Analysis of Lithic and Ceramic Artifacts from Select Excavation Units at the Hatfield Site (36WH678): Modeling Lithic Procurement Patterns and Measuring Ceramic Variation

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ABSTRACT

A sample of 598 lithic and 484 ceramic artifacts from select units at the Hatfield site were analyzed. The lithic assemblage consisted primarily of debitage and a small sample of formal tools. Five diagnostic projectile points/knives are included among the tools, including a probable Paleoindian fluted point base, an Early Archaic St. Charles point, and three Late Prehistoric triangular points. Analysis of raw material source and lithic reduction shows a complex lithic procurement strategy of local and regional lithic materials. This strategy exhibits differential utilization of lithic resources within similar geographic locations, where some materials are minimally reduced at the source and carried back to the site and others are reduced at the source or associated lithic workshops. Analysis of the ceramic artifacts suggests a fairly homogenous assemblage consisting of nearly 100% shell-tempered and nearly 90% cord-marked ceramic sherds. This pattern is consistent with Middle Monongahela period ceramic assemblages and supports the single AMS date of 545±15 rcybp. Variability in the assemblage was noted in rim style and perishable industry as represented through impressions on ceramic sherds.
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INTRODUCTION

In the spring of 2012, a sample of lithic and ceramic artifacts from the Hatfield site was analyzed in order to fulfill requirements for Specialized Methods in Archaeology: Prehistoric Artifact Analysis (Anth 584) course offered by Indiana University of Pennsylvania. In total, 599 lithic and 484 ceramic artifacts were examined, all originating in plow zone contexts at the site. The lithic sample was collected from nine 1 x 1m excavation units while the ceramic artifacts derived from four of those same units. The purpose of the analysis was to inventory and catalog the assemblage from the sample units and to gather data that could be used in present and future interpretations of the Hatfield site. For the purpose of this report, attention was placed on raw material sourcing of lithic artifacts and on temper and surface treatment attributes of ceramic artifacts. In particular, the analysis attempted to define lithic procurement strategies at the site and to measure ceramic assemblage variability.

An Overview of the Hatfield Site

The Hatfield site is a large, multi-component archaeological site located approximately 30 km (18.9 mi) south of Pittsburgh in North Strabane Township, Washington County, Pennsylvania (Figure 1). The principal component at the site represents a Late Prehistoric, Monongahela Tradition village that was occupied during the Middle Monongahela period. The site is situated on a long peninsular hill spur oriented north to south at an elevation of 360 m above sea level (Figure 2). This hill spur is flanked by springs on both the eastern and western sides as it gently slopes down to a small unnamed tributary of Little Chartiers Creek at its southern tip. Little Chartiers Creek joins the larger Chartiers Creek about seven km northeast of the site. Chartiers Creek is a north-flowing, major tributary of the Ohio River that is more or less paralleled by the Monongahela River to the east and a portion of Raccoon Creek to the west.
Figure 1. General Location of the Hatfield Site
Cross-cutting Allegheny and Washington Counties, the stream drains approximately an area of 446 square-kilometers (277 square-miles). The headwaters of the creek originate just south of the City of Washington in south-central Washington County. The creek empties about 50 km (31 miles) north of its origin into the Ohio River near the Borough of McKees Rocks.

![Figure 2. Topographic Setting of the Hatfield Site](image)

The site is situated within the Pittsburgh Low Plateau Section of the Appalachian Plateaus Physiographic Province, which is characterized by narrow summits, narrow stream bottoms, and steep linear valley slopes. This highly dissected terrain results from the erosion of flat lying bedrock that belongs to the Pennsylvanian aged Washington Formation, and is composed of cyclic sequences of sandstone, shale, limestone, and coal (Wagner et al. 1975). The
The base of the Washington Formation is defined by the Washington coal. Overlying the coal are three limestone beds (lower, middle, and upper) that are readily identifiable on many hilltops across Washington County. The weathering of these various beds provides the parent material from which the soils on the Hatfield site have formed. Soils underlying the site are mapped as Guernsey silt loam on 3 to 8% slopes (NRCS 2007a), and are excellent for growing staple crops such as corn and wheat (NRCS 2007b).

