soil horizons consisted of nutshell fragments (96 percent by weight, 92 percent by count). Black walnut (*Juglans nigra*) was the most common nut present, followed by butternut (*Juglans cinerea*). Thick-shelled hickory was present in much smaller quantities (three percent of the nutshell fragments). Three acorns were recovered from two samples. No other categories of nut fragments were recovered from hand-collection.

The flotation samples presented the same pattern for the overall plant remains, with greater than 95 percent of nutshell fragments belonging to the walnut family, dominated primarily by black walnut and secondarily by butternut, though due to the small fragments typically recovered from flotation, 66 percent of the fragments from the walnut family were unidentifiable to species. As in the hand-collected samples, only three percent of the nutshell fragments were thick-shelled hickories, though in the flotation samples hickories were fairly common, occurring in 25 percent of the samples. Small quantities of acorns and hazelnuts were recovered from flotation as well. No other nut varieties were present in the flotation samples.

The only two faunal taxa positively identified were deer and rabbit. The majority of the faunal remains recovered were highly fragmented and calcined, thus obscuring identification. A total of 1,084 bone and mussel shell fragments was recovered from four features and eight units. The majority of these remains (97.7 percent) could not be identified to the class level, and only 0.8 percent was identified below the level of class. The freshwater mussel fragments were recovered from the plow zone, and thus were most likely historic in origin. From the overall faunal remains at Area 3-South, little information could be deduced as to how the fauna were procured, processed, or prepared for utilization as food, for no evidence of butchering could be observed, due to the poor level of preservation of the finds. This is unfortunate, because the rich riverine aquatic and semi-aquatic areas and well-drained terraces at the site would have supported a great variety of faunal resources for inhabitants of the ecosystem at the site, and faunal archaeological remains could potentially have provided vital information on subsistence, seasonality, and diachronic patterns of change in subsistence practices and resources.

Subsistence and Seasonality Studies by Soil Horizon

AB Horizon Floral and Faunal Recovery

The majority of plant remains recovered came from just two features, Features 238 and 243. These two Early Woodland features are the latest features sampled at the site, and date to the first two centuries A.D. Quantities of plant remains recovered at the site remained approximately the same through time until an abrupt increase in quantity recovered from these two features. The majority of plant remains and 95.6 percent of the total weight of nutshell from flotation came from these two features; the majority of plant remains recovered from hand-collection was also found in these two features. Most of the nut fragments recovered from Features 238 and 243 were walnut, over a thousand in number. Similarly, of the 455 seeds recovered from flotation, 442 were found in Features 238 and 243, although the average number of seeds per liter of feature fill was very low for the rest of the features across the site, including the majority of Early Woodland features. The only seeds recovered during hand-collection (n = 14) came from Feature 238.

The majority of seeds recovered from these two features was goosefoot seeds (*Chenopodium* spp.) and erect knotweed seeds (*Polygonum erectum*), and these two seed types were only found within Early Woodland features. Both of these seed types are starchy grain annuals and are part of the Eastern Agricultural Complex, and both goosefoot and knotweed could be utilized either as greens or processed as flour.

Analysis of the seed coats of the goosefoot/*Chenopodium* suggests that they probably are not of the domesticated variety found at other sites in the Midwest (*Chenopodium berlandieri* spp.), but rather are most likely *Chenopodium album*, or common lamb's quarters, often found in disturbed open ground. Furthermore, the erect knotweed seeds showed no evidence of morphological changes that would suggest domestication, but the abundance and frequency of this type of seed in Midwestern sites suggest that it was nevertheless a cultivated resource. Goosefoot and erect knotweed both have a documented connection to domestic cultivation and have often been found together at Midwestern sites

from the Middle Woodland and later. The recovery of high numbers of these seeds from Features 238 and 243 may suggest the possibility of early stage cultivation at the site, the possible presence of cultivated grains within the diet, or the most likely scenario in this instance, an increased focus on the exploitation of standing plants within the subsistence diet of humans residing at the site during the Early Woodland Period. Other seed types also recovered from the two latest features were honeylocust, poke, and possible leadplant, though these give no further information as to potential cultivation of plant resources.

The presence of goosefoot and upright knotweed within these two features does give some potential clues to seasonality during the Early Woodland Period at Area 3-South. Goosefoot and knotweed were often harvested from June through October (Boyd et al. 1998:159). Thus, their presence in Features 238 and 242 suggests a period of habitation of the area at least during those months. Furthermore, the generally accepted period of nut gathering for the species of nut present within the archaeological record at Area 3-South is for a short period (due to competition from other animals) during the fall. However, in contrast to gathering, nut utilization normally occurred either in late winter and spring or spring and early summer, when other types of resources may have become scarce. Thus, since nuts (and seeds for that matter) can be a stored and even transported food commodity, deductions of seasonality can be somewhat problematic. It is likely that the inhabitants of what is now Area 3-South gathered walnuts in the area, since low valley bottoms and slopes are ideal environments for these trees. The presence of abundant nut fragments in the archaeological record for these two features of the Early Woodland period are evidence that inhabitants also resided at Area 3-South at least at some time in the Early Woodland period, even if intermittently, during the season of maximum nut utilization of late winter and early spring. This theory would hold true for the other time periods represented at the site as well, due to the fact that nuts, especially walnut, were the dominant edible plant material recovered from all soil horizons.

The presence of nutting stones, identified as tools used for cracking open nuts, in the Early Woodland component (as in other horizons) would also indicate habitation at the site during the season of nut utilization (winter/spring). At least one of the nutting stones retrieved from the AB horizon was quite large and thus may have been produced at the site for the purposes of nutfood processing rather than merely transported there. Regrettably, no fruit remains of the types found at other area sites (such as blackberry, raspberry, cherry, or grape) were recovered from the site overall; these could have provided further information pertaining to seasonality.

Additional information regarding subsistence is available from the faunal remains recovered. A total of 98.8 percent of the overall faunal remains from Area 3-South were recovered from the Early Woodland component, and the majority of these came from Features 238 and 243, the two latest features on the site. A total of 892 faunal fragments were recovered from Feature 238, of which eight specimens were identified as potential white-tailed deer (*Odocoileus virginianus*). Eleven fragments from this feature were derived from large mammals, most likely deer. All other bone fragments from this feature were calcined and thus unidentifiable to the class level. A total of 155 bone specimens were recovered from Feature 243, though none could be classified below the level of class.

Finally, a small amount of faunal remains were recovered from four units in the AB horizon, including a tentative identification of rabbit and a femural head fragment of a small mammal.

A rich resource of both aquatic and terrestrial animals would be expected in the area of the site, and could provide information as to seasonality and subsistence during the Early Woodland period, as during the other horizons represented at Area 3-South. The faunal remains from the Early Woodland period do not yield such information, however, except for the presence of white-tailed deer and rabbit, which would be available any time of year. If inhabitants lived in the area during the fall, as the gathering of nut resources and the utilization of goosefoot and erect knotweed may suggest, one would expect the availability of waterfowl; no such animal remains were recovered however. There is also a lack of faunal evidence for consumption of aquatic freshwater faunal species. However, groundstone tools recovered provide some evidence for fishing. The Early Woodland horizon was the only horizon from which net weights were recovered. Two net weights, one of quartzite and one of sandstone, were recovered from the AB horizon, both from general excavation unit proveniences rather than from features.

Finally, the microwear analysis revealed that of the pp/ks and bifaces exhibiting edge wear, all appeared to be utilized for scraping. Thirty-five percent of the identified edges on the pp/ks showed evidence of working unyielding substances, such as wood, woody plants, antler or bone, while another 29 percent showed signs consistent with processing skins or hides, or possibly even limited fish scaling or splitting of material for basketry. The utilized edges on the bifaces also appear to have been used on unyielding, resilient materials, although 63 percent of those edges are not as steep and can be considered more general utility edges. Of the 454 flake sample examined, six utilized flakes were determined to be from scraping tasks, and another 75 small-flakes/microliths showed edges suitable specifically for slicing or cutting, various more general tasks, and scraping or gouging.

2BC Horizon Floral and Faunal Recovery

The Terminal Archaic (2BC) component did not show any significant change in subsistence plant utilization from that of the other Archaic soil horizons. Reliance on nutfoods, primarily black walnut, characterized this time period as was true of other horizons. One transitional Terminal Archaic feature, Feature 211, however, was anomalous to all other features at the site in its variety of nut foods, for it was the only feature sampled which contained all of the nut varieties found in plant remains at Area 3-South. Feature 211 was the only feature that contained black walnut, butternut, hickory, acorn, and hazelnut all in one single provenience. This feature also was one of the few features on the site that had a marked abundance of nut remains (n = 242), primarily walnut and thick-shelled hickory. Six mustard seeds were recovered from Features 211 and 212, but because this seed type is Eurasian in origin and not native to the area, the seeds are likely modern in context. No nutting stones were recovered from this soil horizon, and few nut and seed remains were recovered from the other 2BC features, so little specific information pertaining to seasonality or subsistence patterns other than the general seasonality of nut utilization given in the Early Woodland discussion can be deduced.

Only one single unburned bone of a large mammal was recovered from the 2BC horizon, and therefore no subsistence or seasonality information can be inferred from the faunal remains for this horizon.

Unfortunately, the microwear analysis interpretations did not separate out each Late/Terminal Archaic component; therefore, the microwear results for all Late Archaic artifacts examined are summarized here. Of the 80 artifacts examined for evidence of edge wear, 13 were pp/ks that showed substantial use consistent with a knife, and two appear to have been used for scraping hides or skin and possibly limited processing of bone or scaling fish. Eight of the 10 bifaces examined showed signs of being used on unyielding materials, such as wood, woody plants, antler or bone. Nine utilized/retouched flakes were large enough to be handheld implements, two of which were considered "multi-tools" and the others, along with 15 additional microliths, evidenced use ranging from slicing to scraping.

3Ab1 Horizon Floral and Faunal Recovery

The small amounts of botanical and faunal remains recovered from this horizon prohibit any significant deductions pertaining to seasonality or subsistence patterns for this component, although two nutting stones were recovered from the 3Ab1 horizon.

3Ab2 Horizon Floral and Faunal Recovery

Very few nut, seed, or faunal remains were found in this soil horizon, prohibiting significant interpretation of seasons of occupation, specialization, or subsistence patterns. One nutting stone fragment was recovered, however.

3Bw Horizon Floral and Faunal Recovery

A small amount (n = 35) of nutshell remains were recovered from this soil horizon, following the general pattern found throughout the soil horizons of a predominance of black walnut, butternut, and hickory as botanical foodstuffs. No nutting stones were recovered from this horizon, however. Again, the botanical sample for this horizon is too small to draw any conclusions regarding plant use or seasonality, and the faunal remains provide no information regarding a reliance on the fauna of the area or any patterning therein.

One feature from the 3Bw horizon, Feature 251, yielded 250 charred specimens of a type termed "Type J." As discussed previously, these specimens were composed of fragile, thin, flat flakes of a material with small braided striations, identified as most likely deriving from the stems of a reed or grass-like plant but otherwise unidentified, thus prohibiting conclusions as to a potential role of the specimen in the subsistence of inhabitants of this time period.

4Bw Horizon Floral and Faunal Recovery

The presence of two nutting stones indicates that utilization of nut resources was practiced in this earliest time period. A few walnut fragments were recovered from this horizon, supporting the consistent presence of walnuts found among all of the soil horizons at Area 3-South, but the very small amount of botanical remains recovered prohibits any significant conclusions regarding subsistence or seasonality during this time period. No faunal remains were recovered from this horizon to aid in deducing information regarding

subsistence or seasonality. The microwear analysis also did not provide much additional information beyond identifying two pp/ks, four bifaces and two flakes as having evidence of general, non-specific utilization.

Is there any evidence of a diachronic change in subsistence practices?

The paleoethnobotanical remains recovered from Area 3-South suggest a consistent pattern from Late Archaic times through the latest Early Woodland period of a reliance on wild plant foods as a major component of the diet, primarily in the form of nuts. Analysis of the botanical data shows that the quantities of plant remains recovered across all time periods at the site remain approximately the same through time, and that until the two latest Early Woodland features, the plant remains from all horizons overall were too few in quantity or frequency within the samples to present other clear diachronic patterns or shifts in patterns of plant use.

There appears to be little change over time in the pattern of plant utilization and the quantities of plant remains analyzed until the latest part of the record, when there is an abrupt rise in the quantity of nut and seed remains and in the variety of plant remains, still dominated by nutshell, found in the two latest features. This abundance of seeds may be evidence for potentially cultivated plant resources; however, it could also be the result of better preservation in the younger features, thus also the rise in nut remains. No direct evidence for cultivated seeds was identified.

As stated previously, reliance on nutfoods, primarily exhibited by the presence of members of the walnut family as the primary plant remains across all soil horizons, was a characteristic of all the occupations. Another factor supporting the consistent reliance on nuts through time is the presence of nutting stones across the various soil horizons. Two nutting stone fragments were recovered from the AB horizon, two from the 3Ab1 horizon, one from the 3Ab2, and the largest two nutting stones of the entire assemblage were recovered from the earliest soil horizon, 4Bw. It appears that technology for the processing of nut materials was present among inhabitants of the site from Archaic through Early Woodland times.

The fact that the majority of faunal remains were recovered from the latest two features on the site either marks an increase in the abundance of faunal remains from the Early Woodland period or helps substantiate the theory that the increased presence of nut and seed remains in these same features is due to better preservation in those features. However, in terms of diachronic changes in patterns of animal-based subsistence, little change in specialization, seasonality, or utilization of ecological zones over time could be analyzed based on faunal remains, since 97.7 percent of the faunal remains were recovered from the Early Woodland component. The presence of the net weights, found only in the Early Woodland horizon, may indicate some increase in reliance on aquatic animal resources, or changes in the technology utilized in the procurement of such resources during this time period, though too few identifiable faunal specimens were recovered from any soil horizon to verify such a conclusion.

Regional Comparison of Subsistence and Seasonality

As discussed in the paleothnobotanical analysis, the general regional pattern of plant remains for the Late Archaic through Early Woodland components at other neighboring sites, such as the Mayview Site, is dominated by nut remains, especially black walnuts. Hickories are common as well, but secondary to walnuts, acorns are generally small in quantity, and other potential nutfood groups are very scarce (chestnuts, hazelnuts) (Appendix 8P, p.11). The plant remains recovered at Area 3-South follow this same pattern.

Seed remains recovered from early Upper Ohio River sites are often sparse, but suggest the utilization of a wide variety of fruit types, such as berries, grape, persimmon, cherry, and elderberry (Appendix 8P, pp. 11, 26). It would seem that there is no reason why this pattern should not occur at 36AL480, but almost no fruit seed types were recovered at Area 3-South. This may be because the processing techniques for these fruit types did not involve burning or parching, and thus would not have resulted in preservation of fruit seed remains, as noted in the paleoethnobotanical analysis. Nevertheless, fruit plant remains have been recovered in some quantity from other area sites. It seems unlikely that the early (Archaic) inhabitants at 36AL480 did not gather such fruit resources, unless they did not inhabit the site during the seasons of greatest fruit abundance.

Similar to the situation with fruit remains, very few faunal remains were recovered from the early soil horizons; the majority of faunal bone fragments were recovered from the Early Woodland component and even these remains were largely unidentified due to small size and their calcined state. The low riverine valleys, high uplands, and well-drained terraces of the region should have provided ample opportunities for hunting and fishing, and a wide variety of aquatic and terrestrial animal resources. Abundant utilized animal resources have been preserved in the archaeological record at other area sites, but not at Area 3-South. Therefore there was little information from the site other than botanical information to determine whether aquatic or terrestrial resources were exploited more or less through time at 36AL480, and more or less in comparison to other area sites.

The findings at Area 3-South fit into a general emerging pattern of regional subsistence for the Archaic and Early Woodland time periods, and are similar to findings from other regional sites of the Upper Ohio River valley. This pattern is characterized by a predominance of nutshell (especially walnuts), by the presence of varied wood charcoal from various taxa of a mixed deciduous forest, and by a generally scarce though varied presence of seed remains. Based on the increased number of remains and variety, plant use apparently intensified during the Early Woodland Period, and small grains were added to the prehistoric foodways.

How important are riverine versus non-riverine resources in the diet?

Generally speaking, riverine resources do not appear to have been important to the people who visited Area 3-South in prehistory. Very few faunal remains were found including no fish bones or scales, waterfowl bones, turtle shell, or fresh water mollusks. The only artifacts potentially associated with procurement of riverine-specific resources are two net weights found in the AB horizon. They may represent a single event.

What specialized food acquisition and/or processing tool types were recovered?

Overtly specialized food acquisition and/or processing tool types found during Area 3-South excavations are limited to nutting stones and net weights; no manos, metates, mortars, pestles, or hoes were found. The nutting stones—typical large tabular fine-grained stones bearing chipped or pecked nut-sized pits on one surface—were recovered from the AB (*n* = 2), 3Ab1 (*n* =1), 3Ab2 (*n* = 2), and 4Bw (*n* = 2) horizons. Each of these horizons also contained features producing nut shell. Steatite was found in small quantity in the AB horizon. A single vessel sherd was recovered from Unit N66 E231, Level 1. Three other steatite fragments were recovered, one each from Features 200, 238, and 243. A correlation between nut mast and steatite on archaeological sites is discussed by Truncer (2004), who proposes that steatite would increase efficiency in the collection and processing of nuts (1) because the vessels are more durable than pottery for collection and carrying; and (2) because as a cooking vessel it conducts and distributes heat effectively thereby reducing processing time.

Compound tools can be associated with procurement and processing of plant foods, and microwear analyses suggest that between one-sixth and one-third of microliths on site may have been components to compound tools. These compound tools may have been used for cutting, slicing, grating, and scaling.

Two artifacts interpreted as net weights were also found, both in the AB horizon. These were made on quartzite and sandstone and were notched on both ends such that a line or rope could be securely fixed. Given that no fish remains were found on site the possibility that these net weights were used for something other than weighting fishing nets cannot be eliminated.

During what season(s) was each living surface occupied?

Insufficient data were obtained to answer seasonality questions. Nut collection would have occurred in fall, but nuts can be stored for a long time and eaten or used as necessary. Ethnographic data suggest a greater reliance on nuts for food in late spring and early summer when other food resources were scarce (Appendix 8P, p.24). Goosefoot and erect knotweed represented by seeds found the AB horizon Features 238 and 243 can be collected and consumed in late spring and summer. Deer and rabbits, the bones of which were also found AB horizon features, would be available year round. Absent from the assemblage are late summer or early fall ripening fruit remains (cherry, grape, and berries); this may suggest that occupations occurred earlier in the seasonal cycle.

Are there storage pits or other features present, which would indicate longer periods of occupation?

Six indeterminate pits were found during excavations, none of which contained any concentration of materials suggesting they were storage pits. Some of the larger pit features found on site may have been used for storage but this is not clear in the archaeological record. Large stratified pits were encountered, primarily in the AB horizon, which suggest a longer or more intensive period of occupation, however, as previously noted, there are few indicators of long occupational episodes at Area 3-South.

Is there variability in plant and animal remains between features that may add to our inferences regarding activity areas?