A geomorphologic study of the site revealed that a pronounced plow zone with a depth ranging between 23 and 26 cm (9.06-10.24 in) was clearly shown by the unusually dark humic soils of the Ap horizon (Figure 3) (Fritz and Valko 2007). It is possible that midden deposits resulting from prehistoric occupation of the site have enhanced the darkness of the Ap horizon. Based on the auger probes, the artifact density within the plow zone was relatively high, with two artifacts recovered per 1.2 liters of soil. The bottom of the Ap horizon is sharply contrasted against the lighter and more yellow Bt horizons. Formation of these Bt horizons is the result of in situ weathering of bedrock over thousands of years. It was determined that artifacts were unlikely to be found within the Bt horizons except where human features, bioturbation, or any other types of disturbances have intruded into the Bt horizons.

Excavation methodologies consisted of the removal of the Ap-horizon of all 1 x 1 m test units through the use of shovels and trowels until the interface with the B-horizon was reached (Bercel and Espino 2010). All of the soil was screened through quarter-inch mesh. When features and postmolds were encountered, their plan and profile views were mapped and photographed. Constant volume samples of each level in each feature half were taken for floatation, and the rest of the feature fill was wet screened off-site through progressively smaller mesh size.
In total, seven features, over 150 postmolds, and more than 20,000 artifacts have been documented by the Allegheny Chapter’s excavations (Bercel and Espino 2010). The field work has exposed a 40 m² (430.56 ft²) area of contiguous units arranged more or less linearly along the eastern section of the village. Features include two refuse pits, two fire pits, two post-enclosed storage pits, and a burial, all of which are found within the domestic zone, or house ring, of typical Monongahela villages. However, the limited areal extent of the excavations has precluded any positive identification of domestic structures and other large-scale village features. A fragment of hickory nut (Carya sp.) from Feature 2, a refuse pit, produced an accelerator mass spectrometry (AMS) radiocarbon date of 545±15 radiocarbon years before the present.

**Figure 3.** Stratigraphic Profile of the Hatfield Site
(rcybp) (ISGS-A1409; Bercel and Espino 2010). This date has a one sigma calibration of A.D. 1399-1419 and a two-sigma calibration of A.D. 1326-1425.

LITHIC ARTIFACT ANALYSIS

Methodology

The lithic assemblage from the Hatfield site was classified according to four techno-functional categories that include tools, cores, debitage, and miscellaneous artifacts, each with one or more subtypes. This basic classification system was adopted from the system used by the Anthropology Department at Indiana University of Pennsylvania. All lithic artifacts were analyzed with General® Ultratech® digital calipers, an OHAUS Corporation Adventurer™ digital scale, 10x to 30x magnification lenses, and the naked eye. A database of the results was created in Microsoft Excel to facilitate inventorying and statistical analyzes of the data. Photographs of the artifacts were taken with a General Electric 14.1 megapixel digital camera.

Basic attributes measured for each lithic artifact include geometric dimensions, weights, presence and amount of cortex, evidence of thermal alteration, and raw material. Geometric dimensions include length, width, and thickness to the hundredth of a millimeter. Except for complete flakes, these measurements were taken at the maximum extent of the artifact. The length of complete flakes was measured from the striking platform to the distal edge. Weights were measured to the thousandths of a gram.

The amount of cortex on the artifacts, particularly debitage, was given a nominal value between one and five based on the percentage of cortex present on the dorsal surface. A lack of cortex was assigned a value of one, 1-25% of cortex was assigned a value of two, 26-50% cortex was assigned a value of three, 51-75% was assigned a value of four, and 76-100% was assigned a value of five.
The identification of raw materials used in the manufacturing of the lithic artifacts from the Hatfield site was based on macroscopic comparisons with lithic raw material type collections housed at the Anthropology Department of Indiana University of Pennsylvania and with the Allegheny Chapter #1 of the Society for Pennsylvania Archaeology. It is noted that lithic types that were defined as unknown during analysis do not necessarily represent unknown lithic materials. Examples of these unknown lithic materials may not have been contained in either type collection.

The following provides a definition of the classification system used to define the lithic assemblage at the Hatfield site.

**Tools.** Lithic tools were classified into three subtypes: Bifacial, Unifacial, and Flake tools. 1) Bifacial tools are flaked stone tools that are worked in such a way as to create a marginal edge that is sharp on both sides. 2) Unifacial tools are flaked stone tools that are worked in such a way as to create a marginal edge that is sharp on only one side. 3) Flake tools are lithic flakes that exhibit at least one modified edge. Modification on the edge may have resulted from intentional flaking to create a cutting or piercing edge or unintentionally through use of an unmodified flake as a cutting or scraping surface.

**Cores.** Cores are parent lithic material from which stone tools are manufactured. Cores can range from completely unmodified, to minimally modified exhibiting one to a few negative flake scars, to exhausted, exhibiting many negative flake scars.

**Debitage.** Based on morphologic criteria, lithic debitage was classified according to four subtypes: Complete Flake, Platform Flake, Broken Flake, and Shatter. 1) Complete flakes are stone tool manufacturing debris that retain striking platforms and intact distal edges. 2) Platform flakes are stone tool manufacturing debris that retain striking platforms but are missing their
distal edges. 3) Broken flakes are stone tool manufacturing debris that are missing striking platforms but retain other flake characteristics such as bulbs of percussion, lateral and distal edges, and overall flake morphology. 4) Shatter is stone tool manufacturing debris that lacks striking platforms or other flake characteristics.

Miscellaneous. Miscellaneous lithic artifacts are artifacts that could not be identified in any of the other categories described above.

Results

In total, 599 lithic artifacts from nine 1 x 1 m excavation units were analyzed. The assemblage was recovered from the following excavation units: N1008 E1001, N1010 E1001, N1011 E1001, N1011 E1002, N1011 E1003, N1011 E1004, N1012 E1001, N1012 E1002, and N1003 E1003. The majority of the lithic artifacts consist of debitage, which account for 86% of the assemblage (Figure 4). The debitage category is dominated by shatter, comprising 51% of the category. Complete flakes, platform flakes, and broken flakes each account for less than 20% of the category. Bifacial, unifacial, and flake tools as well as cores each represent less than 10% of the assemblage. Of the 24 tools present in the assemblage, there is a slight preference towards expedient flake tools (Figure 5). Formal tool types include nine bifacial tools of which six are projectile points/knifes (pp/k), two are of unknown function, and one is a preform. All but one of the pps/ks are diagnostic. They include a probable Paleoindian fluted, one Early Archaic St. Charles corner-notched, and three Late Prehistoric triangular pps. Unifacial tools include a small endscraper and one sidescraper.

Raw material sourcing of the lithic artifacts indicates the presence of over 16 different raw materials at the Hatfield site (Figure 6). Uniontown (Eisert 1974; Vento et al. 1984) and Onondaga (Holland 2003; Vento et al. 1984) cherts are the only two varieties that exceed a
Figure 4. Distribution of Lithic Artifacts at the Hatfield Site

Figure 5. Distribution of Lithic Tools at the Hatfield Site
Figure 6. Distribution of Lithic Raw Materials at the Hatfield Site
frequency greater than 10% of the assemblage by both count and weight. Monongahela (Eisert 1974; Vento et al. 1984) chert is the third most frequently identified chert by both measures. The remaining raw materials exhibit low frequencies. These include Benwood Limestone (Holland 2003), Boyle (DeRegnacourt and Georglady 1998), Brush Creek (Holland 2003; Vento et al. 1984), Coshocton (DeRegnacourt and Georglady 1998), Indiana Hornstone/Wyandotte (DeRegnacourt and Georglady 1998), Gull River (Holland 2003), Loyalhanna (Oshnock 2005), Plum Run/Flint Ridge (Lepper et al. 2001), Rhyolite (Beckerman 1981; Holland 2003), Ten Mile (Holland 2003; Vento et al. 1984), Upper Mercer (Holland 2003; Vento et al. 1984), and an undefined black chert from the Buffalo Creek, Washington County area (Brian Fritz, personal communication 2011). Untyped cherts represent nearly 10% of the assemblage by both count and weight.