The two large features found in the AB horizon, Features 238 and 243, produced the preponderance of nut and seed remains found. These two features were found within 2.2 m of each other, in the southwest corner of the excavation block and indicate an activity area or single-focus spatially discreet event. Other than that, there is little to no indication of activity areas based on plant and animal remains across Area 3-South.

Is there evidence of site specialization or abundance of certain types of subsistence resources?

Site specialization and/or an abundance of nuts is suggested by the presence of nutting stones in four horizons and nut shell in features across each of the feature bearing strata excavated. However, it should be noted that only in the AB horizon were multiple features with an abundance of nut shell identified. Specifically, flotation samples from Feature 238 produced 3,735 pieces of nut shell greater than 2 mm in size. The combined weight of these nut shell fragments was 97 g. Feature 243 flotation samples produced 2,178 nut shell fragments weighing 101.4 grams. Three features from the 2BC horizon yielded nut shell fragments in flotation samples—245 nutshell fragments were found in total and the combined weight of these was 3.4 g. Two features from the 3Ab horizon also produced nut shell, 36 fragments total with a combined weight of 2.2 g. A greater volume of soil was processed by flotation from Features 238 and 243 than any other feature identified at Area 3-South. However, this fact does not appear to be the cause for the increased count of nut and seed remains, as each feature had a single level that produced the majority of the botanical remains. The volume of flotation samples from those specific levels was comparable to many samples taken from other features that did not produce quantities of botanical remains.

What does the archaeological evidence suggest as to how and where food processing or preparation was performed?

The archaeological evidence found at Area 3-South suggests that nuts were processed using heat and nutting stones. Heat drying of nuts in their shells lengthens the potential storage time by eliminating pests (Appendix 8P, p.24-25). It can also be used to facilitate nut meat recovery, as would the nutting stones. The collective Area 3-South tool kit includes a number of flaked stone tools used for cutting, scraping, slicing, and prying; and evidence of a compound tool industry in both the Archaic and Woodland period occupations. It is not unreasonable to think that some or all of these tool types may have been involved in nut processing.

The local forest environment would have been comprised of a variety of trees, including nut trees represented by the Area 3-South assemblage. It is not unreasonable to think that stands of nut trees would have been located at a relatively short walk from the site, thus it would have been efficient and logical for the processing to have occurred at Area 3-South, situated within a reasonable distance from the source.

What animal species were present?

As noted earlier, faunal remains consisted primarily of highly fragmented, calcined, unidentifiable bone fragments. A total of 1,084 bone and mussel shell fragments weighing 140.85 grams were recovered from 4 features and 8 units. Feature 238 (AB horizon)

produced eight burnt bone fragments identified as possible white-tailed deer (*Odocoileus virginianus*); these bones represent a portion of a single individual. Eleven additional bones found in that feature were identified as "large mammal" and may also be deer. An unburnt bone tentatively identified as rabbit (cf. *Sylvilagus* sp.) was found in N64 E234, as was an additional squirrel-sized small mammal bone, also not burnt. None of the other faunal remains affiliated with prehistoric components could be identified.
Modern faunal remains were also recovered including nine fresh water mussel shell fragments probably forming a single valve and two large mammal bones (larger than deer), one of which is stained, the other is sawed. These are both probably bovine.

What animals were consumed?

Presumably, deer and rabbit were consumed during the Early Woodland period, as these remains have been identified in the AB horizon, albeit in very small quantity.

What is the habitat for these faunal resources?

Deer and rabbit would both be affiliated with Eastern Woodland habitats.

During what season are these animals easiest to procure?

Deer and rabbit could be easily procured throughout the year.

How were these foods processed or prepared?

Inadequate data were obtained during the data recovery to draw conclusions about the processing and preparation of animal food resources.

What types of plants, nuts, and berries were identified?

Table 8.98 summarizes overall plant and nut remains recovered at Area 3-South.

Table 8.98. Overview of Area 3-South Nut and Plant Remain Recovery.

Nut or Plant Remains Type	Count
Nut shell	
Walnut/thick-shelled hickory (Juglandaceae)	4,667
Black walnut (*Juglans nigra*)	1,847
Butternut (*Juglans cinerea*)	671
Thick-shelled hickory (*Carya* spp.)	222
Acorn (*Quercus* spp.)	12
Hazelnut *(Corylus americana*)	8
Seeds	
Erect knotweed (*Polygonum erectum*)	203
Goosefoot (*Chenopodium* sp.)	187
Unknown Type K	26
Mustard (*Brassica* cf. *juncea*)	9
Knotweeds (*Polygonum* spp.)	5
Unknown Type L	4
Honeylocust (*Gleditsia triacanthos*)	2

Nut or Plant Remains Type	Count
Grass family (Poaceae)	2
Poke (*Phytolacca americana*)	1
Leadplant (cf. *Amorpha* sp.)	1
Unidentified	28
Other Non-Wood Plants	0
Type J (thin fragile flakes)	269
Porous amorphous fragments	66
Rind-like fragments	6
"Honeycomb" amorphous fragments	7
Fungal fructification	1

What floral remains were possible food sources?

All of the nuts listed above are food sources, as are the erect knotweed and goosefoot, well known as part of the Eastern Agricultural complex. However, there is no evidence to suggest that the specimens recovered were cultivated, and they are not believed to represent domesticated versions of the plant.

During what season are these floral remains collected for food?

Nut harvesting occurred in fall. Goosefoot and knotweed have edible seeds and leaves, available for collection in late spring and summer.

Is there evidence of cultigens?

Features 238 and 243, identified in the AB horizon and radiocarbon dated to the later part of the Early Woodland to early Middle Woodland period both contained erect knotweed (*Polygonum erectum*) and goosefoot (*Chenopodium* sp.). The chenopods are not the domesticated variety typical of the Eastern Agricultural Complex, but have the lenticular seed shape of wild varieties. No other early cultigens such as maize or squash were among the Area 3-South floral assemblage.

What wood species were used for firewood?

Wood species used for firewood on Area 3-South are summarized in Table 8.99. These trees are generally found in bottom lands and along valleys, that is they would have been locally available to the people visited Area 3-South.

Table 8.99. Overview of Area 3-South Wood Recovery.

Wood Type	Count
Hickory (*Carya* spp.)	48
Black walnut (*Juglans nigra*)	54
Honeylocust (*Gleditsia triacanthos*)	45
Cherry (*Prunus* spp.)	29
Bitternut hickory (*Caryacordiformis*)	26
Maple (*Acer* spp.)	23

Wood Type	Count
Ash (*Fraxinus* spp.)	42
White oak (*Quercus* spp., white group)	17
Red oak (*Quercus* spp., red group)	6
Elm family (Ulmaceae)	12
Beech (*Fagus grandifolia*)	7
Conifer (gymnosperm or softwood)	6
Chestnut (*Castanea dentata)*	1
Hop hornbeam (*Ostrya virginiana*)	2
Sycamore (*Platanus occidentalis*)	1
Bark	40
Unidentifiable	383

Cultural Chronology

The DRP proposed that reconstructing the site chronology would provide critical baseline data for the area, as many other studies are dependent on the identification of temporal relationships. Chronological information is needed in order to produce site-specific reconstructions and to make appropriate regional (Upper Ohio Valley and Appalachian Physiographic Province) site comparisons. It is important to determine what time periods are represented at the site, particularly within each occupation layer. Mixing of occupations is problematic where the living surface was stable for longer periods of time. Single occupation surfaces enable researchers to eliminate much of the noise/confusion and focus the research more effectively. Such narrowly defined date ranges for occupation layers may be critical in order to identify subtle diachronic changes in Archaic Period site usage. Site chronology is also important when discussing these occupations in terms of environmental variables.

Cultural chronology is discussed extensively in other portions of this document. Data used to reconstruct site chronology were obtained through stratigraphic positioning, identification and analysis of diagnostic artifacts, and radiocarbon dating of charred material found in intact features.

Area 3-South excavations were conducted stratigraphically under the supervision of government and contractor PIs and the project geomorphology team. Eight discreet soil horizons bearing cultural material were identified and interpreted as summarized in Table 8.100.

Table 8.100. Summary of Area 3-South Strata and Diagnostic Cultural Material Found.

Description	Depth below Stripped Surface (m)	Field Soil Designation	Diagnostic Artifacts or Datable Features
Ap Horizon/Fill	0 to .06 to .09	F3	Artifacts
AB Horizon	.16 to.42	F4/F9/14	Artifacts and features
2BC Horizon	.42 to.69	F8/F10	Artifacts and features

Description	Depth below Stripped Surface (m)	Field Soil Designation	Diagnostic Artifacts or Datable Features
3Ab1 Horizon	.65 to .80	F15	Artifacts and features
3Ab2 Horizon	.70 to .95	F11	Features
3Bw Horizon	.95 to 1.35	F13 Levels 4 to 6	Artifacts and features
4Bw Horizon	1.35 to 1.7	F13 Levels 7 to 8	Artifacts
5Bw Horizon	1.7 to 2.3-2.8	F13/F167	None
8AC	8.0	F174	None

Parallel to archaeological investigations, site-wide geomorphological studies were carried out to explain landform formation processes and relate the landforms to each other, correlate strata across the site, date soil strata present on site, and place the site in its environmental context. These studies used an allostratigraphic model in correlating and dating the soil across 36AL480. This model identifies units on the basis of bounding discontinuities. Four discreet allostrata, along with an approximate timeline, were identified. Two of the four allostrata, the AU-3 and AU-2a, produced almost all of the cultural materials recovered in Area 3-South. These allostrata are characterized as follows:

- The AU-3 allostratum consists of Upper Holocene episodic high discharge sands, shallow poorly developed soils containing Late Archaic to Woodland deposits (ca. 3,500 to 1,000 B.P.).
- The AU-2a allostratum consists of Middle Holocene overbank sands, silts, and deep soils with Middle Archaic to Late Archaic deposits (ca. 6,500 B.P. to 3,500 B.P.).

All of the Area 3-South strata bearing diagnostic artifacts and datable features are located within the AU-3 and AU-2a allostrata; the break between the two occurs with the B horizons (3Bw, 4Bw, 5Bw), which fall into the AU-2a. As the geomorphology team and archaeologists collaborated to assess site chronology, these designations are in the main consistent with the Area 3-South finds in terms of diagnostic artifacts and dated features.

Sixty-eight diagnostic artifacts were found during Area 3-South excavations. A list of these artifacts is presented in Table 8.101. The table also includes the conventional chrono-cultural affiliation and date range, the recovery soil horizon, and quantity of each diagnostic type.

Table 8.101. Diagnostic Artifact Recovery at Area 3-South.

Type	Cultural Affiliation	Date	Horizon	Count
Mahoning Cord Marked Pottery	Middle to Late Woodland	ca A.D. 500/700	Ap	1
Manker Corner-Notched pp/k	Middle Woodland	ca. A.D. 130 to 320	AB, Surface	2
Adena Ovate pp/k	Early Woodland to Early Middle Adena	ca. 130 B.C. to A.D. 320	AB, 2BC	3

Type	Cultural Affiliation	Date	Horizon	Count
Unnamed Cord marked Thin Walled Pottery	Woodland to Initial Middle Woodland		AB	1
Watson Cord marked pottery	Early to Middle Woodland	ca. 180 B.C. to A.D. 530	AB	4
Unnamed Smoothed Surface Pottery	Late Early Woodland		AB	2
Forest Notched pp/k	Early Woodland	ca. 1,080 to 740 B.C.	AB	8
Middle Ohio Valley Adena Plain pottery	Early Woodland	ca. 645 B.C. to A.D. 150	AB	9
McKees Rocks Plain pottery	Early Woodland	no direct date	AB	1
Half-Moon Cord marked pottery	Early Woodland	ca. 520 to 180 B.C.	AB	25
Steatite Vessel fragment	Terminal Archaic to Early Woodland	ca. 1,800 to 800 B.C.	AB	1
Merom-Trimble pp/k	Terminal Archaic	ca. 1,710 to 1,010 B.C.	2BC	1
Genesee pp/k	Terminal Archaic	ca. 1,900 to 1,060 B.C.	AB	1
Lehigh Broad pp/k	Terminal Archaic	ca. 2,060 to 1,010 B.C.	2BC	3
Steubenville Lanceolate pp/k	Late Archaic to Terminal Archaic	ca. 2,400 to 1,580 B.C.	3Ab1	1
Bottleneck pp/k	Early Late Archaic	ca. 3,770 to 3,000 B.C.	3Bw	1
Brewerton Side-notched pp/k	Early Late Archaic	ca. 3,780 to 2,350 B.C.	3Bw	1

With exceptions, diagnostic materials are generally arranged chronologically by soil horizon, with older artifacts coming from deeper soil horizons. A few do not fall neatly into the anticipated sequence. The Genesee pp/k found in the AB horizon is typically associated with the Terminal Archaic. This specimen was recovered near the bottom of the AB horizon, thus it is possible that it migrated upward, due to pedoturbation. The horizon directly underlying the AB in this portion of the site is a flood deposited C horizon, which may have initially lifted some of the artifacts from the Terminal Archaic horizon directly underlying the C and AB horizons. Unfortunately, none of the pp/ks were found in feature context; however, many of the ceramic sherds were recovered from features. In general, within each horizon the date ranges of the pp/ks and the ceramic types fit with each other and the dates returned from the radiocarbon assays.

A total of 13 charcoal samples taken from features were submitted for radiocarbon dating. The results by soil horizon, feature, and sample are provided in Table 8.102.

Table 8.102. Summary of Horizons, Features, and Radiocarbon Dates.

Conventional Date/ Calibrated Date	Cultural Affiliation	Feature Number	Horizon
1860 ± 40 B.P. A.D. 70 to 240	Early to Middle Woodland	Feature 238	AB Horizon
1860 ± 40 B.P. A.D. 5 to 340	Early to Middle Woodland	Feature 243	AB Horizon
1760 ± 60 B.P. A.D. 120 to 415	Early to Middle Woodland	Feature 243	AB Horizon
1890 ± 40 B.P. A.D. 40 to 230	Early to Middle Woodland	Feature 243	AB Horizon
1200 to 940 B.C.	Terminal Archaic to Early Woodland	Feature 166	2BC Horizon
3030 ± 40 B.P. 1400 to 1100 B.C.	Terminal Archaic	Feature 172	2BC Horizon
3100 ± 40 B.P. 1440 to 1280 B.C.	Terminal Archaic	Feature 196	2BC Horizon
3090 ± 40 B.P. 1430 to 1270 B.C.	Terminal Archaic	Feature 209	2BC Horizon
3870 ± 40 B.P. 2470 to 2210 B.C.	Late Archaic	Feature 219	3Ab1 Horizon
3780 ± 40 B.P. (AMS) 2310 to 2120 B.C.; 2090 to 2050 B.C.	Late Archaic	Feature 220	3Ab1 Horizon
3830 ± 40 B.P. 2450 to 2140 B.C.	Late Archaic	Feature 217	3Ab2 Horizon
3790 ± 40 B.P. 2330 to 2130 B.C.; 2080 to 2060 B.C.	Late Archaic	Feature 227	3Ab2 Horizon
4730 ± 40 B.P. (AMS) 3460 to 3370 B.C.; 3640 to 3490 B.C.	Late Archaic	Feature 244	3Bw Horizon

The merging of diagnostic artifacts and dated features is limited to pottery. Features 238 and 243 were both dated; and both contained Adena Plain pottery sherds. The radiocarbon dates fall within the late Early Woodland period to the early Middle Woodland period, later than typically associated with the pottery type. This could represent a late continuance of the Early Woodland Adena culture in the lower Upper Ohio drainage, as postulated in Appendix 8N:

> Greber (1991:1, 17-19) argued for a continuity between the ancestral Adena and the descendent Hopewell florescence in southern Ohio in tributary Ohio River basins with headwaters within the terminal Wisconsinan moraine beginning ca. 100 B.C. She states that otherwise local Adena manifestations, however, apparently continued to flourish in northern Kentucky and in some upper Middle Ohio River tributary drainages such as the lower Kanawha and Hocking river valleys after 100 B.C.-A.D. 1 without making the step of complexity to Hopewell, and thus, complicating the assignment of a date for the end of the Early Woodland period. Perhaps the lower Upper Ohio Valley is yet another example of an attenuated Adena-related manifestation.

Features not dated that contained pottery sherds are as follows:

- Feature 163, AB horizon, contained a Watson Cord-marked ceramic sherd; this pottery dates to the late Early Woodland to Middle Woodland period.

- Features 155, 177, 198, and 200, AB horizon, contained Half-Moon Cord-marked sherds, this pottery type is considered to be the earliest of the Early Woodland ceramics, and on some levels this would point to multiple Early Woodland occupations within the AB horizon. Half-Moon sherds have been found in association with Adena and Watson sherds at other regional sites— a hearth containing two Half-Moon and two limestone-tempered Watson Cord-Marked sherds was present at the Lower Georgetown site (36BV29), located on the Ohio River downstream from the Ohioview site. Half-Moon Cord-Marked sherds in association with Adena Plain sherds were dated to 480 B.C. ± 55, 460 B.C. ± 60, and 420 B.C. ± 150 at the upland Crawford-Grist No. 2 site in the Monongahela River Valley in Fayette County, Pennsylvania (Grantz 1986:18, Table 4).

All of the Area 3-South artifacts and dated features are combined in Table 8.103 and arranged in descending date from the Middle Woodland Period to the late Middle Archaic.

Table 8.103. Area 3-South Artifacts and Dated Feature Summary.