**Interpretations**

Based on the few diagnostics that were included in the assemblage for analysis, occupation of the Hatfield site appears to extend back into the Paleoindian and Early Archaic period. Interestingly, both artifacts were manufactured from locally available cherts during a time when exotic cherts were preferred over local cherts for the manufacture of formal tools (Carr and Adovasio 2002). The remaining three diagnostic artifacts all represent Late Prehistoric triangular points and are consistent with radiometric and ceramic data from the site that indicates a Monongahela Tradition village component at the Hatfield site.

Insights into lithic procurement patterns of lithic artifacts from the site are drawn from the identification of raw materials. The patterns observed in the data reveal a complex strategy of stone acquisition for the production of tools (Table 1). By count and weight, raw materials available within a 10 km radius (local) of the Hatfield site were used most frequently, but only slightly. These materials include cherts that originate in the Monongahela group of
Pennsylvanian-aged strata, such as Benwood Limestone, and Loyalhanna, Monongahela, and Uniontown cherts (Eisert 1974; Holland 2003; Oshnock 2005; Vento et al. 1984).

Table 1. Frequency of Lithic Raw Materials at the Hatfield Site by Count and Weight

<table>
<thead>
<tr>
<th>Lithic Type</th>
<th>Count</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Raw</td>
<td>Percentage</td>
</tr>
<tr>
<td><strong>Local</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benwood Limestone</td>
<td>13</td>
<td>2.17</td>
</tr>
<tr>
<td>Loyalhanna</td>
<td>37</td>
<td>6.19</td>
</tr>
<tr>
<td>Monongahela</td>
<td>62</td>
<td>10.37</td>
</tr>
<tr>
<td>Uniontown</td>
<td>163</td>
<td>27.26</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>275</td>
<td>45.99</td>
</tr>
<tr>
<td><strong>Regional</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buffalo Creek Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chert</td>
<td>8</td>
<td>1.34</td>
</tr>
<tr>
<td>Gull River</td>
<td>29</td>
<td>4.85</td>
</tr>
<tr>
<td>Onondaga</td>
<td>175</td>
<td>29.26</td>
</tr>
<tr>
<td>Ten Mile</td>
<td>12</td>
<td>2.01</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>224</td>
<td>37.46</td>
</tr>
<tr>
<td><strong>Exotic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boyle</td>
<td>3</td>
<td>0.50</td>
</tr>
<tr>
<td>Brush Creek</td>
<td>6</td>
<td>1.00</td>
</tr>
<tr>
<td>Coshocton</td>
<td>15</td>
<td>2.51</td>
</tr>
<tr>
<td>Hornstone</td>
<td>3</td>
<td>0.50</td>
</tr>
<tr>
<td>Plum Run/Flint Ridge</td>
<td>9</td>
<td>1.51</td>
</tr>
<tr>
<td>Rhyolite</td>
<td>1</td>
<td>0.17</td>
</tr>
<tr>
<td>Upper Mercer</td>
<td>3</td>
<td>0.50</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>40</td>
<td>6.69</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>59</td>
<td>9.87</td>
</tr>
<tr>
<td><strong>Assemblage Total</strong></td>
<td>598</td>
<td>100</td>
</tr>
</tbody>
</table>

Materials from within a 38 km radius (regional) were used nearly as frequently, particularly glacially derived Onondaga and Gull River cherts that occur along the Ohio and Allegheny Rivers and their northern tributaries originating in the Glaciated Appalachian Plateau (Holland 2003). Ten Mile chert and a black chert from the Buffalo Creek area of Washington County also occur within the 38 km radius of the site. Ten Mile chert occurs south of the
Hatfield site within the Dunkard group of Permian-aged bedrock (Holland 2003). The geologic origin of the black chert is unknown at this point (Brian Fritz, personal communication 2011), but based on the geologic bedrock distribution in southwestern Pennsylvania, it likely originates in the same Monongahela group in which the local cherts outcrop.

Raw materials from distances greater than 38 km (exotic) are varied but minimally represented. These materials occur within the Ohio River valley as far west as Indiana (Hornstone) and Kentucky (Boyle chert) and in Ohio (Plum Run/Flint Ridge, Coshocton, and Upper Mercer cherts) and western Pennsylvania (Upper Mercer and Brush Creek cherts) and from as far east as south-central Pennsylvania (Rhyolite).

Initial observations of the lithic data suggested that there may have been differences in procurement strategies based on presence of cortex between local, regional, and exotic sources. Since one of the objectives of the research was to define lithic procurement patterns, a chi-square test analysis was undertaken to determine if there were indeed any significant differences between raw materials. The analysis returned a non-significant p-value, indicating that there were no significant differences between the data. However, further exploration of the data revealed that as opposed to differences between the levels of geography defined here, there were significant differences within the levels of geography. The data suggests that lithic procurement strategies are very complex and cannot simply be defined by expectations of what the lithic assemblage should resemble if local, regional, and/or exotic cherts are utilized.

Focusing on local and regional lithic materials, interesting patterns of differential use of cherts with similar spatial distributions emerge. It appears that the two predominant local materials, Uniontown and Monongahela cherts, were utilized differently. Lithic reduction based on the distribution of debitage above and below a 50% cortex threshold indicates that a
statistically significant difference exists in lithic reduction ($X^2=4.7419$, $p<.05$, 1 df; Table 2).

The data suggests that Uniontown chert may have been procured at the source and brought back to the Hatfield site for early stage reduction while Monongahela chert may have been procured and reduced at the source or associated workshops. A similar incidence of significant difference arises when Onondaga and Gull River cherts are compared ($X^2=14.6592$, $p<.001$, 1 df; Table 2).

With these materials, it appears that Gull River cherts was brought back to the site for primary reduction while Onondaga chert was more often reduced at the source or associated workshops.

**Table 2. Chi-squared Tests of Lithic Raw Material Data**

<table>
<thead>
<tr>
<th>Raw Material and Reduction</th>
<th>Observed</th>
<th>Expected</th>
<th>O-E</th>
<th>sq. root</th>
<th>/ E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uniontown Primary</td>
<td>17</td>
<td>13.04</td>
<td>3.96</td>
<td>15.68</td>
<td>1.2024</td>
</tr>
<tr>
<td>Uniontown Secondary</td>
<td>146</td>
<td>149.96</td>
<td>-3.96</td>
<td>15.68</td>
<td>0.1045</td>
</tr>
<tr>
<td>Monongahela Primary</td>
<td>1</td>
<td>4.96</td>
<td>-3.96</td>
<td>15.68</td>
<td>3.161</td>
</tr>
<tr>
<td>Monongahela Secondary</td>
<td>61</td>
<td>57.04</td>
<td>3.96</td>
<td>15.68</td>
<td>0.274</td>
</tr>
</tbody>
</table>