Diagnostic Tool/Dated Feature	Period	Date	Horizon
Manker Corner-Notched pp/k	Middle Woodland	ca. A.D. 130 to 320	AB, Surface
Mahoning Cord Marked Pottery	Middle to Late Woodland	ca. 180 B.C. to A.D. 530	Ap
Watson Cord marked pottery	Early to Middle Woodland	ca. 180 B.C. to A.D. 530	AB
Feature 238	Early to Middle Woodland	A.D. 70 to 240	AB Horizon
Feature 243	Early to Middle Woodland	A.D. 5 to 340	AB Horizon
Feature 243	Early to Middle Woodland	A.D. 120 to 415	AB Horizon
Feature 243	Early to Middle Woodland	A.D. 40 to 230	AB Horizon
Unnamed Cord marked Thin Walled Pottery	Late Early Woodland to Initial Middle Woodland		AB
Unnamed Smoothed Surface Pottery	Late Early Woodland		AB
Adena Ovate pp/k	Early Woodland to Early Middle Adena	ca. 130 B.C. to A.D. 320	AB, 2BC
Forest Notched pp/k	Early Woodland	ca. 1080 to 740 B.C.	AB
Middle Ohio Valley Adena Plain pottery	Early Woodland	ca. 645 B.C. to A.D. 150	AB

Diagnostic Tool/Dated Feature	Period	Date	Horizon
McKees Rocks Plain pottery	Early Woodland	no direct date	AB
Half-Moon Cord marked pottery	Early Woodland	ca. 520 to 180 B.C.	AB (Features 155, 177, 198, and 200
Steatite Vessel fragment	Terminal Archaic to Early Woodland	ca. 1800 to 800 B.C.	AB
Feature 166	Terminal Archaic to Early Woodland	1200 to 940 B.C.	AB to 2BC Horizon
Merom-Trimble pp/k	Terminal Archaic	ca. 1710 to 1010 B.C.	2BC
Genesee pp/k	Terminal Archaic	ca. 1900 to 1060 B.C.	AB
Lehigh Broad pp/k	Terminal Archaic	ca. 2060 to 1010 B.C.	2BC
Feature 172	Terminal Archaic	1400 to 1100 B.C.	AB to 2BC Horizon
Feature 196	Terminal Archaic	1440 to 1280 B.C.	2BC Horizon
Feature 209	Terminal Archaic	1430 to 1270 B.C.	2BC Horizon
Steubenville Lanceolate pp/k	Late Archaic to Terminal Archaic	ca. 2400 to 1580 B.C.	3Ab1
Feature 219	Late Archaic	2470 to 2210 B.C.	3Ab1 Horizon
Feature 220	Late Archaic	2310 to 2120 B.C.; 2090 to 2050 B.C.	3Ab1 Horizon
Feature 217	Late Archaic	2450 to 2140 B.C.	3Ab2 Horizon
Feature 227	Late Archaic	2330 to 2130 B.C.; 2080 to 2060 B.C.	3Ab2 Horizon
Feature 244	Late Archaic	3460 to 3370 B.C.; 3640 to 3490 B.C.	3Bw Horizon
Bottleneck pp/k	Early Late Archaic	ca. 3770 to 3000 B.C.	3Bw
Brewerton Side-notched pp/k	Early Late Archaic	ca. 3780 to 2350 B.C.	3Bw

Analysis of Artifact Assemblage and Lithic Technologies

Typically, lithics represent the vast majority of the archaeological material recovered from prehistoric sites. At this site, it was suggested in the DRP that lithic analysis could contribute to the understanding of technology, group mobility, and activities at the site. Differences between lithic assemblages from the different occupation layers were suggested to have the potential to shed light on site usage and lithic reduction strategies through much of the Holocene. Artifact specific research questions posed in the DRP are as follows:

- Is there evidence of bone or shell artifacts?
- What ceramic types are present? What vessel forms?
- What types and quantities of lithics were recovered?
- What is the tool kit composition for each occupation and how do these assemblages compare between occupations?
- What types of activity areas are present?
- What stages of the lithic reduction sequence are evident?

- Are there differences in lithic reduction strategies sequence between occupation surfaces?
- Are other lithic technologies and tool assemblages identified at Site 36AL480 similar to other sites in the region of the same time period?
- What were the sources of the lithic materials represented?
- Are there any exotics represented in the assemblage?
- Is there a preference in lithic material?
- Is there a relationship between projectile point function and lithic raw material use?

In order to answer questions posed for this theme, the Area 3-South artifact assemblage was categorized according class, form, function, and segment, and any outstanding physical characteristics were noted. Bone and shell remains were examined first in terms of seasonality and subsistence and then checked for signs of modification or other use. Ceramics were examined for temper, segment and vessel form, surface treatment, and manufacturing techniques, with an eye to categorizing into known types. Lithic artifacts were categorized into flaked stone tools and debitage, groundstone or roughstone categories, other stone, and FCR. Raw material analyses were conducted to answer questions about lithic sourcing.

Is there evidence of bone or shell artifacts?

Bone and shell identified on site was limited to the Ap/disturbed soil horizons and the AB horizon, affiliating these remains with the historic to modern and Early Woodland occupations of the site area. Shell is limited to unmodified freshwater mussel shell found in the plow zone, which is probably of historic origin.

Bone was found in four features and four non-feature contexts in the AB horizon. Most of the bone fragments were burned and too fragmented to assign to a specific species. Some bones were identified as deer and rabbit. No evidence of butchering or other modification beyond burning is evident. There is no suggestion that shell or bone were modified for use as something else (for example tools or jewelry).

What ceramic types are present? What vessel forms?

Ceramic sherds were found primarily in the AB horizon although a few pieces were also found in the Ap and disturbed upper layers and in the 2BC layer underlying the AB horizon. A total of 222 prehistoric ceramic sherds weighing 538.5g were recovered. Also identified in the recovered assemblage were 133 fragments of fired prepared clay feature floors weighing 438.6 g.

Twenty-five chert and mixed chert and hematite-tempered cord-marked sherds conform to Mayer-Oakes' (1955:184, 189) chert-tempered variant of his early Early Woodland Half-Moon Cord-Marked type.

Nine limestone and mixed limestone and hematite or ironstone-tempered smooth surface sherds are most likely all attributable to the late Early Woodland period Middle Ohio Valley Adena Plain type (Haag 1940:76).

One chert-tempered smooth surfaced sherd conforms to the late Early Woodland period McKees Rocks Plain type (Mayer-Oakes 1955:190-191).

A single mixed chert, siltstone, and hematite-tempered smooth sherd probably represents one of the many temper varieties of the later Early Woodland smooth surfaced wares recorded but not described in the lower Upper Ohio Valley (Appendix 8N). A mixed sandstone, siltstone, and hematite-tempered sherd most likely also represents one of several as yet undescribed and unnamed late Early Woodland smooth surfaced ceramic types. Many other mixed temper varieties in the Area 3-South assemblage, both cord-marked and smoothed specimens, are considered to be assignable to an as yet unnamed and undescribed Early Woodland ceramic type or possibly more than one type.

Four limestone and mixed limestone and hematite-tempered cord-marked sherds are attributable to the Watson Cord-Marked type (Mayer-Oakes 1954:16, 1955:193-195).

One mixed shale, siltstone, and chert-tempered cord-marked sherd in Feature 243, based on the feature date and the thin wall of the sherd, most likely represents an unnamed and undescribed terminal Early Woodland-initial Middle Woodland pottery type.

The mixed quartz and igneous rock-tempered cord-marked sherd recovered in the Ap horizon has relatively thin wall measurements suggesting that it is an example of Mayer-Oakes' (1955:191-193) Middle and Late Woodland period Mahoning Cord-Marked type.

Little could be gleaned from the assemblage with respect to vessel forms present on site. No rim sherds were recovered, and no diagnostic initial and early Early Woodland appliqué lugs or flat basal sherds were documented. One mixed siltstone and hematite-tempered cord-marked sherd, however, did exhibit a flange or heel along the juncture between the vessel wall and the outer edge of a flat base. Flat circular bases are considered to be a diagnostic characteristic of early Half-Moon Cord-Marked ceramics in the lower Upper Ohio Valley (Mayer-Oakes 1955:189).

The fragments of fired prepared clay surfaces were recovered from Features 238 and 243, AB horizon features thought to be Early Woodland period nut processing loci. These features are large and relatively deep and display multiple superimposed lenses indicating successive filling and reuse episodes. The third natural level or lens in each pit was associated with relatively large quantities of the well-fired prepared clay floor fragments, FCR, and copious quantities of carbonized nutshell. None of the fragments of the prepared clay surfaces were recovered in the lowest levels of either pit. In fact, only a relatively small amount of carbonized nutshell was recovered in the lenses below the third layer in either feature. The data argues for the deliberate preparation of smooth, probably puddled clay surfaces on the top of the underlying levels for the processing of nuts.

What types and quantities of lithics were recovered?

Area 3-South lithic artifact recovery is summarized in Table 8.104.

Table 8.104. Summary of Area 3-South Lithic Artifact Recovery.

	Ap	AB	2BC	3Ab1	3Ab2	3BW	4BW	5BW	8AC	Total
PP/K	3	23	13	2	0	5	1	1	0	48
Bifaces	1	11	4	1	2	12	0	0	0	31
Expedient	1	2	1	2	0	2	0	0	0	8
Cores	2	65	7	6	7	31	0	0	0	118
Debitage	59	3,524	505	108	108	3,526	29	5	1	7,865
Groundstone	1	10	3	3	1	1	2	0	0	21
Other Stone	0	50	7	3	8	4	4	0	0	76
FCR	37	4,603	2,204	1,961	1,863	371	69	0	0	11,108
Total	**104**	**8,287**	**2,744**	**2,086**	**1,989**	**3,952**	**105**	**6**	**1**	**19,274**

Flaked stone tools included pp/ks, bifaces, expedient tools or utilized flakes, and cores. No formal scrapers, drills or other chipped stone tool forms were identified in the assemblage. Groundstone tools were also found in small quantities, including nutting stones, hammerstones and anvils, and net sinkers. Absent from the assemblage were woodworking tools such as adzes, axes, and celts, and tools associated with processing of plant remains and horticulture such as grinding stones or manos and metates, mortars and pestle assemblages and hoes. Other stone items collected and retained as artifacts based on the idea that they were not naturally occurring on site include cobbles and pebbles, some with evidence of battering; and somewhat exotic materials like steatite, ochre, hematite, and mica. The most frequently encountered lithic on site was FCR.

Forty-eight artifacts identified as whole or partial pp/ks were recovered during excavations. Half of the recovered pp/k fragments are associated with known diagnostic types as summarized in Table 8.105.

Table 8.105. Diagnostic PP/Ks Recovery by Type, Count, and Cultural Affiliation.

Type	Count	Cultural Affiliation	Date
Manker Corner-Notched	2	Middle Woodland	ca. A.D. 130 to 320
Adena Ovate	3	Early Woodland to Early Middle Adena	ca. 130 B.C. to A.D. 320
Forest Notched	8	Early Woodland	ca. 1080 to 740 B.C.
Merom-Trimble	1	Terminal Archaic	ca. 1710 to 1010 B.C.
Genesee	1	Terminal Archaic	ca. 1900 to 1060 B.C.
Lehigh Broad	3	Terminal Archaic	ca. 2060 to 1010 B.C.
Steubenville Lanceolate	1	Late Archaic to Terminal Archaic	ca. 2400 to 1580 B.C.
Bottleneck	1	Early Late Archaic	ca. 3770 to 3000 B.C.
Brewerton Side-notched	1	Early Late Archaic	ca. 3780 to 2350 B.C.

Bifaces numbered 31, which includes whole bifaces and fragments. With respect to reduction sequence, four could not be determined, but among the assemblage Stage 2 (n = 14), Stage 3 (n = 11), and Stage 4 (n = 1) were represented.

One hundred eighteen cores and core fragments were found during Area 3-South excavations. Eighty-six were exhausted, and only 18 bore no cortex. A range of cores and core fragments were found, from test cobbles to rejuvenation flakes.

Debitage recovery totaled 7,865 pieces including whole flakes, proximal fragments, other fragments, and shatter. It was found in all of the artifact-bearing strata in Area 3-South. While debitage was the most common stone artifact found onsite (with the exception of FCR), the quantity and weight are small. This suggests that prehistoric use of the site occurred as multiple short term occupations. The low overall counts of other chipped and groundstone tools further support this conclusion.

Groundstone tools were found in small number during Area 3-South excavations. The assemblage consists of nutting stones, hammerstones, anvils, net weights, and pitted stones. Area 3-South groundstone tool recovery is summarized by type and soil horizon in Table 8.106. Groundstone (including roughstone) and pitted stones comprise a small part of the overall lithic assemblage for Area 3-South. Present are a few items associated with particular activities. Nutting stones are presumed to be used for nut processing, which is consistent with the identified features and recovered botanical assemblage. Other pitted stones may have served multiple purposes, including use in tool manufacture or the processing of plant material. Hammerstones and anvils are associated with tool manufacture. Finally, net weights are indicative of fishing, but may also have been used for hunting as bola stones.

Table 8.106. Area 3-South Groundstone Tool Recovery by Type and Horizon.

	AB	**2BC**	**3Ab1**	**3Ab2**	**3Bw**	**4Bw**	**Total**
Nutting Stone	2		2	1		2	7
Hammerstone		1			1		2
Anvil		2	1				3
Hammerstone/Anvil	1						1
Net Weight	2						2
Pitted Stone	5						5
Total	**10**	**3**	**3**	**1**	**1**	**2**	**20**

Other stone artifacts (Table 8.107) total 75 and consist primarily of unmodified pebbles, cobbles, and unidentified, all probably manuports (*n* = 56). These are interpreted as cultural due to a general lack of natural stone or rock material in the excavated matrices. Other items of interest include steatite, often used for making vessels (*n* = 5, including a vessel fragment); hematite and ochre (*n* = 8) sometimes used for pigment; and mica, sometimes used for ornamentation (*n* = 5). The recovered mica fragments do not show any sign of modification and are extremely small fragments.

Table 8.107. Area 3-South Other Stone Recovery by Type and Horizon.

Artifact	**AB**	**2BC**	**3Ab1**	**3Ab2**	**3Bw**	**4Bw**	**Total**
Unmodified Pebble	25	4	1	7	3	4	44
Unmodified Cobble	2	2	2	1			7
Unidentified	4	1					5
Steatite Vessel	1						1

Artifact	AB	2BC	3Ab1	3Ab2	3Bw	4Bw	Total
Steatite Fragments	3						3
Steatite Cobble					1		1
Mica	5						5
Hematite Pebble	1						1
Hematite / Ochre	7						7
Claystone	1						1
Total	**49**	**7**	**3**	**8**	**4**	**4**	**75**

Eleven thousand seventy one pieces of FCR were found in soil horizons AB through 4Bw, the total weight of which was around 765 kilograms. The distribution FCR by soil horizon, count, and weight is summarized in Table 8.108. Pieces of FCR were not individually weighed. One observation is that the FCR found in the 4Bw horizon tended to be on average much larger than that within the other horizons, whereas the FCR found in the 3Bw was the smallest. The FCR is associated primarily with hearths; it tends to be found in and around concentrations of features in every soil horizon.

Table 8.108. Area 3-South FCR Recovery by Horizon, Count, and Weight.

	AB	2BC	3Ab1	3Ab2	3Bw	4Bw	Total
Count	4,603	2,204	1,961	1,863	371	69	11,071
Weight (kg)	308.2	144.3	137.1	130.7	21.1	20.4	761.8

What is the tool kit composition for each occupation and how do these assemblages compare between occupations?

Tool recovery by type and soil horizon is provided in Table 8.109. Although not noted in the table, compound tools were also present in the studied horizons based on the results of the microwear analysis (Appendix 8M).

Table 8.109. Summary of Area 3-South Tool Recovery by Type and Horizon.

	AB	2BC	3Ab1	3Ab2	3BW	4BW	Total
PP/K	23	13	2		5	1	44
Biface	11	4	1	2	12		30
Expedient Tools	2	1	2		2		7
Cores	65	7	6	7	31		116
Nutting Stone	2		2	1		2	7
Hammerstone		1			1		2
Anvil		2	1				3
Hammerstone/Anvil	1						1
Net Weight	2						2
Pitted Stone	5						5
Total	**111**	**28**	**14**	**10**	**51**	**3**	**217**

Tool type as percentage of the overall horizon tool kit for each occupation is presented in Table 8.110.

The AB horizon has the greatest diversity of tool types (*n* = 8) and the greatest quantity of artifacts overall. The 2BC and 3Ab1 horizons each produced six different tool types, the 3Ab2 horizon only had three tool types, five tool types are identified for the 3Bw, and finally only two tool types were found in the 4Bw.

AB horizon tools suggest a variety of activities occurred on site. The high proportion of cores indicates tool production, as do the bifaces (four whole and seven fragments were found). Six of the cores were bipolar; the hammerstone/anvil may be associated with these cores.

Table 8.110. Area 3-South Tool Types as Expressed as Percentage of Overall Kits by Horizon.

	AB	**2BC**	**3Ab1**	**3Ab2**	**3Bw**	**4Bw**
PP/K	20.7	46.4	14.2	0	9.8	33.3
Biface	9.9	14.2	7.1	20	23.5	
Expedient Tools	1.8	3.5	14.2	0	3.9	
Cores	58.8	25	42.8	70	60.7	
Nutting Stone	1.8		14.2	10	0	66.7
Hammerstone		3.5			1.9	
Anvil		7.1	7.1			
Hammerstone/Anvil	0.9				0	
Net Weight	1.8					
Pitted Stone	4.5				0	
Total	**100.2**	**99.7**	**99.6**	**100**	**99.8**	**100**

Note: Rounding errors account for totals other than 100.

The points, bifaces, and expedient tools, plus a sample of putatively unmodified flakes, were subject to a microwear analysis which produced some interesting results. All of the points recovered from the AB horizon had steep edge angles and exhibited wear that suggested they were used for scraping as opposed to cutting or slicing. Furthermore, they consistently appear to have been used on hard or unyielding material such as wood, antler, or bone. Bifaces and expedient tools show signs of having been used for more generalized or utility work based on edge angles and polish or abrasion. Of the flakes examined (*n* = 443), 75 percent were assessed as microlith components to compound tools. These tools were apparently used for cutting and slicing tasks; general utility tasks; and scraping, grating, and planing tasks.

The nutting stones and net weights imply site activity including processing of nuts (which is consistent with the results of the feature and paleobotanical analyses) and fishing. No artifacts or faunal material related to fishing or were found though (probably due to poor preservation of perishable materials and non-substantial bone), so the possibility that the net weights were associated with some other sort of activity cannot be eliminated.

The 2BC horizon contained six tool types. In comparison with the overlying AB, it is curious that the proportion of cores to hammerstones and anvils in this horizon is nearly 2:1. This suggests that stone tool manufacture via bipolar technique may have been a higher priority to the inhabitants of Area 3-South during the Terminal Archaic than in later occupations. Two of the seven cores found in the 2BC horizon were analyzed as bipolar.

The microwear analysis indicates that the points and bifaces were used as general utility tools—cutting, slicing, and scraping implements. Microliths were present among the Late Archaic assemblage as well; however, only about one-third of the flake sample appears to have been used in compound tools as opposed to the 75 percent seen in the Early Woodland collection.

The 3Ab1 horizon also contained manufacturing tools in the form of cores and an anvil. Points, bifaces, and expedient tools were present and used for a generalized activity set. Two nutting stones were also found.

The 3Ab2 horizon had ten tools—seven cores, two bifaces, and a nutting stone. This suggests tool manufacture (no bipolar cores, hammerstones, or anvils were found incidentally), some generalized cutting and slicing, and nut processing occurred during this occupation.

The 3Bw horizon overall tool count is greater than observed in the overlying 2BC, 3Ab1, and 3Ab2 horizons but only five tool types were found—cores comprised 60 percent of the assemblage, bifaces 24 percent, and a single hammmerstone was found. Two expedient tools and 5 finished pp/ks were also found. Tool making and another involving cutting and slicing clearly occurred on site.

Finally, the 4Bw horizon produced only a point and two nutting stones.

What types of activity areas are present?

As discussed in the site settlement patterns sections, very little can be said about activity areas based on the spatial distribution of tools within each soil horizon. Two main clusters of artifacts and features are observed in the AB horizon—one cluster to the north and one to the south. The artifacts and features are similar between the two clusters and suggest a generalized activity set in each location. These artifact and feature clusters may represent the remains of two contemporary social units or two separate visits to the site by a small group of individuals.

A nut processing work station is indicated by Features 238 and 243. These features were located within two meters of each other and are both characterized as large multi-use stratified features that included a fired clay floor surface covered by copious amounts of burnt nutshell and FCR. Other remains included edible plant seeds, some faunal material, debitage, and pottery. Tools found in association with these two features are limited to cores and groundstone objects—Feature 238 contained five core fragments and Feature 243 contained one pitted stone and seven cores. Both features also contained possible steatite fragments. A correlation between nut mast and steatite is discussed by Truncer (2004) who

proposes that steatite would increase efficiency in the collection and processing of nuts (1) because the vessels are more durable than pottery for collection and carrying; and (2) because as a cooking vessel it conducts and distributes heat effectively thereby reducing processing time.