$X^2=4.7419$

$p<.05$

<table>
<thead>
<tr>
<th>Raw Material and Reduction</th>
<th>Observed</th>
<th>Expected</th>
<th>O-E</th>
<th>sq. root</th>
<th>/ E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onondaga Primary</td>
<td>5</td>
<td>9.89</td>
<td>-4.89</td>
<td>23.91</td>
<td>2.4175</td>
</tr>
<tr>
<td>Onondaga Secondary</td>
<td>154</td>
<td>149.11</td>
<td>4.89</td>
<td>23.91</td>
<td>0.1603</td>
</tr>
<tr>
<td>Gull River Primary</td>
<td>7</td>
<td>2.11</td>
<td>4.89</td>
<td>23.91</td>
<td>11.3317</td>
</tr>
<tr>
<td>Gull river Secondary</td>
<td>27</td>
<td>31.89</td>
<td>-4.89</td>
<td>23.91</td>
<td>0.7497</td>
</tr>
</tbody>
</table>

$X^2=14.6592$

$p<.001$

**CERAMIC ARTIFACT ANALYSIS**

**Methodology**

The ceramic assemblage from the Hatfield site was analyzed with General® Ultratech® digital calipers, an OHAUS Corporation Adventurer™ digital scale, 10x to 30x magnification lenses, and the naked eye. A database of the results was created in Microsoft Excel to facilitate
inventorying and statistical analyzes of the data. Photographs of the artifacts were taken with a General Electric 14.1 megapixel digital camera.

A description of the attributes recorded for the Hatfield ceramic sample are as follows.

*Temper.* Temper is any material added to the clay during ceramic manufacturing that prevents rapid shrinkage or expansion during the firing process. The Hatfield ceramic artifacts were examined for the presence of at least eight different tempering agents: 1) shell; 2) limestone; 3) grit; 4) combination shell/limestone; 5) combination shell/grit; 6) combination limestone/grit; 7) quartz; and 8) a lack of temper. Shell temper is defined as pulverized fresh water mussel. Limestone temper is defined as crushed limestone that exhibits angular morphology. Grit temper is defined as crushed rock that exhibits irregular morphology. Quartz temper is defined as crushed quartz mineral often appearing white in color.

*Temper Size.* Temper size was recorded based on 3 characteristics: 1) course, 2) fine, and 3) combination of course and fine. Course tempering is described as fragments greater than 2 mm in size while fine tempering is categorized as temper specks typically less than 2 mm size.

*Paste Texture.* Ceramic paste texture was classified by visual appearance of the ceramic sherd based on three characteristics: 1) fine laminations parallel to the vessel walls, 2) flakey, and 3) compact-dense.

*Color.* The surface color (interior) and the surface finish color (exterior) were determined through comparisons to Munsell® soil color charts (Munsell® Color 1994).

*Vessel Section.* Ceramic sherds were classified according to seven potential vessel sections to which they may have pertained, including 1) rim, 2) neck, 3) body, 4) base, 5) combination, 6) indeterminate, and 7) handle. Rims were additionally categorized by lip shape and rim profile. Lip shapes include 1) straight, 2) rounded, 3) angled, 4) castellated, 5) v-shaped,
6) pie crust, 7) pointed, and 8) tool-impressed. Rim profiles include 1) straight, 2) excursive, and 3) incurvate.

*Surface Finish.* Surface finish on the exterior of the ceramic sherds was classified based on a number of 17 characteristics: 1) plain, 2) cord-marked, 3) cord-marked horizontal, 4) cord-marked vertical, 5) cord-marked oblique, 6) decorated, cord-impressed, 7) fabric-impressed, 8) decorated, paddle edge or cord-wrapped stick impressed, 9) decorated, stamped, 10) indeterminate, 11) decorated, incised notched, 12) decorated, incised chevron, 13) decorated, incised rectilinear, 14) decorated, punctuate, 15) other, 16) none, and 17) cord-marked smoothed.

*Cordage Twist Direction.* Cordage twist direction was identified from positive impressions on latex casts of exterior surfaces of ceramic sherds. Two possible variables were recorded: 1) final Z-twist or 2) final S-twist. Twist direction refers to the manner in which the cordage was spun, with final Z-twist slanting from upper right to lower left as a result of being twisted to the left and final S-twist slanting from upper right to bottom left as a result of being twisted to the right (Hurley 1979:6).

*Average Cord Thickness.* Average cord thickness of impressions on exterior surfaces of ceramic sherds were obtained by measuring the individual thickness of multiple cord marks to the one hundredth of a millimeter and averaging those measurements.

*Cord Density.* Cord density was measured based on the quantity of individual cord marks present within a 10 mm section of the sherd.

*Cord Orientation.* When definable, the orientation of cord impressions along the sherd was documented. Orientations include 1) vertical, 2) horizontal, 3) oblique top right to bottom left, 4) oblique top left to bottom right, 5) interrupted, 6) combinations, and 7) indeterminate.
*Sherd Thickness.* Ceramic sherd thickness was measured to the one hundredth of a millimeter at the thickest point.

*Sherd Size.* Ceramic sherd size is based on eight nominal values representing a no greater than size of the sherd in increments of three centimeters. 1) Sherds less than 3 cm in size were assigned a value of one. 2) Sherds less than 6 cm in size were assigned a value of two. 3) Sherds less than 9 cm in size were assigned a value of three. 4) Sherds less than 12 cm in size were assigned a value of four. 5) Sherds less than 15 cm in size were assigned a value of five. 6) Sherds less than 18 cm in size were assigned a value of six. 7) Sherds less than 21 cm in size were assigned a value of seven. Finally, 8) sherds less than 24 cm in size were assigned a value of eight.

*Sherd Weight.* Sherd weight were measured to the thousandth of a gram.

**Results**

In total, 484 ceramic artifacts weighing just over 744 g were analyzed. The ceramic sherds were recovered from the following excavation units: N1008 E1001, N1010 E1001, N1011 E1001, and N1011 E1002. The assemblage consisted of 445 ceramic vessel sherds, 38 baked clay fragments, and one pipe bowl fragment. Percentages below represent weight measurements unless otherwise indicated.

Shell-tempering or leached shell-tempering is present in nearly 100% of the assemblage. Only three sherds, or 1.81 g of the assemblage, are not shell-tempered. Instead, these sherds display neither tempering nor any evidence that the temper leached.

Sherds consist of rim, neck, body, and basal portions of vessels as well as spalls and sherds too eroded to classify (Figure 7). In total, approximately 64% of the assemblage is classified as body sherds. Eroded sherds represent 19% of the assemblage while basal sections,
neck sections, rims, and spalls each account for less than 10%. With an average thickness of 8.19 mm, basal sections exhibit the thickest sherds in the assemblage. Rims are on average slightly thicker than body sherds, measuring an average of 6.37 mm while the average thickness of body sherds measures 5.72 mm. The sole neck section measured 7.32 mm.

Cord-marking appears to be the preferred surface treatment used on the exterior surfaces of the ceramic assemblage (Figure 8). Combined, cord-marking (64%) and smoothed cord-marking (23%) are present on 87% of the sherds. Smooth cord-marking is defined as sherds that display traces of cords but have either been intentionally wiped by the potter(s) or have eroded to the extent that diagnostic features such as thickness, twist direction or density of cords could not be measured. Thickness of individual cords range between 0.74 and 4.45 mm, with an average of 1.61 mm and a standard deviation of 0.51 mm. Density of cords range between 1 and 6 cords per 10 mm, with most sherds containing 3 cord marks. Cordage twist direction on latex casts of 14 sherds shows a moderate preference (by count) of final Z-twist (71.4%) over final S-twist (28.6%) (Figure 9). The casted sherds include one rim, one neck, one base, and 11 body sherds.

Plain exterior surface sherds comprise 12% of the assemblage. Plain sherds are defined as sherds that do not have any evidence of having been cord-marked, either because the potter(s) had completely wiped the surfaces of the vessel or had not utilized a cord-wrapped paddle to form the vessel. The remaining surface treatment consists of incisions applied to the exterior surfaces with a pointed tool. These sherds represent slightly over 1% of the assemblage. Interior surfaces on all ceramic sherds are all plain.