An additional nut processing or consumption area is suggested by the presence of two nutting stones within a 16 m^2 area. Likewise, a fishing event may be suggested by the presence of two net weights in an 8 meter by 10 meter portion of the excavation block. These artifacts could be the result of single short term episodes.

A bipolar reduction workshop or area may be indicated by the collocation of bipolar cores and debitage and groundstone tools. Groundstone tools identified on site include hammerstones and anvils which would be used during bipolar reduction. Alternatively, it is possible that bipolar cores, waste flakes, and tools were somehow involved in another activity that also involved the use of groundstone tools.

Within the 2BC horizon generalized activity is indicated in the central portion of the excavation block by the presence of a concentration of several artifact classes. A bipolar reduction area or workshop is suggested by the fact that bipolar cores and debitage are clustered with hammerstones and anvils in an area separate from other classes of artifacts.

In some ways, the 3Ab1 horizon shows a more specialized focus than the overlying cultural horizons. A single concentration of artifacts and features was found. Artifact recovery includes two pp/ks, a biface, two expedient tools, six cores, 108 pieces of debitage, and a hammerstone/anvil. Two nutting stones were recovered from a single unit—N64 E237. Over ten percent of the non-FCR lithic assemblage from this horizon was tools; something not seen in other excavated soil horizons in Area 3-South and possibly indicative of a more focused or specialized activity set. Three features were also found one of which contained significant amounts of nut shell. When combined with the two nutting stones, this suggests a focus on nut processing at the site during this occupation. Also, it is worth noting that no bipolar flakes or cores were found in the 3Ab1 horizon. It seems that tool manufacture, use, maintenance, and retouch were less intensive in this horizon than in the overlying AB and 2BC horizons.

The 3Ab2 horizon tool kit consisted of two bifaces, seven cores, and a nutting stone. Unlike the 3Ab1 horizon, bipolar reduction technology was applied on site—five of the seven cores were bipolar.

All of the tools found in the 3Bw horizon were clustered in the northern portion of the excavation block. No formal spatial analyses were conducted for this horizon and artifacts suggest a generalized activity set that included stone tool manufacture, use, and maintenance. Bipolar reduction techniques were used.

The remains found in the 4Bw horizon are indicative of an activity area, again, focused on nuts and the possible processing of some other unidentified plant remains. The

two largest nutting stones recovered in Area 3-South were found in the 4Bw horizon, in one of two features present (Feature 252). The only other tool found was a pp/k.

What stages of the lithic reduction sequence are evident?

Lithic artifacts from the occupations at Area 3-South were examined to reconstruct the lithic technologies used at the site. A mass analysis was completed for all debitage, including flakes and flake fragments, cores and core fragments, and shatter, to identify size grades, weights, and presence of cortex. Further, a detailed analysis was conducted on a sample of the whole and proximal flake fragments in order to collect data on flake size, platform (thickness, angle, and type), and presence of a bulb of percussion. These data were used to reconstruct the lithic reduction technologies that were used by stone toolmakers in the different occupation periods and results are discussed below. Conclusions regarding lithic manufacturing technologies are based on standard descriptions and definitions of stone tool manufacture. A discussion about the analysis of striking platforms and interpretation of that data is provided in some detail first.

The shape and dimensions of striking platforms have been shown to be a useful means of interpreting types of tool manufacturing technology. Specifically, striking platform characteristics can provide an indication of the intent of the toolmaker in shaping the core and producing the final tool product (Andrefsky 1998; Dibble 1997; Odell 1989 in Andrefsky 1998). For example, according to Dibble, the decision to prepare bigger platform areas creates larger flakes, and vice versa. In turn, flake size suggests the type of core treatment and need for core curation considered by the toolmaker. According to Dibble, "By producing larger flakes with larger platforms, more of the edge is removed as the striking platform for a given area. If the exterior platform angles are increased instead, then the striking platform of a core is conserved longer, thereby extending the usefulness of the core in relation to the size of the flakes taken from it." (Dibble 1997:157).

One measure of larger platform area is the platform thickness. Different types of platform measurements can be used, then, to infer type of strike (soft or hard hammer percussion), stage of reduction, and intention of the toolmaker regarding core preparation and curation. Platform thickness is also used to determine reduction stage. Here, platform thickness was defined as a line perpendicular to the striking platform width, of which the latter runs from lateral edge to lateral edge.

Platform angles were also measured, in five-degree increments. Platform angle is difficult to measure due to the often irregular shape of the platform. For this analysis, only clearly determined angles were measured. Platform angle was measured as the angle between the striking platform and ventral face. While Andrefsky (1998) discounts the importance of striking platform angle, other analysts have found it useful in determining degree of reduction (Dibble and Whittaker 1981) and reduction stages (Raab et al. 1979). It has been shown that flake assemblages with platform angles tending toward the middle or lower degree angles is suggestive of tool edging, probably late stage biface production and/or resharpening, while a tendency toward higher angles is suggestive of earlier stages of reduction with more of a focus on removal of larger amounts of material.

Platform type is also a useful indicator of stage in the reduction sequence. For this analysis, platform types were as follows: flat, cortical, lipped, or faceted. Flat platforms usually result from removing a flake from a non-bifacial tool or a unidirectional core. According to Andrefsky, "small debitage with flat striking platforms may have been removed from a flake blank or some other objective piece with a smooth flat surface." (Andrefsky 1998:95). Cortical platforms indicate the flake to be a primary, or initial flake removed from a cobble, or a secondary flake removed that has some cortex attached to the initial flake. Lipped platforms are usually interpreted as resulting from soft-hammer percussion, such as use of an antler or bone billet to detach the flake. Finally, faceted platforms indicate the flake was removed from a prepared edge; these types of striking platforms most often result from detachment from a retouched edge such as occurs during biface preparation.

Finally, the presence or absence of a bulb of percussion was noted. A pronounced bulb of percussion can also be used to distinguish between hard and soft hammer percussors. Soft hammers have been found to result in either no bulb or a diffuse bulb of force, and a pronounced lip, while hard hammers result in a pronounced bulb.

AB Horizon Lithic Reduction Discussion

Analysis of the lithic assemblage indicates that the entire sequence of reduction technology took place at Area 3-South. Cores, primary, secondary, and tertiary stage flakes, and finished bifaces and pp/ks were recovered from this occupation period. The cores included bipolar cores to indicate that technique was also used during this occupation period, as well as the more well-known direct percussion technique of reducing cores. Groundstone tools include one hammerstone/anvil. The presence of the hammerstone/anvil also provides evidence for the use of the bipolar technique to reduce the cobbles.

The detailed flake analysis was used to further identify the types of reduction techniques used during this time period. Whole and proximal flake fragments were examined and classed into primary, secondary or tertiary flakes in the reduction sequence. Of the total 1,664 whole and proximal flake fragments analyzed, 427 (25.66 percent) were identified as primary, 963 (57.88 percent) as secondary, and 268 (16.10 percent) as tertiary. Six (0.36 percent) were unidentifiable as to reduction stage.

Data collected on platform types and dimensions provides additional information regarding the reduction technology. Of the 1,664 whole and proximal flake fragments examined, there is an almost even division among flat (29 percent), lipped (22 percent), faceted (31 percent) and cortical (17 percent) platform types, to suggest that both soft and hard percussors were used to reduce cores and shape bifaces. Slightly over three quarters of the flakes (78 percent) exhibited a bulb of percussion, to indicate a hard hammer technique was used to remove flakes from cores and in biface manufacture.

Although there is a wide range of platform angles represented, most striking platform angles were found to fall within three categories: the 60° to 64° category (12.20 percent), 70° to 74° (14.06 percent), and 80° to 84° (12.26 percent). Angles greater than 90° and less than 30° made up only five percent of the collection studied. The presence of the larger platform angles suggests that direct percussion rather than pressure flaking was more common in reducing cores and shaping bifaces. While some pressure flaking surely took place, the

peaks in the middle to larger range of angles is most likely the result of core reduction and biface thinning. If cobbles, rather than tabular (quarried) lithic material, was the primary raw material source, then more initial reduction may have occurred than would be apparent from the platform angle data, since by its nature the size of a cobble would seem to limit the possible striking platform angle and/or the need to remove large amounts of stone.

Of the 65 cores found in the AB horizon, 11 (17 percent of the total number of cores and core fragments) were bipolar cores or core fragments, and an additional two were possible bipolar cores or core fragments, to indicate the use of that reduction technique. Of the cores and core fragments, 43 (66 percent) were exhausted at discard.

In sum, tool manufacture during the Early Woodland occupation(s) of Area 3-South was a combination of percussion and pressure flaking technology, and bipolar reduction, as shown in the variety of platform types identified and the striking platform analysis. Combined with the small size of flakes, the Early Woodland Period occupants of the site appear to have used locally available cobbles that were shaped and reduced in an expedient manner to accommodate the cobble size. Bipolar manufacture has also been proposed as a type of expedient manufacturing technique for smaller cobbles.

2BC Horizon Lithic Reduction Discussion

Types of lithic reduction were reconstructed using data from the mass analysis and the detailed flake analysis. These analyses, along with information from the cores and groundstone tools, indicate that a number of different strategies were used to reduce local cobbles. As in the Early Woodland occupation, the presence of all stages of the lithic reduction sequence, including cores of local cobbles; primary, secondary, and tertiary stage reduction flakes; and completed bifaces and pp/ks of the local Onondaga chert, indicates that the entire reduction sequence was performed on site during this occupation period. Two bipolar core and core fragments were recovered, as were stone anvils, to indicate that technique was used to reduce the cobbles in addition to direct percussion. The fact that the finished tools were of the same material as the cobbles and reduction debitage suggests they were manufactured on site.

Striking platform data collected provides additional information regarding the reduction technology. Of the 236 whole and proximal flake fragments examined, flat platforms were the most common (36 percent), with the second most common type of striking platform being faceted (28 percent). Lipped (17 percent) and cortical (19 percent) platforms were represented in lower proportions. However, again, the presence of all types of platform shapes suggests that different percussors were used to reduce cores. Almost all the flakes (93 percent) had a bulb of percussion to indicate that most of the flakes were removed using either a hard or soft hammer percussor, but with enough pressure and force in the blow to create the bulb. Platform angles could not be determined for almost half the platforms examined. For the remainder, the three highest numbers fell within the 70° to 74° class, the 75° to 79° class, and the 85° to 89° class. The wide angles provide additional evidence that most of the flakes were removed with a hard hammer percussor, and most likely represent a wide range of general reduction activities. Platform thicknesses averaged 1.52 mm. Cortex was present on 39 percent of the flakes with 1-49 percent (30 percent)

covered being the most common, 50-99 percent (6 percent) covered the next most common, and 100 percent (3 percent) the least most common. The only type of cortex present was cobble.

3Ab1 Horizon Lithic Reduction Discussion

Reduction technologies utilized during this time period were reconstructed from the mass analysis and detailed flake analysis. Again, the data indicate that the entire range of the reduction sequence took place during this time period. Cores and core fragments, primary, secondary, and tertiary stage flakes, retouched and expedient tools were recovered from this occupation period. The lithic assemblage from this occupation period was small, and included only 108 debitage artifacts, two retouched tools, and two expedient tools, so that conclusions are tentative regarding more specific types of reduction techniques. Platform types were primarily cortical (50 percent), and also included 21 percent each of flat and faceted platforms; the smallest percentage was lipped (seven percent). As with the previous prehistoric component, angles could not be determined on over half (60.17 percent) of the artifacts analyzed. Platform angles were primarily between 60 and 90 degrees (55 percent), followed by angles measuring between 30 and 60 degrees (28 percent). Angles of less than 30 degrees and more than 90 degrees comprised nine percent each of the total. As with the previous occupation periods, the wider platform angles may indicate the choice by the toolmaker of a hard hammer percussor, or the flakes could represent earlier stages of reduction. However, the number of remaining platforms where the angle could be determined was so small that an interpretation cannot be made here. A total of 93 percent of the whole and proximal flakes had visible bulbs of percussion to indicate reduction using either a hard or soft hammer percussor. No evidence of a bipolar reduction technique was recovered from this occupation period. However, this could be because the total assemblage was so small.

3Ab2 Horizon Lithic Reduction Discussion

The reduction technology identified for this time period is similar to those discussed above. Cores, primary, secondary, and tertiary stage flakes, and retouched tools (one biface and one biface fragment) were recovered in this soil horizon. Again, the small number of lithic artifacts from this soil horizon limits interpretations regarding reduction technology. However, it is worth noting that of the seven cores and core fragments recovered, five were from bipolar manufacture.

Examination of platforms and presence of bulbs of percussion suggest similar reduction methods to those described above. Again, most of the whole and proximal flakes analyzed have prominent bulbs (93 percent) present on the ventral surface. Platform shapes are as follows: again, most of the platforms were cortical (44 percent); followed by flat platforms (31 percent). The remaining platform types appeared in much smaller proportions: 20 percent were faceted, and six percent were lipped. The larger number of faceted platforms indicates biface shaping, while the flat platforms suggest flake removal from flake blanks, or unidirectional cores, to indicate that additional flake removal techniques were being used during this time period. Almost half (44.43 percent) of platforms could not be identified as to angle. Again, the number remaining is so small that angle cannot be used to draw conclusions about lithic technologies for this time period.

3Bw Horizon Lithic Reduction Discussion

As with the other time periods discussed, analysis of the lithic assemblage from this time period indicated that the entire manufacturing process took place within Area 3-South. Primary, secondary and tertiary stage flakes were recovered from this soil horizon, as were retouched artifacts and core and core fragments. The presence of bipolar cores indicates that this reduction technology was used during this time period as well. Most of the striking platforms were faceted (37 percent); one-third of the platforms from this time period were lipped (33 percent), followed in frequency by flat platforms(19 percent), and cortical platforms (11 percent). As in the previously discussed time period, almost all (96 percent) of the whole and proximal flake fragments examined exhibited bulbs of percussion, again to indicate that hard hammer percussors, or soft hammer percussors used with enough force to create a bulb were used to reduce cores in addition to the bipolar method.

4Bw Horizon Lithic Reduction Discussion

Only 29 debitage artifacts were recovered from this occupation period. Of these, 11 whole and proximal flake fragments were examined as part of the detailed flake analysis. These flakes were almost evenly divided between primary (n = 4) and secondary (n = 6) flakes, with only one tertiary flake represented. Because the sample size is so small, no conclusions can be drawn based on the detailed analysis. No cores were recovered, and no retouched or finished tools were recovered, with the exception of one pp/k. No direct evidence for percussors, in the form of hammerstones, was present, either.

<u>Are there differences in lithic reduction sequences between occupation surfaces?</u>

Mass Analysis Results

Means, standard deviations, and standard errors were calculated for debitage weights in the different size grades to examine the potential for statistically significant differences among the different occupation periods that could indicate diachronic differences in tool manufacturing technologies and choices of raw material. Changes in average weight were compared among the different occupation periods by using a two-sample t-test where alpha = 0.05. The t-test measures the difference among means and a p value is derived to indicate the probability that there is no difference among the average weights in each group. The smaller the p value, the greater the evidence that a difference is statistically significant. The results indicate that while the average weights varied within each size grade among the different occupation periods (Table 8.111), statistically significant differences appeared only in the smallest size grades.

For the smallest size grade (< 0.25 in), the increase in average weight was found to be statistically significant between the 2BC horizon (Terminal Archaic Period) and the AB horizon (Early Woodland Period) (p = 0.0000387), and between the 4Bw (Terminal Middle Archaic/Early Late Archaic Period) and the 3Bw horizon (Earlier, Late Archaic Period) (p = 3.83×10^{-13}). A statistically significant difference was also noted in the decrease in weight between the debitage recovered in the 3Bw horizon (Earlier, Late Archaic Period) and the 3Ab2 horizon (Later, Late Archaic [2] Period) (p = 3.14×10^{-13}).

A similar pattern was observed for flakes in the next largest size grade (< 0.5 and > 0.25 in). For that size grade, there was a significant increase in average weight per debitage artifact from the 2BC horizon (Terminal Archaic Period) to the AB horizon (Early Woodland Period). The difference was statistically significant (p = 0.000132). Average weight per debitage artifact also increased significantly from the 4Bw (Terminal Middle Archaic/Early Late Archaic Period) to the 3Bw horizon (Earlier, Late Archaic Period) (p = 0.000529). The average weight per debitage artifact decrease between 3Bw and 3Ab2 horizons was also statistically significant ($p = 5.44 \times 10^{-13}$).

For the < 1 and > 0.5 in size grade, the average weight per debitage artifact increased from the 4Bw to the 3Bw horizon. The weight change here was also statistically significant ($p = 2.39 \times 10^{-7}$). Finally, the analysis showed that none of the differences between weights in the different horizons in the larger size grades (< 2 and > 1 in and > 2 in) were significant.

Table 8.111 and Figure 8.201 present the findings by time period for the different size grades. Although the graph appears to show that all occupation periods follow a similar pattern as regards average weights, there are differences between time periods. At first glance it might appear that these increases in average debitage weight are suggestive of a change in lithic reduction focus. However, that change does not appear to be supported by the size grade and detailed flake analyses (see below). In sum, there seem to be statistically significant differences among weight within the smaller size grades that do not have an apparent cultural distinction or meaning. It appears that the overall pattern that persists through time is one of reduction of local cobbles and basic shaping of bifacial tools.

Table 8.111. Debitage Weight in each Size Grade.

Time Period		**< 0.25 in**	**< 0.5 and > =0.25 in**	**< 1 and > = 0.5 in**	**< 2 and > = 1 in**	**➢ =2 in**
Early Woodland (AB) n=3524	Mean(g)	0.30	1.41	6.51	40.62	0.00
	SD	± 0.31	± 1.93	± 6.11	± 32.62	± 0.00
	SE	± 0.01	± 0.07	± 0.53	± 7.48	± 0.00
	Count	1245	2110	150	19	0
Terminal Archaic (2BC) n=505	Mean(g)	0.21	0.93	5.64	123.35	0.00
	SD	± 0.20	± 1.33	± 5.77	± 85.63	± 0.00
	SE	± 0.02	± 0.10	± 1.32	± 60.55	± 0.00
	Count	203	281	19	2	0
Later, Late Archaic (1) (3Ab1) n=108	Mean(g)	0.25	1.21	5.88	84.30	274.95
	SD	± 0.19	± 0.96	± 4.22	± 0.00	± 84.46
	SE	± 0.04	± 0.17	± 0.92	± 0.00	± 62.55
	Count	29	54	22	1	2
Later, Late Archaic (2) (3Ab2) n=108	Mean(g)	0.18	1.06	6.88	42.25	0.00
	SD	± 0.10	± 1.07	± 4.98	± 15.75	± 0.00
	SE	± 0.02	± 0.15	± 1.33	± 7.88	± 0.00
	Count	34	56	14	4	0
Earlier, Late Archaic (3Bw) n=3526	Mean(g)	0.73	4.55	9.46	26.00	465.80
	SD	± 1.04	± 6.77	± 10.56	± 13.70	± 116.5
	SE	± 0.07	± 0.43	± 0.99	± 7.92	± 67.27
	Count	1292	1952	276	3	3

Time Period		< 0.25 in	< 0.5 and > =0.25 in	< 1 and > = 0.5 in	< 2 and > = 1 in	➢ =2 in
Terminal Middle Archaic/Early Late Archaic (4Bw) n=29	Mean(g)	0.17	1.68	3.35	0.00	0.00
	SD	± 0.05	± 1.52	± 0.81	± 0.00	± 0.00
	SE	± 0.02	± 0.54	± 0.41	± 0.00	± 0.00
	Count	9	16	4	0	0

Debitage Size

The percentages of flakes that fell within each size grade were also compared among the different time periods. For each occupation period, the majority of the flakes fell into the second smallest size grade (< 0.5 in and > 0.25 in). The second most frequent size grade was the smallest (< 0.25 in). The fact that so many of the flakes were less than one-half inch again confirms that locally available river cobbles were used to manufacture the stone tools throughout the occupation periods at Area 3-South. The percent of flakes in the < 1 in and > 0.50 in size grade varied from 14 percent to 4 percent. Figure 8.202 illustrates the pattern that persists through all the occupation periods, that most of the flakes fall in the smaller size grades, to confirm that in each time period, smaller cobbles are being used to manufacture stone tools.

Detailed Flake Analysis

Diachronic analysis of the whole flakes and proximal flake fragments included comparisons of measurements of flake length, width, thickness, and weight (only whole flakes were examined for these measurements). Flake type (primary, secondary, tertiary) was also examined. Striking platform data were compared among the different soil horizons/occupation components. Results are shown in Tables 8.112 to 8.118 and Figures 8.203 to 8.208.

The results of these analyses show some slight differences in various attributes among the different occupation periods. However, overall similarities among time periods indicate that there was little change in manufacturing technology during the different occupations, and that the main source of raw tool material throughout the different time periods continued to be locally accessible small to moderate sized river cobbles, primarily of secondarily deposited Onondaga chert.

T-tests were conducted on average flake thickness and relative thickness (measured as the thickness divided by the square root of length times width) for whole flakes only. Although for the most part, there are few differences among the different occupation periods, the t-test indicated a statistically significant increase in average flake thickness from whole flakes in the 2BC horizon (Terminal Archaic Period) to whole flakes in the AB horizon (Early Woodland), with a two-tailed p value of 0.00000623. There is also a statistically significant (p = 0.0000195) increase in relative thickness of flakes from the AB horizon (Early Woodland Period) compared to those from the 2BC horizon (Terminal Archaic Period). The increased average and relative thickness in flakes in the AB horizon may suggest a somewhat different manufacturing technique that would result in thicker flakes.

However, it should be noted that the difference in average thickness is less than one millimeter and may not be representative of any cultural or technological differences. The average length, average width, and average weight for whole flakes does not appear to vary considerably. While the mean values show variation, the standard deviation ranges for these metrics (Figures 8.203-8.207) show that the assemblages from each temporal period are not substantially different.

Platform thickness was also compared for the different soil horizons, and the difference between platform thickness in flakes from the 2BC horizon (Terminal Archaic Period) and from the 3Ab1 horizon (Later, Late Archaic [1] Period) was found to be statistically significant ($p = 0.007$). Platform thicknesses appear to be significantly thicker in the Later, Late Archaic occupations, both the 3Ab1 and the 3Ab2 (Table 8.112). However, again the standard deviation ranges do not suggest any difference between temporal periods (Figure 8.208). Platform thickness is one indication of the intent of the flint knapper to remove larger flakes and create a wider platform on the core.

Table 8.112. Mean, Standard Deviation, and Standard Error of Whole Flake Sample Measurements by Time Period.

Time Period		**Length (mm)**	**Width (mm)**	**Thickness (mm)**	**Weight (g)**	**Platform thickness (mm)**	**Relative thickness (mm/mm)**
Early Woodland (AB)	Mean	14.16	12.87	2.33	0.68	1.78	0.17
n=830 (whole flakes/	SD	± 5.51	± 5.00	± 1.72	± 1.69	± 1.56	± 0.09
1664 (all flakes)	SE	± 0.19	± 0.17	± 0.06	± 0.06	± 0.04	± 0.003
	Count	830	830	830	830	1664	830
Terminal Archaic (2BC)	Mean	13.79	12.57	1.73	0.62	1.52	0.13
n=116 (whole flakes)/	SD	± 6.05	± 5.03	± 1.23	± 0.92	± 1.21	± 0.08
236 (all flakes)	SE	± 0.56	± 0.47	± 0.11	± 0.08	± 0.08	± 0.01
	Count	116	116	116	116	236	116
Later, Late Archaic (1)	Mean	17.65	14.14	2.36	1.34	2.96	0.14
(3Ab1)	SD	± 8.24	± 6.26	± 1.82	± 1.51	± 2.53	± 0.08
n=20 (whole flakes)/	SE	± 1.84	± 1.40	± 0.41	± 0.39	± 0.48	± 0.02
28 (all flakes)	count	20	20	20	20	28	20
Later, Late Archaic (2)	mean	16.48	16.12	2.91	2.19	2.60	0.15
(3Ab2)	SD	± 7.91	± 7.71	± 3.44	± 4.99	± 3.34	± 0.10
n=24 (whole flakes)/	SE	± 1.62	±1.57	± 0.70	±1.02	± 0.56	± 0.02
36 (all flakes)	count	24	24	24	24	36	24
Earlier, Late Archaic (3Bw)	mean	17.44	14.59	2.80	1.09	1.88	0.17
n=161 (whole flakes)/	SD	± 8.81	± 6.34	± 2.47	± 1.66	± 1.16	± 0.11
294 (all flakes)	SE	± 0.69	± 0.50	± 0.19	±0.13	± 0.07	± 0.01
	count	161	161	161	161	294	161
Terminal Middle	mean	17.01	15.21	3.01	1.25	1.61	0.18
Archaic/ Early Late Archaic	SD	± 3.74	± 2.87	± 2.12	± 0.87	± 1.23	± 0.12
(4Bw)	SE	± 1.87	± 1.28	± 0.95	± 0.39	± 0.37	± 0.06
n=5 (whole flakes)/	count	5	5	5	5	11	5
11 (all flakes)							

Note: Platform thickness values include both whole and proximal flakes.

Platform angles for each whole and proximal flake fragment were also measured, and comparative results are shown in Table 8.113. In all horizons except for the 4Bw horizon (Terminal Middle Archaic/Early Late Archaic Period), the majority of the flakes had a platform angle of between 60 and 90 degrees. The second most prevalent platform angle group was between 30 and 60 degrees. Platform angles of less than 30 and greater than 90 degrees were the least prevalent in all strata. These results suggest again that the basic focus of tool manufacture did not change during the six occupation periods represented at Area 3-South.

A closer look shows that striking platform angles between 60° to 64°, 65° to 69° and 70° to 74° contain the highest percentage of flakes and flake fragments for the three soil horizons AB, 2BC and 3Bw. Almost no flakes are within the 10° to 29° angle categories. The 3Ab1 and 3Ab2 assemblages show a similar pattern but the 3Ab2 platform angles are skewed slightly higher. The overall low count of flakes from the 3Ab1, 3Ab2, and 4Bw analyzed for platform angle preclude any patterns from being viewed as trustworthy. The tendency toward flake angles in the upper middle range for the three most recent time periods suggests that the toolmakers consistently manipulated impact and strike direction suggestive of biface reduction activities. Lower flake platform angles are more indicative of final stage reduction or sharpening of tools, at least for thin tools and pp/ks, and higher angles are more indicative of initial reduction of raw material. It may be that the initial reduction stage is not clearly represented by platform angle in this assemblage given the reliance on cobble sources for raw material. Use of cobbles by the nature of their size and shape may limit the possible striking platform angle and/or the need to remove large amounts of stone. This conclusion is supported by the distribution of the flake types, with most flakes falling into the secondary type followed by primary flakes, rather than tertiary (Table 8.114). The only exception is the 3Ab1 which shows the second highest percentage slightly in the primary flake category; however, the total sample size is only 28 flakes and 82 percent are in the secondary flake category.

Platform shapes were also analyzed and compared among the different occupation periods (Table 8.115). In the three horizons with a large enough sample size to warrant examination, the flake platform shapes seem to show some slight differences between the temporal periods. The highest percentage in the 3Bw horizon is faceted platforms followed closely by lipped. This suggests that a mix of biface thinning and sharpening was the focus of the lithic reduction activities. In the 2BC horizon the majority of platforms are flat, followed closely by faceted. This may mean that a mix of biface thinning and non-bifacial core reduction (perhaps for expedient tool flakes) was occurring. Finally, the AB horizon seems focused equally on the faceted and flat categories, similar to the 2BC. Unfortunately, these differences are not completely in agreement with the platform angle or flake size, both of which suggest consistent reduction activities across temporal periods. In any case, there seems to be a high percentage of middle-stage reduction, with the cortical platforms being noticeably lower in percentages. Again, this low percentage of initial reduction may be related to the nature of reducing cobbles rather than a block outcrop of raw material.

Table 8.113. Percentages of Platform Angles for Whole Flakes and Proximal Flake Fragments.

Time Period		10 - 14	15 - 19	20 - 24	25- 29	30 -34	35 - 39	40 - 44	45 -49	50 -54	55 - 59	60 - 64	65- 69	70 - 74	75 - 79	80 -84	85- 89	> 90	Indet.
Early Woodland AB n=1664	%	0.06%	0.00%	0.30%	0.48%	1.56%	1.32%	3.73%	2.82%	9.01%	3.79%	12.20%	4.75%	14.06%	7.93%	12.26%	6.79%	3.00%	15.94%
	SE	± 0.06	± 0.00	± 0.13	± 0.17	± 0.30	± 0.28	± 0.46	± 0.41	± 0.70	± 0.47	± 0.80	± 0.52	± 0.85	± 0.66	± 0.80	± 0.62	± 0.42	± 0.42
	count	1	0	5	8	26	22	62	47	150	63	203	79	234	132	204	113	50	265
Terminal Archaic 2BC n=236	%	0.00%	0.00%	0.00%	0.00%	0.85%	0.85%	2.54%	1.27%	3.81%	4.66%	5.93%	4.24%	6.78%	6.78%	4.66%	6.36%	2.97%	48.30%
	SE	± 0.00	± 0.00	± 0.00	± 0.00	± 0.60	± 0.60	± 1.02	± 0.73	± 1.25	± 1.37	± 1.54	± 1.31	± 1.64	± 1.64	± 1.37	± 1.59	± 1.10	± 3.25
	count	0	0	0	0	2	2	6	3	9	11	14	10	16	16	11	15	7	114
Later, Late Archaic (1) 3Ab1 n=28	%	0.00%	0.00%	3.57%	0.00%	0.00%	0.00%	3.57%	0.00%	3.57%	3.57%	7.14%	7.14%	0.00%	3.57%	0.00%	3.57%	3.57%	60.71%
	SE	± 0.00	± 0.00	± 3.51	± 0.00	± 0.00	± 0.00	± 3.51	± 0.00	± 3.51	± 3.51	± 4.87	± 4.87	± 0.00	± 3.51	± 0.00	± 3.51	± 3.51	± 9.23
	count	0	0	1	0	0	0	1	0	1	1	2	2	0	1	0	1	1	17
Later, Late Archaic (2) 3Ab2 n=36	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.78%	0.00%	5.56%	5.56%	0.00%	5.56%	11.11%	5.56%	11.11%	0.00%	8.33%	44.43%
	SE	± 0.00	± 0.00	± 0.00	± 0.00	± 0.00	± 0.00	± 2.74	± 0.00	± 3.82	± 3.82	± 0.00	± 3.82	± 5.24	± 3.82	± 5.24	± 0.00	± 4.61	± 8.28
	count	0	0	0	0	0	0	1	0	2	2	0	2	4	2	4	0	3	16
Earlier, Late Archaic 3Bw n=294	%	0.34%	0.34%	0.00%	0.34%	1.02%	0.34%	4.08%	3.06%	4.76%	4.42%	5.10%	6.46%	5.10%	3.40%	3.74%	2.39%	4.76%	50.35%
	SE	± 0.34	± 0.34	± 0.00	± 0.34	± 0.59	± 0.34	± 1.15	1.00	± 1.24	± 1.20	± 1.28	± 1.43	± 1.28	± 1.06	± 1.11	± 0.89	± 1.24	± 2.92
	count	1	1	0	1	3	1	12	9	14	13	15	19	15	10	11	7	14	148
Terminal Middle Archaic/ Early Late Archaic 4Bw n=11	%	0.00%	0.00%	0.00%	0.00%	9.09%	0.00%	0.00%	18.18%	9.09%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	54.55%
	SE	± 0.00	± 0.00	± 0.00	± 0.00	± 8.67	± 0.00	± 0.00	± 11.63	± 8.67	± 8.67	± 0.00	± 0.00	± 0.00	± 0.00	± 0.00	± 0.00	± 0.00	± 8.28
	count	0	0	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	6

Table 8.114. Percentages of Flake Types, for Whole Flakes and Proximal Flake Fragments.

Time Period		Primary	Secondary	Tertiary	UID
Early Woodland	Percent	25.66%	57.87%	16.11%	0.36%
AB	SE	± 1.07	±1.21	± 0.90	± 0.15
n=1664	Count	427	963	268	6
Terminal Archaic	Percent	22.03%	59.32%	18.65%	0.00%
2BC	SE	± 2.70	± 3.20	± 2.54	± 0.00
n=236	Count	52	140	44	0
Later, Late Archaic (1)	Percent	7.14%	82.14%	10.72%	0.00%
3Ab1	SE	± 4.87	± 7.24	± 5.85	± 0.00
n=28	Count	2	23	3	0
Later, Late Archaic (2)	Percent	25.00%	69.44%	5.56%	0.00%
3Ab2	SE	± 7.22	± 7.68	± 3.82	± 0.00
n=36	Count	9	25	2	0
Earlier, Late Archaic	Percent	24.15%	57.82%	18.03%	0.00%
3Bw	SE	± 2.50	± 2.88	± 2.24	± 0.00
n=294	Count	71	170	53	0
Terminal Middle Archaic/Early Late Archaic	Percent	36.36%	54.55%	9.09%	0.00%
4Bw	SE	± 14.50	± 15.01	± 8.67	± 0.00
n=11	Count	4	6	1	0

Table 8.115. Percentages of Platform Shapes of Whole and Proximal Flake Fragments.

Time Period		% Cortical	% Faceted	%Flat	% Lipped	% Indeterminate
Early Woodland	Percent	17.37%	30.71%	29.03%	22.36%	0.54%
(AB)	SE	± 0.93	± 1.13	± 1.11	± 1.02	± 0.18
n=1664	count	289	511	483	372	9
Terminal Archaic	Percent	19.07%	27.97%	36.44%	16.53%	0.00%
(2BC)	SE	± 2.56	± 2.92	± 3.13	± 2.42	± 0.00
n=236	count	45	66	86	39	0
Later, Late Archaic (1)	Percent	50.00%	21.43%	21.43%	7.14%	0.00%
(3Ab1)	SE	± 9.45	± 7.75	± 7.75	± 4.87	± 0.00
n=28	count	14	6	6	2	0
Later, Late Archaic (2)	Percent	44.44%	19.44%	30.56%	5.56%	0.00%
(3Ab2)	SE	± 8.28	± 6.60	± 7.68	± 3.82	± 0.00
n=36	count	16	7	11	2	0
Earlier, Late Archaic	Percent	10.54%	37.07%	19.05%	33.33%	0.00%
(3Bw)	SE	± 1.79	± 2.82	± 2.29	± 2.75	± 0.00
n=294	count	31	109	56	98	0
Terminal Middle Archaic/Early Late Archaic	Percent	0.00%	54.55%	27.27%	18.18%	0.00%
(4Bw)	SE	± 0.00	± 15.01	± 13.43	± 11.63	± 0.00
n=11	count	0	6	3	2	0

The percentages of whole and proximal flake fragments with a bulb of percussion and without a bulb of percussion did not vary substantially among the different occupation periods either (Table 8.116). In all horizons, the majority of the flakes had a bulb of percussion. The high number of flakes with bulbs of percussion suggests that hard hammer percussion, which causes a prominent bulb of percussion, was the most predominant method of core reduction and biface shaping. This is not in agreement with the platform shape data for the 3Bw. In that horizon, 33 percent of the platforms are lipped, supposedly indicating removal by a soft hammer, whereas the bulb of percussion data suggests that 89 percent were removed with a hard hammer.

Table 8.116. Percentages of Whole and Proximal Flake Fragments with and without a Bulb of Percussion.

Time Period		**% Present**	**% Absent**	**Indeterminate**
Early Woodland	Percent	78.31%	21.63%	0.06%
(AB)	SE	± 1.01	± 1.01	± 0.06
n=1664	Count	1303	360	1
Terminal Archaic	Percent	93.22%	6.78%	0.00%
(2BC)	SE	± 1.64	± 1.64	± 0.00
n=236	Count	220	16	0
Later, Late Archaic (1)	Percent	92.86%	7.14%	0.00%
(3Ab1)	SE	± 4.87	± 4.87	± 0.00
n=28	Count	26	2	0
Later, Late Archaic (2)	Percent	88.89%	11.11%	0.00%
(3Ab2)	SE	± 5.24	± 5.24	± 0.00
n=36	Count	32	4	0
Earlier, Late Archaic	Percent	95.58%	4.42%	0.00%
(3Bw)	SE	± 1.20	± 1.20	± 0.00
n=294	Count	281	13	294
Terminal Middle	Percent	81.82%	18.18%	0.00%
Archaic/Early Late	SE	± 11.63	± 11.63	± 0.00
Archaic	Count	9	2	11
(4Bw)				
n=11				

An examination of thermal alteration on whole and proximal flakes suggests that purposeful heat treatment of chert was not practiced at this site. The majority of flakes in all strata did not have any evidence of thermal alteration. Of those that did exhibit thermal alteration, a majority in each horizon have thermal damage on both sides, indicating that thermal alteration occurred after the flake was removed. Heat treatment of chert is designed to improve the fracture qualities of the stone, thus it would have occurred prior to flakes being removed. Therefore, thermal damage would only manifest itself on the dorsal side of the flakes. The high percentage of thermally altered flakes in the 3Bw may be related to the fact that a number of non-cultural anomalies were identified as being part of or associated with a burned tree fall. Table 8.117 provides percentages and mean standard error for presence of thermal damage.

Table 8.117. Percentages of Flakes (Whole Flakes and Proximal Flake Fragments) with Thermal Damage.

Time Period		% None	% Dorsal	% Both	% Ventral	% Present*
AB	Percent	89.54%	2.64%	7.76%	0.00%	0.06%
n=1664	SE	± 0.75	± 0.39	± 0.66	± 0.00	± 0.06
	Count	1490	44	129	0	1
2BC	Percent	97.03%	1.69%	1.28%	0.00%	0.00%
n=236	SE	± 1.10	± 0.84	± 0.73	± 0.00	± 0.00
	Count	229	4	3	0	0
3AB1	Percent	100.00%	0.00%	0.00%	0.00%	0.00%
n=28	SE	± 0.00	± 0.00	± 0.00	± 0.00	± 0.00
	Count	28	0	0	0	0
3AB2	Percent	97.22%	2.78%	0.00%	0.00%	0.00%
n=36	SE	± 2.74	± 2.74	± 0.00	± 0.00	± 0.00
	Count	35	1	0	0	0
3Bw	Percent	67.01%	1.70%	30.95%	0.34	0.00%
n=294	SE	± 2.74	± 0.75	± 2.70	± 0.34	± 0.00
	Count	197	5	91	1	0
4Bw	Percent	100.00%	0.00%	0.00%	0.00%	0.00%
n=11	SE	± 0.00	± 0.00	± 0.00	± 0.00	± 0.00
	Count	11	0	0	0	0

* Location of damage was not recorded.