In total, the assemblage contains 10 rim sherds, each representing a distinct ceramic vessel. By count, lip shapes consist of four rounded, two straight, two angled, one pointed, and one tool impressed (Figure 10). Rim profiles are predominantly straight, with seven rims. Two
Figure 7. Distribution of Ceramic Vessel Section at the Hatfield Site

Figure 8. Distribution of Ceramic Surface Treatment at the Hatfield Site
**Figure 9.** Percentage of Cordage Twist Direction at the Hatfield Site

**Figure 10.** Distribution of Lip/Rim Styles at the Hatfield Site
rims are excursive and one rim is incurvate. Two rims are cord-impressed. Specimen 13.092 exhibits an angled lip and flared profile with oblique sub-lip cord marks angling from top left to bottom right. The cord marks measure 1.47 mm thick with four cords per 10 mm. A latex cast of the sherd proved inconclusive in determining final cord twist. The second cord-impressed sherd, specimen 15.051, exhibits a straight lip and profile with relatively narrow sub-lip cord marks measuring 0.95 mm at a density of four cords per 10 mm. The cord marks were applied vertically along the vessel wall. A latex cast of the sherd indicates that the cords were spun with a final Z-twist.

The remaining ceramic artifacts represent a pipe bowl fragment and 38 baked clay fragments. The pipe bowl fragment consists of an untempered sherd with a straight lip and profile. The top of the lip is decorated with a number of incised lines etched perpendicular to the bowl. The baked clay fragments consist of untempered nodules of clay that were baked hard likely through incidental exposure to a source of heat.

**Interpretations**

The ceramic analysis suggests a very homogenous pottery assemblage at the Hatfield site that is consistent with a Middle Monongahela period temporal ascription. Over 99% of the assemblage is shell-tempered and 87% of the identifiable sherds are cord-marked or smoothed cord-marked. Plain sherds comprise 12% of the assemblage and only 1% are incised. The predominance of shell-tempering and cord-marked exterior surfaces as well as a general lack of decorations comport with Middle Monongahela period ceramic technologies (Johnson 2001; Johnson et al. 1989) and the single 545±15 rcybp radiometric age determination of the site.

The greatest degree of variability was noted in lip/rim shape and perishable technology as seen in the ceramic assemblage. Overall rim style of the 10 rims analyzed showed just as many
different styles. Therefore, variability in the assemblage may not be based on technological differences but rather on stylistic differences. The site’s perishable industry as inferred from impressions on the ceramics appears to be highly variable as well. Cord thickness exhibits a wide range as does the cord density. The cordage twist direction analysis undertaken here supports an earlier analysis conducted on surface-collected sherds from the Hatfield site (Johnson 2007) (Figure 11). The slight preference of final Z-twist over final S-twist suggests a distinct learning pool at the site and in the Chartiers Creek watershed in general from that found in the core area of the Monongahela tradition (Johnson and Speedy 2009).

Figure 11. Comparison of Cordage Twist Direction Data from William C. Johnson and This Analysis
CONCLUSIONS

A sample of 598 lithic and 484 ceramic artifacts from select units at the Hatfield site were analyzed. The lithic assemblage consisted primarily of debitage and a small sample of formal tools. Five diagnostic projectile points/knives are included among the tools, including a probable Paleoindian fluted point base, an Early Archaic St. Charles point, and three Late Prehistoric triangular points. Analysis of raw material source and lithic reduction shows a complex lithic procurement strategy of local and regional lithic materials. This strategy exhibits differential utilization of lithic resources within similar geographic locations, where some materials are minimally reduced at the source and carried back to the site and others are reduced at the source or associated lithic workshops.

Analysis of the ceramic artifacts suggests a fairly homogenous assemblage consisting of nearly 100% shell-tempered and nearly 90% cord-marked ceramic sherds. This pattern is consistent with Middle Monongahela period ceramic assemblages and supports the single AMS date of 545±15 rcybp. Variability in the assemblage was noted in rim style and perishable industry as represented through impressions on ceramic sherds.

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