Finally, presence and amount of cortex on each flake was examined (Table 8.118). Again, there were relatively little differences in the percentages of cortex amount between the different time periods. Flakes without cortex, or with coverage between 1 and 49 percent were the most prevalent. The Early Woodland Period, Terminal Archaic Period, and earlier Late Archaic Period had the highest proportion of flakes with no cortex. The remaining assemblages did not have a large enough sample to warrant discussion. For example, in the 3Ab1 a difference in count of only two artifacts manifests itself as a percentage difference of almost ten percent.

Table 8.118. Cortex Percentages for Whole Flakes and Proximal Flake Fragments.

Time Period		0	1-49	50-99	100	Yes
Early Woodland	Percent	61.00%	29.15%	6.55%	3.25%	0.05%
AB	SE	± 1.20	± 1.11	± 0.61	± 0.43	± 0.06
n=1664	Count	1015	485	109	54	1
Terminal Archaic	Percent	61.86%	32.20%	5.08%	0.86%	0.00%
2BC	SE	± 3.16	± 3.04	± 1.43	± 0.60	± 0.00
n=236	Count	146	76	12	2	0
Later, Late Archaic (1)	Percent	50.00%	42.86%	7.14%	0.00%	0.00%
3Ab1	SE	± 9.45	± 9.35	± 4.87	± 0.00	± 0.00
n=28	Count	14	12	2	0	0
Later, Late Archaic (2)	Percent	30.56%	47.22%	13.89%	8.33%	0.00%
3Ab2	SE	± 7.68	± 8.32	± 5.76	± 4.61	± 0.00
n=36	Count	11	17	5	3	0

Time Period		0	1-49	50-99	100	Yes
Earlier, Late Archaic	Percent	62.24%	29.93%	6.80%	1.03%	0.00%
3Bw	SE	± 2.83	± 2.67	± 1.47	± 0.59	± 0.00
n=294	Count	183	88	20	3	294
Terminal Middle Archaic/Early Late Archaic	Percent	36.36%	45.45%	18.18%	0.00%	0.00%
4Bw	SE	± 14.50	± 15.01	± 11.63	± 0.00	± 0.00
n=11	Count	4	5	2	0	0

What were the sources of the lithic materials represented?

The lithic raw material analysis for Area 3-South was tiered and involved categorizing all artifacts according to raw material types, with samples of each type subject to an expert sourcing study. Methodological approaches are discussed in Section B. The full raw material analysis report is provided as Appendix 8L. An excerpt of this report discussing in detail chert types and their origins follows Table 8.119, below.

In summary, the main prehistoric components of Area 3-South were identified in six horizons—the AB, 2BC, 3Ab1, 3Ab2, 3Bw, 4Bw, and 5Bw. The total count of debitage and flaked stone tools for these six horizons is 8,003. Among this assemblage, three types of chert, Onondaga, Upper Mercer, and Flint Ridge/Vanport, were identified. Quartzite, sandstone, and silicified shale artifacts were encountered as well. The distribution of flaked stone tools and waste between material types is shown in Table 8.119.

Table 8.119. Summary of Lithic Types for Flaked Stone Tools and Debitage from Area 3-South, Horizons AB through 5Bw.

Lithic Material	Quantity	Percent of Assemblage
Onondaga Chert	7,931	99.10
Upper Mercer Chert	20	.25
Flint Ridge/Vanport Chert	20	.25
Quartzite	16	.20
Sandstone	3	.04
Shale	2	.02
Unidentified	11	.14
Total	**8,003**	**100.00**

Of the chert artifacts subject to specialized raw material type analysis, the majority were Onondaga chert, which ranges from gray to black or nearly black in color. A few pieces consisting of black chert appeared to be not of Onondaga chert, glacially transported from deposits in New York or Canada, but rather of Upper Mercer chert, resembling that found in Coshocton County, central Ohio. Given the geographical range of the Upper Mercer limestone formation, the latter may have been eroded from fairly local limestone deposits and gathered from the Ohio River gravels. The black Upper Mercer chert may be nearly impossible to distinguish from the black Onondaga chert. Their slight differences may be apparent using 20X or 40X magnification in conjunction with comparison to samples

from known outcrops. Both may have varying quantities of fossil remains. The fossils from each, at least as observed in the artifacts recovered from Area 3-South, are typically not distinguishable from those of the other using macroscopic or low-level microscopic techniques. This is due to silicification during the formation of the chert, which has destroyed the original carbonate microstructure of the fossils. Color of the fossils in both cherts may range from white to light blue. In the most general terms, the darkest Upper Mercer chert itself tends to be just slightly blacker, with the darkest Onondaga chert having an almost imperceptible brown hue. This subtle difference can be obscured by weathering and patination and thus can be an unreliable indicator. In terms of texture, both are generally very fine-grained, porcelaneous cherts. Upper Mercer chert may tend to be slightly more vitreous, but this may be obscured where weathering has polished artifacts. Under 40X magnification, both may be similarly fine-grained and differ in texture in a way that can only be distinguished with close scrutiny and the use of comparative specimens. It should be stressed that identification using a "key" based on various macroscopically observable characteristics can be unreliable, especially when dealing with weathered, stream-gathered, glacially- and alluvially-transported specimens of similar-looking cherts from different formations. More important is a familiarity with the range of variation observable at various outcrops.

Also present in the assemblage from Area 3-South were artifacts of Flint Ridge (Vanport formation) chert. As is the case with Upper Mercer and Onondaga cherts, Flint Ridge chert and Brush Creek chert, best known from outcrops found farther south along the Ohio River in southeastern Ohio and neighboring West Virginia, can be difficult to distinguish. The two limestone formations, if not their best-known chert-bearing outcrops, overlap each other considerably in geographic range. The two cherts are typically difficult to distinguish in part due to their stratigraphic proximity. Being of similar upper Pennsylvanian age, cherts from these formations may have formed in very similar depositional environments, and may thus have very similar contents or characteristics. Again, familiarity with the range of variation observable at various outcrops of these cherts is essential for identification, as differences may be subtle. Flint Ridge/Vanport and Brush Creek cherts may exhibit a wide range of colors, including but not limited to green or olive, red, pink, white, yellow or black, any of which may or may not be caused by patination or thermal alteration. While Flint Ridge (Vanport) chert is highly vitreous with somewhat greater consistency due to its high silica content, specimens of Brush Creek chert can be of equally high-quality, glossy appearance. Typically, these cherts are easier to distinguish from other Ohio Valley cherts than from each other. In the case of the observed specimens of Flint Ridge/Vanport chert recovered in Area 3-South, they happened to match closely with specimens in the investigator's (Michael Kagelmacher) comparative collection, but otherwise they could easily fall within the range of variation for Brush Creek chert as observed at various outcrops in southeastern Ohio and adjacent West Virginia. As Flint Ridge chert is known to have been widely distributed prehistorically, and as chert from the Vanport formation is perhaps more likely to occur, at least in small quantities, among the Ohio River gravels as far north as the site, there is further reason to believe that these specimens are most likely Flint Ridge/Vanport chert.

The lithic artifacts from Area 3-South, when compared to samples of known cherts (including specimens from the Holland Lithic Laboratory in Buffalo, New York), appeared to consist of a limited range of raw materials. Based on the presence of rounded and weathered surfaces on much of the debitage, this material was likely gathered primarily from nearby Ohio River gravels. The great majority of the artifacts analyzed consisted of glacially transported Devonian-aged Onondaga chert. Though the southern extent of the Wisconsin glaciation was somewhat north of the project area, the region was nonetheless subsequently subjected to considerable glacial outwash (J.D. Holland, personal communication, 2003). As a result, Onondaga chert, which occurs in bedrock exposures across New York State, can be found in Ohio River gravels in the vicinity of the site. Similar material is found in glacial deposits throughout western New York and northern Pennsylvania. Nearly 84 percent of the artifacts analyzed for raw material source (38 of 48 tools and 92 of 107 flakes) strongly resembled Onondaga chert from the Clarence and Seneca members, which outcrop surficially in New York State and which themselves may be similar in appearance. Much of this material is gray to black and occasionally very fossiliferous, but a considerable amount of weathering has caused numerous specimens to acquire varying degrees of tan coloration. One of the points (Catalog no. 2198) clearly exhibits both gray and weathered tan phases of Onondaga chert.

A number of the artifacts analyzed consist of black chert. While some of these are Onondaga chert, a few (three tools and two flakes) consist of lower-Pennsylvanian-aged Upper Mercer chert resembling that from Coshocton County, Ohio (Kagelmacher 2000, 2001). Given the geographical range of the Upper Mercer formation (Carlson 1994), it is likely that such material may also have been gathered from nearby Ohio River gravels.

A small number of artifacts (three tools and six flakes) appear to consist of upper-Pennsylvanian-aged Vanport chert (Kagelmacher 2000, 2001). This material resembles Vanport chert from Flint Ridge, Licking County, Ohio, and may have been imported. As is the case with Upper Mercer chert, however, given the extent of the Vanport limestone in Ohio and Pennsylvania (Carlson 1994), small quantities of Vanport chert may possibly occur in Ohio River gravels. The chert-bearing range of the Vanport formation in Pennsylvania is unfortunately poorly documented.

In addition, three of the analyzed tools consist of light colored quartzite that may have originated in any number of geological formations. It is essentially impossible to identify this material as to its formation of origin using macroscopic and low-magnification analysis. Such material is found in considerable quantities in the gravels of the Ohio River.

In general, though the artifacts analyzed appear to consist primarily of chert from as many as three different geological formations, including in particular Onondaga chert, the vast majority of the material was apparently locally acquired from glacially transported Ohio River gravels in the vicinity of the site.

In summary, based on the presence of rounded and weathered surfaces on much of the debitage, and the location of known outcrops, the material for this artifact assemblage was likely gathered primarily from nearby Ohio River gravels. Though the southern extent

of the Wisconsin glaciation was somewhat north of the site, the region was nonetheless subsequently subjected to considerable glacial outwash. Given the high percentage of Onondaga chert in the artifact assemblage, it is possible that there was a higher percentage of Onondaga material in the river gravels available during the prehistoric site occupation; however, no attempt was made to sample the cobbles currently available in the Ohio River gravels to test this scenario.

In addition, a steatite vessel fragment was found during Area 3-South excavations in the AB horizon. The apparent vessel fragment was included in a material sourcing study (Vento and Stahlman 2004), and most closely resembles material at the Georgetown and Christiana quarries in Chester County, Pennsylvania. Three additional possible steatite fragments were found in the AB horizon; and a possible steatite cobble was found in the 3Bw horizon.

Other lithic materials recovered during excavations include hematite, ochre, and mica.

Is there a preference in lithic material?

Raw material use remained consistent throughout the occupation of Area 3-South. Onondaga chert, available in the form of river cobbles, was used almost exclusively throughout the entire occupation of the area. Flint Ridge/Vanport chert and Upper Mercer chert was used, but in very limited quantities. This pattern was evidenced both in the debitage that was left from tools manufactured at the site, and tools either made at the Area 3-South or brought there in the form of finished bifaces and pp/ks. An overview of materials recovery by soil horizon and artifact type is provided in Table 8.120. Additional discussion by soil horizon follows.

Table 8.120. Summary of Area 3-South Material Recovery by Horizon and Artifact Type.

	AB	2BC	3Ab1	3Ab2	3Bw	4Bw	5Bw	Total
Debitage								
Chert								
Onondaga	3,494	491	105	103	3,521	28	5	7,747
Upper Mercer	12	3		1				16
Flint Ridge/Vanport	9	7		1	1			18
Quartzite	7		1	1	3			12
Sandstone			1		1			2
Shale				2				2
Unidentified	2	4	1			1		8
Cores and Tools								0
Chert								
Onondaga	98	19	9	8	48	1	1	184
Upper Mercer	1	2		1				4
Flint Ridge/Vanport	1	1						2
Quartzite		1	2		1			4
Sandstone					1			1

	AB	2BC	3Ab1	3Ab2	3Bw	4Bw	5Bw	Total
Shale								0
Unidentified	1	2						3
Total	3,625	530	119	117	3,576	30	6	8,003

This pattern of raw material choice, combined with the small size of the flakes, and the evidence for use of the bipolar technique, which has been interpreted as a technique used to extract the most material from small cobbles and cores (Perry and Kelly 1987), suggest that the people that lived in what is now Area 3-South made and used tools from easily available river cobbles from the adjacent Ohio River. One question that remains is whether they were selectively choosing particular chert types from those types available as river cobbles. Additional future studies to determine the percentage of available river cobbles that are Onondaga chert, and average size of the available cobbles, by collecting sample cobbles from the area near the site could add to the conclusions made here.

The Area 3-South pattern differs from the diachronic pattern of raw material use compiled for the Raccoon Creek Watershed (Watershed D of the Ohio River Subbasin 20), which is located less than one mile south of Area 3-South. Those data were compiled from findings at the Meadowcroft Rockshelter, Mungai Farm (36WH106), Cross Creek Village (36WH298), and the Avella Mound Sites (36WH15) sites. That study concluded that one-third to slightly less than one-half of material used at archaeological sites in Watershed D through time was locally available stone. One similarity is that those data also indicate that raw material use remains constant over time for the Raccoon Creek Watershed (GAI Consultants, Inc. 2003).

AB Horizon Raw Material

Raw materials from this horizon was overwhelmingly Onondaga chert; available to the site occupants in the form of nearby river cobbles. Almost 100 percent of the debitage recovered is of Onondaga chert (*n* = 3,494). The only additional debitage material recovered includes twelve fragments of Upper Mercer chert; nine Flint Ridge/Vanport chert fragments, to indicate that some non-local chert was carried to the site during this time period; and seven quartzite fragments. The two remaining pieces are cortical fragments, which could not be assigned to a particular raw material. All the cores (*n* = 65) recovered from this occupation period were also of Onondaga chert. Finally, all the pp/ks (*n* = 23), and all the bifaces and expedient tools (*n* = 13) from this time period were also made from Onondaga chert.

2BC Horizon Raw Material

The raw material use pattern for the Terminal Late Archaic Period as evidence by 2BC horizon artifact recovery is similar to that of the Early Woodland Period component identified in the AB horizon. From a total of 505 debitage fragments, 491 pieces, or 97 percent, were of Onondaga chert; the remaining amounts were seven pieces of Flint Ridge/Vanport chert, three Upper Mercer chert fragments, and one unidentified material. Three additional pieces were cortical rind only and could not be assigned to a particular raw material. Thirteen pp/ks were found in the 2BC horizon, eight were Onondaga chert, two were made on Upper Mercer chert, and two were made of quartzite. All of the bifaces and

expedient tools (*n* = 5) were made from Onondaga chert. With the exception of one quartzite core fragment, all the cores (*n* = 7) were also made of Onondaga chert.

In sum, lithic production for this time period appears to have been expedient from raw material collection through final manufacture. Raw material was collected from the nearby Ohio River in the form of small cobbles, and was reduced using opportunistic methods, including either hard or soft hammer percussion, or bipolar techniques to reduce cores and shape bifaces. Again, evidence for the entire manufacturing sequence was found on site, within Area 3-South.

3Ab1 Horizon Raw Material

The pattern described for the AB and 2 BC horizons continues into the 3Ab1 and later, Late Archaic (1) occupation period. From a total of 108 debitage pieces, 105, or 97 percent, are of Onondaga chert. The remaining three pieces include one quartzite fragment, one sandstone fragment, and one unidentifiable, possibly igneous, stone fragment. Six core and core fragments were recovered; all except for one quartzite cobble are of Onondaga chert. The pp/k was also made from Onondaga chert, as were the two bifaces and one expedient tool recovered in this occupation period. A fragment of a quartzite Lehigh Broad pp/k was also recovered in this soil horizon (Field Designation F15, Level 1); it refits with a fragment recovered in the 2BC Soil Horizon (found in Field Designation F10, Level 2).

3Ab2 Horizon Raw Material

The raw material use pattern continued into this occupation period. Of the 108 debitage fragments recovered, 103 (95 percent) were of Onondaga chert. The remaining pieces included one piece of Flint Ridge/Vanport chert, one Upper Mercer fragment, one quartzite fragment, and two fragments of silicified shale. Of the two bifaces recovered, the whole biface was made from Upper Mercer chert, and the biface fragment was made from Onondaga chert. No pp/ks were recovered from this occupation period. Seven cores and core fragments were recovered; all were of Onondaga chert.

3Bw Horizon Raw Material

A total of 3,521, or over 99 percent, of the 3,526 debitage fragments was made of Onondaga chert. The remaining fragments included one piece of Flint Ridge/Vanport chert, three quartzite fragments, and one sandstone fragment. All the pp/ks recovered were manufactured from Onondaga chert, and the 12 bifaces and expedient tools recovered were likewise of Onondaga chert. All of the 31 cores and core fragments were of Onondaga chert except for two bipolar tested cobbles; one of these was made of sandstone, and the other was quartzite. This pattern again indicates that the people that lived at what is Area 3-South used locally available chert cobbles almost exclusively, and practiced different techniques to reduce them, apparently depending on cobble size; it is inferred that smaller cobbles were reduced using bipolar techniques.

4Bw Horizon Raw Material

Almost all (*n* = 28) the artifacts from this time period were made from Onondaga chert. The remaining fragment was unidentifiable, made possibly of an igneous rock. No ‘exotic’ or non-local material was recovered from this time period. No bifaces or expedient

tools were recovered from this time period. The one pp/k fragment recovered from Field Designation F13, Level 8, of the 4Bw horizon was made of Onondaga chert. Because the assemblage from this time period is so small it is difficult to make conclusions regarding raw material use.

Is there a relationship between projectile point function and lithic raw material use?

The relationship between projectile point function and lithic raw material selection was explored via the microwear study and that study found no correlation between the two. Furthermore there was no evident relationship between point type and use type or implied activity set. The only patterning observed was that the pp/ks found in the AB horizon had use-wear indicating that they were used for scraping tasks as opposed to cutting or slicing and that the converse applied to tools found in underlying soil horizons. Those found in layers beneath the AB horizon all appeared to have been used as general purpose or utility tools and showed wear consistent with cutting and slicing as opposed to scraping tasks.

Are other lithic technologies and tool assemblages identified at Site 36AL480 similar to other sites in the region of the same time period?

The Area 3-South pattern differs from the diachronic pattern of raw material use compiled for the Raccoon Creek Watershed (GAI Consultants, Inc. 2003). That study examined sites within Watershed D of the Ohio River Subbasin 20, which is located less than one mile south of Area 3-South. Those data were compiled primarily from findings at the Meadowcroft Rockshelter (36WH297), Mungai Farm (36WH106), Cross Creek Village (36WH298), the Avella Mound Sites (36WH15), and the Cross Creek survey, as well as some comparative data from nearby adjacent watersheds. Their study concluded that one-third to slightly less than one-half of material used at archaeological sites in Watershed D through time was locally available stone. This is in contrast to Area 3-South, where over 99 percent of the flaked stone material is available locally, although in the form of river cobbles that originated farther north. One similarity between Area 3-South and the Raccoon Creek study is that both indicate that raw material use remained constant over time.

Area 3-South does not have a varied or extensive lithic tool assemblage. As such, for the region it represents a fairly common toolkit for short-term procurement sites. These were located both in the uplands and riverine settings, near naturally available food resources (Weed 2002). One lithic technology that has not been well documented in the region is the use of compound tools. These are represented in the Area 3-South flaked stone assemblage by what Neumann (Appendix 8M) terms microliths. His criteria for defining a microlith is as follows:

> (1) microflake edge damage had to be unifacial; (2) the loss of those microflakes could have come only after the small flake itself had been detached from whatever stone it was flaked from (usually this meant that the microflakes had been lost from the distal edge of that small flake); (3) the microflake scars had to be as weathered as the remainder of the flake; (4) there had to be a series of multiple adjacent microflakes, not just an incidental flake here or there; (5) at least some of the other edges along the perimeter of the flake had to have been undamaged, indicating that the unifacial flaking identified was localized and intentional; and (6) because of the possibility of platform preparation, platform areas of the flake were excluded.

Two lithic reduction trajectories have been identified as sources of microliths. One is simply making use of flakes created during the process of forming a biface. The other is more direct and involves purposeful bipolar reduction using an anvil and hammerstone to shatter a small core or cobble and select out the appropriate flakes for the compound tool. There is evidence in the Area 3-South artifact assemblage for both types of reduction. This process may provide an explanation for the possible bipolar reduction activity areas identified by the spatial analysis. However, Neumann states that it appears much of the Area 3-South collection originated from intentional selection of flakes incidentally created during bifacial thinning. This is determined by the characteristic lipped platform and fan-shaped flakes.

Neumann examined 502 small flakes that by macroscopic examination were seemingly unmodified. With microscopic examination he identified 92 microliths and small utilized flakes associated with the occupations during the Middle Archaic (n = 2), Late Archaic (n = 15), and Early Woodland (n = 75). The Middle Archaic specimens can only be ascribed to general utility tasks, such as scraping and processing of resilient materials. In the Late Archaic specimens, angles on utilized edges indicate some were best suited for scraping while others were most likely used for slicing. Finally, the Early Woodland assemblage evidences a range of edge angles, indicating use of compound tools for all manner of slicing, cutting, scraping, and gouging.

Are there any exotics represented in the assemblage?

As indicated in the raw material study and general artifact discussion, all of the stone used in chipped and groundstone tools could have been obtained locally, in from Ohio River cobbles. Ninety-nine percent of all flaked stone tools and debitage was Onondaga chert. Upper Mercer and Flint Ridge/Vanport cherts, quartzite, sandstone, silicified shale, and unidentified stone comprise the balance of the assemblage.

The steatite vessel sherd found was included in a material sourcing study (Vento and Stahlman 2004) and most closely resembles material at the Georgetown and Christiana quarries in Chester County, Pennsylvania.

Environmental Context and Reconstruction

According to the DRP, to date, there has not been an in-depth study of the environmental and depositional history of the Upper Ohio River Valley in an archaeological context. Understanding the environmental and depositional histories of the Upper Ohio River Valley is important for interpretation of cultural change in the region. A major focus of the overall site data recovery effort was to involve environmental reconstruction of the site vicinity during the Archaic Period. It was proposed in the DRP that the study could also help predict the potential location and depth of archaeological sites. Lines of evidence included understanding the range of resources available to the prehistoric inhabitants and how the availability of these resources changed during the Holocene. The DRP also suggested that the environmental reconstruction of Area 3-South could have the potential to serve as a reference site for future archaeological studies, and that it would be important to compare the information gained from data recovery activities associated with the excavation of Area 3-South with the information available from other site excavations within various regions

(southwestern Pennsylvania, Upper Ohio Valley, Appalachian Plateau, Pennsylvania, and Eastern United States). Much of the depositional processes of the T_3 terrace landform on which Area 3-South is located had already been examined but needed to be refined during the data recovery fieldwork. Specific questions posed in the DRP regarding Environmental Context and Reconstruction are:

- How did the environmental setting, including climate and soil deposition, of the site change during the Holocene?
- How do changes in climate, deposition stream flow, fauna, and vegetation relate to settlement activities that occurred at the site?
- How did flooding of the T3 terrace affect the archaeological evidence of various occupations? Any evidence of scouring present?
- What were the Holocene climatic history, depositional history, and environmental history of the Upper Ohio River Valley in the site vicinity?

Excavations at 36AL480 and accompanying geomorphological and palynological analyses provide the first comprehensive set of data with which to reconstruct the prehistoric environment for the region. This section provides a reconstruction of the environment based on studies completed by the Area 3-South geomorphology and palynology team.

Area 3-South is located within the Unglaciated Appalachian Plateaus section of the Appalachian Plateaus physiographic province (Thornbury 1965). The 30-acre project area on which the site is located is on the right bank of the Ohio River. The site straddles three terrace surfaces, designated T_1, T_2, and T_3, reaching up to 7 meters (23 ft) above stream level. Area 3-South occupies the highest and broadest terrace, designated T_3, which lies 6 to 7 meters above the active river channel. Geomorphological investigations identified prehistoric archaeological contexts to at least 5 meters of depth across the site and beneath the T_3 surface, and prehistoric occupation of the T_3 terrace was dated to at least 6800 B.P. Habitable floodplain environments were found to have been in existence in the project area since the Pleistocene/Holocene transition dating to approximately 11,500-10,000 B.P. (Schuldenrein et al. 2003).

The larger 36AL480 project area contains not only the three terrace landforms listed previously, but also a relict backchannel zone to the northeast of the T_3 terrace and a recent casting basin, the excavation of which cut into portions of the T_2 and T_3 terraces north of Area 3-South. The whole of Area 3-South, the focus of this report, was contained on the T_3 terrace, but two other portions of 36AL480 (designated Area 1 and Area 2) also underwent geomorphological, pollen, and paleobotanical investigation in an attempt to develop a model of environmental and landscape evolution for the area and to present a geomorphological framework within which to place the depths of cultural activity on the site. Approximately 70 percent of the archaeological units excavated at 36AL480 during the Phase I survey, as well as during the subsequent follow-up geomorphological excavations over the entire site, were positioned on the T_3 terrace, while 20 percent of the units were on the T_2 terrace. Area 3-South was found to contain the thinnest Middle Holocene and thickest Late Holocene deposits of the entire project area.

Due to the fact that all of the soil horizons of interest in this discussion were encapsulated within one allostratum at the site (AU-3, Late Holocene), with the exception of horizon 4Bw, a summary of the several environmental time periods relevant to the site will be given first. This overview, and much of the discussion below, is based on the *Interim Geomorphological Report for Leetsdale Area 3-South* (Schuldenrein et al. 2003). This summary serves as a partial diachronic discussion of environmental changes in the project area, as an introductory context. Further discussion by specific time period will follow, as well as subtle diachronic patterns relevant to the vegetative environment at the site.

As discussed in Section C. Results, four discrete allostrata were identified which contained the archaeological evidence discovered at 36AL480 from the Late Archaic through Early Woodland time periods. These allostrata were identified as AU-1, AU-2, AU-3, and AU-4, and provided evidence of landscape changes by illustrating patterns of soil deposition and consequential production and alteration of landforms over time; the allostrata also provided some clues to climactic changes.

The AU-1 allostratum was identified as composed of Early Holocene sands, reaching depths of approximately 7 meters, and dating from 11,500-6500 B.P. Allostratum AU-2 was characterized as 1 to 2 meters of Middle Holocene overbank sands, silts, and deep soils containing Middle to Late Archaic archaeological deposits, dating from 6500 to 3500 B.P. The upper meter of this Middle Holocene allostratum contained dense Late Archaic archaeological features. Above the Middle Holocene soils was a series of Late Holocene sediments with a depth of approximately one meter, identified as AU-3, and comprised of episodic high discharge sands and shallow, less-developed soils which were indicative of shorter-term soil formation, in the form of thin and sandy flood deposits. This AU-3 allostratum contained archaeological deposits dating from Late Archaic to Early Woodland times. The latest allostratum in time was the AU-4 allostratum, and was constituted largely by historic period fill containing construction debris and landscaping sediment.

Each allostratum is associated with a unique stream environment, and thus is equivalent to a different period of transition in the environmental history of the area studied. AU-1 was characterized by a broad, shallow river channel with a braided stream and broad flood belt of the late glacial and early post-glacial Ohio drainage. A laterally migrating habit of the stream was predominant, and meandering at this time began to form the active river channel. This period was approximately subsequent to the Younger Dryas, a cold and dry climatic pulse predating the close of the Pleistocene Age. It is thought that though this post-glacial period was characterized by an amelioration of the climate and although some Early Archaic cultural deposits may be present in this allostratum, stream competence was likely still high enough that little evidence of sustained occupation would be preserved. This proved true based on the archaeological record.

The AU-2 allostratum marks a transition during Middle Holocene times from a laterally migrating stream to a more confined stream entrenched in its channel, though some meandering of the stream resulted in point deposition, so that the earliest cultural deposits were often present on former point bars. At this same time, the T_3 terrace was building up, almost exclusively vertically, and became a high, dry landform, well above the floodline and

thus conducive to prehistoric settlement. The T_3 terrace during this time became the dominant landform, and after 6500 B.P. was the highest landform in the floodplain. The top of AU-2 was dated to ca. 3500 B.P., during which time the T_3 terrace was flanked by the back channel, and a date of 3800 B.P. for the back channel sediments suggests that this landscape feature became part of a continuous landform with the T_3 terrace after that time. This stabilized terrace environment and backchannel began to provide a hospitable riverine as well as high and dry terrace environment for inhabitants, and denser Late Archaic archaeological deposits present in the upper sediments of the AU-2 allostratum of Area 3-South corroborate existence of inhabitants during this time.

Some evidence of an erosional phase, possibly marking a regional climatic phenomenon, occurred between the accumulation of AU-1 and AU-2 allostrata, and the Laurentide ice sheet had retreated north, allowing the penetration of cyclonic storms from the Gulf of Mexico and south Atlantic. Evidence of such large storms was found in the 6AC-6BC-7AC sequences of the AU-2/AU-1 interface. There is no archaeological evidence indicating how these climatic events may have affected inhabitants of the area, however, or any cultural environmental adjustments of those inhabitants.

The AU-3 allostratum marks another transitional period in the evolution of the landscape, and contains medium to fine sands (dated to post 3500 B.P.) topped by thin soils which indicate high discharge flooding, only irregularly rising to the level of the T_3 terrace. In fact, a second new Terrace (T_2) was building up and cutting into the T_3 terrace at this time. Thus, the local environment during this period was transformed into a complex riverine environment featuring three distinct surfaces, an emerging new floodplain (the T_2 terrace), an elevated stabilized terrace (T_3), and an aquatic component on the distal edges of the T_3 terrace in the form of the back channel. This complex and varied environment would be conducive to habitation and subsistence, and in fact this Late Holocene AU-3 landscape contained the densest archaeological remains, ranging from the Transitional Archaic through Early Woodland time periods. The soil horizons within the AU-3 allostratum consist of a series of short term soils (Inceptisols or Entisols) represented by Field Designations F3 (the disturbed top soil layer), F4, F14, F6, F9, F10, F8, F15, F11, and F13 (preserved in stratigraphic order), ranging from Late Archaic to Transitional Archaic to Early Woodland times. These horizons accumulated above the eroded 4Bw or 4Bt horizon, and indicate highly variable land use occurring on at least two surfaces (terraces). At some point the back channel was abandoned during the time period represented by AU-3, but consequences of this in the activities of inhabitants is unknown.

The last major modification of the landscape was evident in the AU-4 allostratum, when some evidence of high discharge flooding (post 1600 A.D.) appeared, resulting in extensive erosion of the uppermost prehistoric components (Middle and Late Woodland). Also, significant and continuous grading and filling in recent times has obscured the archaeological record for this latest time period, creating an artificial landscape and resulting in irregular preservation of the latest prehistoric and historic deposits.

Environmental Context of Area 3-South by Soil Horizon

AB Horizon

This time period was marked by episodic overbank flooding, yet with the flooding only irregularly rising to the level of the T_3 terrace. As discussed above, the presence of the high and stable T_3 terrace as the dominant landform, the presence of a new second terrace/floodplain (T_2), and a complex and varied riverine environment would be highly conducive to habitation during this time period. This time period also corresponds to the later portion of the Sub-Atlantic climatic phase (ca. 3,000-1,750), which is identified as a period of relative terrace stability and warm and moist climatic conditions. These factors likely all contributed to a more extensive and intensive period of habitation of the site, as evidenced by the fact that the greatest abundance of archaeological remains was recovered from this soil horizon. As discussed in previous sections of this report, this time period was characterized by a marked increase in amount and variety of plant foodstuffs seen in the archaeological record. Additionally, 98.8 percent of the faunal remains recovered from Area 3-South came from this soil horizon, though the poor level of preservation of those finds prohibited extensive identification of the faunal remains, so that little information regarding how climatic and environmental changes may have affected utilization of the rich resources of this environment could be determined.

2BC Horizon

The soils of the Terminal Archaic time period are characterized as coarse-grained deposits suggestive of episodic flood events, though only irregularly reaching the level of the T_3 terrace. Climatic conditions during the time of 2BC soil accumulation were most likely warm and dry with less effective precipitation than during the later Early Woodland times. This may account for both the lesser abundance and lesser diversity of paleobotanical evidence within this horizon relative to the AB horizon, though it has been noted previously that a pattern of reliance on nutfoods in the diet of inhabitants of the site was consistent over all time periods studied. Differences in artifactual preservation conditions between the two horizons may also account for this pattern, however. The environmental changes presented above for the AU-3 allostratum are relevant here, and no further episodic climatic events or information on environmental evolution are available for this horizon specifically.

3Ab1, 3Ab2, and 3Bw Horizons

The soil horizons representing the Later, Late Archaic (1) and (2) and Earlier, Late Archaic (3Bw) have been put together for this discussion of environmental context due to the fact that the environmental processes producing the sediments of those horizons are generally the same. The soils that accumulated during Late Archaic times to form what were identified as Field Designations F15, F11, and F13 (the 3Ab1-3Ab2, 3Bw soil succession) are the earliest Inceptisols present on the site. Together they constitute a period of protracted soil development, though each episode of soil accretion was represented by thin and sandy flood deposits and by shallow poorly developed soils indicative of short-term individual soil formations. A package of fine-grained deposits within this time period (3Bw-4Bw-5Bw) suggests lower energy overbanking of river waters, though more sustained flooding is suggested by the terminal warm and moist climatic conditions of the Atlantic climatic phase dating to ca. 3500 B.P. This Late Archaic period witnessed the genesis of a stable and varied

riverine environment conducive to habitation. The T_3 terrace was well established, the T_2 terrace floodplain was in existence, and the backchannel added aquatic complexity to the landscape. The paleobotanical analysis showed little variation in subsistence patterns throughout the Late Archaic time periods, the faunal remains were unidentifiable for these soil horizons, and the environmental evolution is encapsulated within one allostratum with similar environmental characteristics, so no further deductions are made based on climate/environmental changes and subsequent human settlement/subsistence patterns for this time period.

4Bw Horizon

The depth of the sediment associated with this horizon, the lack of flooding structures, and the well developed character of the soils support the concept of a vertical accretion depositional process and sustained, long-term formation of the T_3 terrace landform during this time period. As discussed previously, the vertical building up of the T_3 terrace, well above the floodline, and the formation of the back channel as a consistent part of the T_3 landform during this time period provided a varied and stable environment for habitation. In fact, the denser Late Archaic archaeological deposits present in the upper sediments of the AU-2 allostratum, as compared with AU-1, do suggest that this environment was conducive to habitation. However, the archaeological remains recovered from this soil horizon were the fewest in number of all of the horizons at Area 3-South. As discussed in other sections of this report, two nutting stones were found within Feature 252, a limited amount of FCR was recovered, and a small number of flaked stone artifacts were recovered, though no bifaces, expedient tools, or cores or core fragments were identified from this soil horizon. One untyped pp/k artifacts was recovered from the 4Bw horizon, though its cultural and chronological associations could not be determined. Additionally, one untyped pp/k artifact was recovered in Field Designation F13, Level 13, in what is tentatively interpreted as a 5Bw horizon. Paleobotanical and faunal remains were very scarce as well, so very little additional information relating to a relationship between changes in climatic and environmental conditions and activities of inhabitants of the site can be deduced.

Diachronic Comparison of Environmental Context

The discussion given above regarding environmental evolution of the landscape at the site, as evidenced by soil deposition patterns within the individual allostrata, is the primary evidence of diachronic transformation there. Additional information will be given here, however, pertaining to diachronic changes in the vegetative environment of the site.

As discussed in the subsistence and seasonality section of this report, a paleoethnobotanical study was completed as part of this study (Appendix 8P). This study provided data on the floral environment of the site over time, and subtle diachronic changes within that environment. Hand-collected wood charcoal and charcoal from flotation were analyzed to identify plant taxa used as wood fuel. Though the presence of these taxa reflects selection by inhabitants for fuel purposes, they do indicate the types of vegetation most likely present in the vicinity of inhabitants and available for human exploitation.

The wood taxa identified for Area 3-South were of the types expected to be found in the mixed deciduous forest present in the region. For the wood charcoal component overall

from flotation, the three most common taxa were hickory, walnut, and honeylocust, followed by cherry, bitternut hickory, maple, ash, and white oak. The paleobotanical analysis showed that all time periods contained diverse wood assemblages, though some slight patterning in wood remains through time was noted. Ash, cherry, oak and hickory were the most common in the earlier samples. Hickories and honeylocust dominated the Early Woodland assemblage, and walnut, honeylocust, and bitternut hickory were most abundant in the late Early Woodland features. The data suggest that a shift in fuel collection from the upland forests in Archaic times (more xeric species such as oak) to lower forest types during Early Woodland times occurred. There appears to be an increase over time in the proportion of plant types most likely to be found in low, rich, wet alluvial soils and to be of the shade-intolerant taxa likely to occur in open settings. This may suggest a transformation of the riverine environment toward the Early Woodland period characterized by a more open and disturbed landscape than during previous times, or a greater utilization of that part of the vegetative environment. Other than an abrupt increase in the quantity of nutshell derived from these riverine and shade intolerant taxa during Early Woodland times, the effect of a more open environment on settlement activities is uncertain. Recovered plant remains of all types were too scarce for the earlier (Archaic) components to give further clues to diachronic changes in vegetation and its utilization by human inhabitants.

During the 2001 preliminary palynological investigation at Area 3-South, as discussed in the interim geomorphological report (Jones in Schuldenrein et al. 2003), limited pollen analysis was performed on Area 3-South, the casting basin, and the back channel to assess potential for pollen preservation and in an attempt to gather data on environmental change at the base of the excavated sequence. The strongly oxidized condition of the sediments of Area 3-South seemed to inhibit preservation of pollen samples in this area, though a few fossilized grains of oak, hickory, and chestnut were found from the 4Bt1 horizon (AU-2, corresponding approximately to the Terminal Middle/Early Late Archaic period). The pollen samples from the casting basin taken immediately above the Pleistocene age gravels (baseline of sequence) had well-preserved pollen samples. The uppermost sample characterized a beech woodland with large quantities of elm and hemlock. The deeper sample in the casting basin contained an unexpected sample with high concentrations of Heath, Basswood, and Blueberry or Mountain laurel, while the expected gymnosperms (Pine, Spruce) were completely absent.

It was noted in the geomorphological analysis that the pollen record from the casting basin was consistent with Boreal vegetation patterns dated to post 10,000 B.P., with a unique presence of heath vegetation. The post-glacial pattern noted from other sites in Pennsylvania was marked by a replacement of species-poor spruce woodlands of the full-glacial period by a greater variety of conifers (jack pine, fir, pitch pine) in the post-glacial period (Schuldenrein et al. 2003), but the absence of the expected gymnosperms in pollen samples at the site prohibits recognition of this diachronic pattern at this site. The lack of preserved pollen samples at Area 3-South prohibits recognition of further diachronic changes in the vegetative environment from Late Archaic through Early Woodland times, as well as potential adaptations of the inhabitants to such changes.

Another interesting diachronic change concerns the T_3 terrace. As mentioned in the geomorphological report (2003), a radiocarbon date of ca. 3,800 B.P. from the back channel suggested that before that time the T_3 terrace may have been an island; this suggestion was bolstered by the presence of a slough behind the T_3 terrace. With the abandonment of the back channel and decreased competence of the river over time, a modified aquatic environment would have emerged and changed over time, producing a varied riparian environment during the latter depositional stage of the AU-2 allostratum and the duration of the AU-3 allostratum, constituted by Late Archaic through Woodland soil horizons. It would be expected that the development of various microenvironments in this complex riverine context would have produced abundant and varied faunal resources, but the faunal remains recovered at Area 3-South were scarce until the Early Woodland period, and the faunal fragments largely unidentified across all horizons. Therefore, changes in utilization of and adaptations to this changing environment by its human inhabitants remain obscure.

Regional Comparison of Environmental Context

As part of the geomorphological study conducted by Schuldenrein et al. (2003), site stratigraphies were compared with sequences of analogous age in the Delaware and Susquehanna River drainages, to study long-term alluvial chronologies, and to attempt to link archaeological chronologies, soil and depositional histories, and climatic chronologies along high landforms bordering major streams (2003). The geomorphological report reviewed several sites along the trunk drainages of the Susquehanna, Delaware, and Ohio Rivers. These sites included City Island, Harrisburg (Susquehanna River, Main Branch), Memorial Park (Susquehanna, West Branch), Sandts Eddy (Delaware River), and Mayview (Chartiers Creek/Ohio River), and 36AL480 (Ohio River). The factors that these three areas share are that each sequence involve a T_2 or T_3 terrace which is the oldest and highest post-Pleistocene landform for the drainage; each contains at least two vertically ordered discrete prehistoric components within separable stratigraphic contexts; each sequence extends to the base of the Holocene deposits; each contains well radiometrically dated deposits; and each has soils and sediments indicative of large-scale geomorphic and environmental transitions. A major difference between the trunk drainages is that the Ohio is part of the interior Mississippi drainage net and is thus a Midwestern stream of continental character in terms of floodplain-terrace morphologies and sedimentary sequences, while the Delaware and Susquehanna basins empty into the Atlantic Ocean (2003). The comparative findings of the geomorphological report will be summarized here as a regional comparison.

The four allostratigraphic units (AU-1 through AU-4) described at the beginning of this section in reference to depositional patterns and landscape alteration at the site were found to correspond nicely to the other sites discussed. For all three drainages, AU-1 was found to correspond to the Early Holocene period (11,500 to 6,500 B.P.), to begin above Pleistocene gravel, and to follow a pattern characterized by deposition of massive sands progressing to graded bedding in the form of lamellar beds (A-C successions) at all of the sites after approximately 10,000 B.P. The lowest AU-1 sediments, those of massive sand deposition, correspond to hydrographic overhauls of all of the Pennsylvania drainages resulting from the melting of the glaciers during the Pleistocene/Holocene transition. The stream flow model discussed for the site, of anastomosing channels forming braided streams during this time period, finds correspondence with those of the other trunk drainages. For all

of the sites reviewed from the three drainages, the channel morphologies changed from braiding to meandering in character, with graded beds and lower sedimentation rates. Schuldenrein et al. (2003) note that the most dynamic geomorphic environments of the contemporary Pennsylvania valleys existed during the Early Holocene Period, and that for the majority of sites the AU-1 allostratum indicates that 40 to 60 percent of terrace fills accumulated during this time period. The majority of landform construction of the T_2 and T_3 terraces occurred within this AU-1 allostratum at all of the sites reviewed. The amount of vertical buildup during this period was greater for the Delaware drainage than for the Susquehanna and Ohio drainages, however, due to the wider valleys of the latter two drainages. The only exception to this pattern of more dynamic geomorphic environments during the Early Holocene is found at City Island, where the base of deep Fragic soil, characterized by brittle soil consistency, bleached facies, and low organic content, rose well into the upper AU-1 levels, possibly due to local climatic conditions there.

The construction of the T_2 and T_3 landforms during the Early Holocene would be conducive to human habitation along the river, and cultural deposits within this allostratum, corresponding to Early to Middle Archaic periods, have been documented at all of the sites researched for the three drainages, though such deposits are thin and disparate, due to the fact that the deposits containing them resulted from high energy flood sands. These sands were erosive, tended to mobilize cover sediments, and often only buried cultural remains in microenvironmental settings (Schuldenrein et al. 2003).

The AU-2 allostratum accumulated between 6,500 and 3,500 B.P., and presented evidence of the continued building up of the T_2 and T_3 terraces at all sites. Stream competence and stream levels (relative to terrace surfaces) were generally lower during this Middle Holocene Period, flooding was less frequent, and the construction of the terraces was due more to channel overbanking than to channel migration; thus net sediment accumulation during this period was much reduced for all three drainages. Stream flows were confined to stabilized channel trenches, conditions were favorable for soil formation rather than sedimentation, soil variability is noticeable both between and within sites, and relatively stable terraces well above flood levels were conducive to habitation at all of the sites reviewed. At 36AL480, Memorial Park (Susquehanna drainage), and Sandts Eddy (Delaware drainage) several generations of soils were vertically stacked, and all contained rich archaeological deposits, due to the fact that the higher settings were less exposed to high discharge flooding and thus more conducive to habitation, as well as less likely to have had archaeological evidence obliterated. For all of the drainages, the increased density of archaeological remains suggests an increase in population and expansion of territories along the borders of these major rivers. Single occupations were contained within buried soils, suggesting that weathering occurred after abandonment, and subsequent occupations occurred after new surfaces were created (Schuldenrein et al. 2003). City Island was anomalous in that only one discrete soil was present in AU-2, related to the deeper Fragic soil profile. The AU-2 allostratum was thickest at 36AL480 and thinnest at Sandts Eddy, due to the narrower Delaware River valley at this latter site.

Within the AU-3 allostratum (3,500 to 1,500 B.P.), there is some evidence across the sites of stripping due to high discharge floods (though low in frequency) and marked

disconformity along the AU-2/AU-3 interface, but due to the ever higher topographic level of the T_2 and T_3 landforms, AU-3 is generally thin for all sites. Several soil generations were represented within AU-3 among all sites, and were thin sandy Entisols or Inceptisols capped by thin A horizons, truncated and with insufficient time to produce well-developed B horizons. These soils were virtually absent from the upper Delaware locale studied (Sandts Eddy), for there high discharge floods rarely reached the top of that terrace during the Late Holocene, but for the Ohio and Susquehanna valleys the evidence of AU-3 soil formation is consistent, with each profile presenting at least two to three of these thin soils. AU-3 contained rich Late and Transitional Archaic and Early Woodland archaeological deposits at all of the three drainages' sites reviewed, though the uppermost levels were missing due to historic landscaping and high discharge flood events in some cases.

The AU-4 allostratum across the Susquehanna, Delaware, and Ohio drainages, though varying in thickness between sites, was altered greatly by re-engineering of surfaces to impede flooding or re-contour surfaces, and the presence of archaeological remains proved unpredictable.

In conclusion, though the landscape and stratigraphy at Area 3-South parallel those of the Susquehanna and Delaware drainages, the Holocene sequence may be the deepest known to date, and thus may have great importance in understanding similarities in linked landscape and occupational histories among the three drainages, as well as potentially extending interregional reconstructions from Pennsylvania's Atlantic Coastal catchment to the greater Mississippi Valley catchment, as Schuldenrein, Vento, and Selby suggest.

E. CONCLUSIONS

Excavations at Area 3-South yielded remains of occupations from Terminal Middle Archaic, Late Archaic, and Early Woodland prehistoric periods, and from nineteenth-century historic use of the site. Over 37,000 artifacts were recovered, and 78 cultural features were identified within the excavation block. This section summarizes the finds and site interpretation, and provides general conclusions comparing the findings to current models of Archaic and Early Woodland period life and settlements systems in the region.

Early Woodland Occupation

The Early Woodland Occupation was identified in the AB horizon. Diagnostic Early Woodland artifacts consisted of Half–Moon Cord-Marked, Adena Plain, Watson Cord-Marked, and McKees Rocks Plain ceramics, and Forest Notched, Genesee, and Adena Ovate projectile points. Additional artifacts recovered in the AB horizon included chipped stone debitage (core and core fragments, flakes and flake fragments, shatter). The largest number of groundstone tools recovered in the Area 3-South excavation block was recovered in the AB horizon. These tools include nutting stones, net weights, a steatite vessel fragment, hammerstone/anvils, and pitted stones. Fragments of mica and possible hematite/ochre were also recovered in the AB horizon. Thirty-eight cultural features were identified as being associated with the AB horizon, containing the Early Woodland occupations of the site. Three of the features (Features 238, 240, and 243) were stratified and indicate reuse and longer-term use as cooking hearths or processing pits. Special analyses completed for this

soil horizon included ^{14}C dating, spatial analysis, lithic refit studies, flaked stone micro-wear examination, and floral and faunal analyses. Four radiocarbon dates were calculated from features associated with the Early Woodland occupations; Features 238 (1860 ± 40 B.P.), and 243 (1860 ± 70 B.P., 1760 ± 60 B.P., and 1890 ± 40 B.P.). Floral material identified included a rich variety of nuts, wood remains, and seeds, including black walnut, hickory, honeylocust, cherry, and elm; and erect knotweed, leadplant, and goosefoot seeds. Faunal analyses completed identified only deer and rabbit, as preservation of bone was poor.

Late Archaic Occupations

Evidence for occupation during the Late Archaic Period was found in the 2BC, 3Ab1, 3Ab2, and 3Bw horizons. Based on radiocarbon dates, diagnostic artifacts recovered, and site stratigraphy, this period was divided into the following periods and associated soil horizons: the Terminal Late Archaic Period (2BC horizon), the Later, Late Archaic (1) (3Ab1 horizon), Later, Late Archaic (2) (3Ab2 horizon), and Earlier, Late Archaic Period (3Bw horizon).

The Terminal Late Archaic occupation was one of the most limited found in these excavations. Artifacts recovered include five diagnostic pp/k artifacts (Merom-Trimble, and Lehigh Broad), as well as a few untyped pp/ks. Additional flaked stone included a small number of biface fragments, groundstone tools, and debitage. The groundstone artifacts included anvils, hammerstones, and modified and unmodified cobbles and pebbles. Sixteen features were identified as being associated with the 2BC horizon, including hearths, storage pits, and FCR clusters. Four radiocarbon dates were calculated from feature material associated with the Terminal Late Archaic; Feature 166 (2890 ± 40 B.P.), Feature 172 (3030 ± 40 B.P.), Feature 196 (3100 ± 40 B.P.), and Feature 209 (3090 ± 40 B.P.). Floral material included black walnut, butternut and acorn nutshells, and wood fragments from black walnut, maple, white oak and ash trees. Mustard seeds were also recovered. The latter are an invasive Euroasian species.

Artifacts from the 3Ab1 horizon, associated with the Later, Late Archaic (1) Period, included a small variant of a Steubenville Lanceolate pp/k and Lehigh Broad pp/k. Other tools included one biface and two expedient tools. Groundstone tools included nutting stones, a hammerstone/anvil, and modified and unmodified cobbles and pebbles. Floral remains included nutshell fragments from black walnut, and wood fragments from white oak, sycamore, cherry, and beech trees. Two radiocarbon dates were calculated from feature fill. Feature 219 yielded a date of 3870 ± 40 B.P, and Feature 220 yielded a date of 3780 ± 40 B.P. Only three features were identified from this horizon/occupation period.

Artifacts from the 3Ab2 horizon are associated with the Later, Late Archaic (2) occupation of the site. These include bifaces, and debitage. Nine groundstone artifacts were recovered, including one nutting stone fragment. Floral remains included nutshells from black walnut, butternut, and walnut family trees, and mustard and poke seeds. Charcoal fragments from black walnut, hickory, and red oak trees were also identified. Two dates were calculated. Material from Feature 217 yielded a date of 3820 ± 40 B.P., and Feature 227 yielded a date of 3790 ± 40 B.P. Thirteen cultural features were identified in the 3Ab2 horizon, all seemingly hearths.

The occupation identified in the 3Bw horizon was interpreted as representing the Early, Late Archaic Period. Artifacts included five pp/ks, including a Bottleneck Stemmed-like pp/k and a Brewerton Side-Notched-like pp/k. Other chipped stone included bifaces and expedient tools, and debitage, including cores and core fragments. Five groundstone artifacts were recovered, including one hammerstone. Floral remains included black walnut, walnut family, and thick-shelled hickory nutshells, and hickory and beech wood fragments. One C14 date was calculated for this occupation, from Feature 244. The date was 4730 ± 40 B.P. There were eight cultural features identified for this soil horizon, all somewhat more amorphous and less well-preserved than those identified in the overlying horizons.

Terminal Middle Archaic/Early Late Archaic Occupation

Artifacts and features found in the 4Bw horizon were interpreted as possibly representing the Terminal Middle/Early Late Archaic occupation of the site. One unidentifiable pp/k was recovered. No diagnostic artifacts, and no bifaces or expedient tools were recovered in this horizon, and very few debitage artifacts were recovered. Six groundstone artifacts were recovered, including nutting stones. There were only two features identified within this soil horizon, both hearths or cooking pits.

General Conclusions

Archaeological remains at Area 3-South show intermittent occupation at the site from the Terminal Middle Archaic through Early Woodland Periods, with short-term occupation during the Archaic periods, and somewhat longer-term occupation during the Early Woodland Period.

The Late Archaic/Terminal Archaic Period has been characterized as representing a continuation of the social and economic patterns of Middle Archaic hunter-gatherers who later began to practice horticulture during the Early Woodland Period. However, there is evidence that by the end of the Archaic subsistence patterns are better characterized as representing collectors, rather than foragers as was the case in preceding temporal periods. That is, people were not moving quite so frequently, but instead were becoming more seasonally sedentary or semi-sedentary. There appears to be an increased reliance on riverine biomes. Resources were procured during short trips from base camps typically located along or near major waterways (GAI Consultants, Inc. 2003).

Area 3-South seems to fit this general model of subsistence and settlement pattern for the Late Archaic Period. Give the flood plain setting of Area 3-South it is likely that this was one of the limited duration procurement sites rather than a long-term base camp. The number of artifacts and features appears to result from a series of short-term occupations rather than one or a few lengthy occupations, as shown in the spatial and lithic analyses completed and discussed in Section 8.5. Artifacts indicate raw material collection of local chert river cobbles for manufacture into bifaces, including pp/ks, and expedient tools. There is also evidence of hunting, plant collection, and food preparation.

The small number of projectile points and groundstone tools recovered in the Late Archaic period levels of the site, in conjunction with the 4,276 fragments of lithic debitage recovered suggests a limited number of people lived at the site. The combined debitage weighed a total of only 5,498.7 g (5.5 kg), or 12.12 pounds for all Archaic occupations at the site. A total of 40 features that date to the Archaic soil horizons (including the Terminal Middle Archaic/Early Late Archaic occupation) also indicate shorter span occupations.

The Early Woodland Period assemblage is somewhat more substantial and may represent longer time period occupations, or more frequent occupations, based on the number and size of features identified. The radiocarbon dates range from 2890 ± 40 B.P. to 1760 ± 60 B.P., which is more recent than dates calculated at other Early Woodland occupations within the region (Weed 2002). The more recent dates were calculated from carbon material that came from Feature 243, which also yielded Adena Plain ceramic sherds. According to Weed, "In general, the absolute dates bracket the Early Woodland between about 3050 and 1900 B.P." (Weed 2002:3-135). The dates from 36AL480 suggest a potential re-dating of the end of the Early Woodland Period for the Upper Ohio area.

Tools recovered from the Early Woodland Period (AB horizon) indicate a variety of activities took place at the site, including raw material collection of local chert river cobbles, tool manufacture, hunting, fishing, plant collection and food preparation. The presence of remains of goosefoot and erect knotweed, major components of the Eastern Agricultural Complex, place the site within the larger settlement and subsistence framework of the Early Woodland Period. The goosefoot samples recovered are the wild variety, commonly known as lamb's quarters. The presence of Adena Plain, Half-Moon Cord-Marked, Watson Cord-Marked, and McKees Rocks Plain pottery also indicate that the inhabitants of the site were part of that larger complex. Thirty-eight features, including deep stratified features, were identified in the AB horizon to suggest at least occasionally more substantial occupation as well.

In contrast, the number of diagnostic artifacts from the AB horizon is relatively small. Twenty projectile points or point fragments dating to the Early or Middle Woodland were recovered at the site, not all in the AB horizon (five Middle Woodland pp/ks, three Late Early Woodland, four, possibly five, Middle Woodland, and seven or possibly eight early Early Woodland pp/ks or fragments). Most of these are broken haft fragments, and two were retouched considerably. One Forest Notched-like pp/k had been retouched into a scraper, which had been used extensively before it was dropped at the site.

The number of hammerstones and anvil stones is also small. Only one hammerstone/anvil (showing typical pitting and some flake removal inferred to be caused by use as a hammerstone on cobbles) was recovered. Additional groundstone tools included two net weights, two nutting stones, and five pitted stone artifacts. This pattern of limited number of artifacts is repeated with the prehistoric pottery fragments, which total 222 and in total weigh only 538.5 g (0.54 kg), or 1.2 pounds. Most of the ceramic fragments are small and many are eroded. Assuming each pot weighs approximately 0.5 pounds, this weight represents a minimum number of three pots; however, the definition of 21 temper types or combinations suggests a greater minimum number of vessels. At the same time, 3,524

debitage fragments were recovered weighing a total of 2,922.70 g (2.92 kg), or 6.4 pounds. This contradiction between the small number and physical condition of artifacts and the presence of the 40 features and seasonal botanical remains indicates that the site was occupied during the Early Woodland for somewhat substantial but intermittent time periods, but that post-depositional scouring, flooding, fires, and historic use of the landscape have altered the site, so that artifacts that would provide a true representation of the Woodland Period occupation have been lost. Nevertheless, excavations at Area 3-South have provided an invaluable picture of the subsistence and social lifeways of the people that lived there.

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APPENDICES