Artifacts

Field testing recovered 26,994 artifacts from all phases of testing and excavation during the Data Recovery operations in Lots 4-8. Table 1 shows that most artifacts came from the plowzone in Lot 4S, Lot 5H and S, Lot 6s and Lot 7S while in the remaining areas, most came from the anomalies. Excavation recovered very few artifacts from the subsoil in any lot.

Table 1. Gross artifact counts Lots 4-8

Location	Plowzone	Anomaly	Subsoil	Total	Overall Density
Lot 4H	1979	801	101	2881	16/ m
Lot 4S	4278	5326	128	9732	162.2/ m
Lot 5H	2606	2446	12	5064	33.3/ m
Lot 5S	15	NA	0	15	.25/ m
Lot 6H	1069	3822	8	4899	27.2/ m
Lot 6S	430	283	35	748	12.5/ m
Lot 7H	300	551	1	852	4.7/ m
Lot 7HN	114	269	2	385	2.1/ m
Lot 7S	25	1	NA	26	.4/ m
Lot 7SN	49	1901	35	1985	99.25/ m
Lot 8H	40	NA	NA	40	.22/ m
Lot 8HN	59	212	3	274	15/ m
Lot 8 S	38	55	0	93	.6/m
Total	**11002**	**15667**	**325**	**26994**	**17.6/ m average**

Artifact classes include historic materials dating from the late 18th century to the present century, with a concentration in the late 18th to middle 19th century. Lithic tools and debitage (quartz, quartzite, argillite, chert, rhyolite, Pennsylvania and Saugus Jaspers, and hornfels) dominated the assemblage with charcoal, carbonized maize (especially from lot 6H large deep storage pits), calcined and unburned faunal remains, shellfish, and pottery also occurring.

Projectile point styles recovered from Data Recovery testing identified two main periods of use within the overall project area, Transitional Archaic to Early Woodland and Middle to Late Woodland. Other periods sparsely represented included Early Archaic (Lot 6H) Middle Archaic (Lot 4, Lot 5, Lot 6) and Late Archaic (Lot 4S).

Table 2. Projectile point recoveries Lots 4-8

Point Type	**L4H**	**L4S**	**L5H**	**L6H**	**L6S**	**L7H**	**L7HN**	**L7SN**	**L8H**
Early Archaic									
Bifurcate				2					
Middle Archaic									
Neville	1	1	1						
Stark	2	6	3	1					
Late Archaic									
Brewerton		1							
Transitional Archaic									
Perkiomen			1						
Susquehanna Broad							1		
Wayland Notched- Dudley	2	3		1	1				
Wayland Notched- Coburn	1	2		3		1			1
Wayland?			1		2				
Mansion Inn		1							
Boats	1		3						
Orient Fishtail	1	2							
Small Stemmed									
Small Stemmed-Bare Island	2	2	2	1		1	1		
Squibnocket Stemmed	1	3	1	3					
Wading River	1	5		2					
Small Stemmed?	2								
Squibnocket- Long	5	8		1	1	2			
Squibnocket- Squat	1	13	2			1		1	
Squibnocket?	1	9	1	2					
Early Woodland									
Rossville		2							
Middle Woodland									
Fox Creek	2	1			1				
Jack's Reef			1						
Greene	2	1	2	2	1				
Late Woodland									
Levanna-Deep Based			2	1	2	1	1	2	
Levanna- Shallow Based	6	1	1	3	1	2	2	3	2
Levanna?	4	2	1	2	1	1		2	

Total	**35**	**63**	**22**	**24**	**10**	**9**	**5**	**8**	**3**

Historical Artifacts

Testing recovered a variety of historic period artifacts from across the project area. Testing recovered most of the historic cultural material from the Lot 1 and 2 impact areas. The concentration of historic material in this area is the result of two houses dating to the eighteenth century being located within and near these lots. Historic material recovered from the southern lots are likely the result of field scatter during their use life as cultivation and hay fields.

Excavation in the L1H impact area yielded a total of 1096 (51.8% of the total recovered in this impact area) historic artifacts (Table 3). Testing recovered 115 (31.7% of the total recovered in

Table 3. Lot 1 Historic cultural material

Class	L1H	L1S	L1HN	L1SN
Ceramics	**716**	**92**	**280**	**22**
Brick	340	18	114	16
Clay Tobacco Pipe	15	3	11	
Earthenware	1	1		2
Creamware	180	23	15	
Pearlware	53	10	11	2
Whiteware	9		7	
Slipware	1		1	
Redware	114	37	115	2
Stoneware	1			
White Salt-Glazed Stoneware			7	
Tin-Glazed			1	
Porcelain	2			
Yellowware			1	
Coal	**261**	**6**		**1**
Glass	**64**	**5**	**198**	**4**
Flat	16	3	110	4
Curved	48	1	88	
Other		1		
Metal	**58**	**12**	**251**	
Cuprous	2		2	
Iron				
Blade	2			
Kettle Fragment	1		1	
Can		1		
Flat Fragment	1		21	
Tool Tooth	1			
Rod		1	1	
Tool Handle	4			
Hand-Wrought Nails	16	3	170	
Machine-Cut Nails	30	5	23	
Nail Fragments			22	
Ring			1	
Harness Buckle			1	
Handle			1	

Table 3. (continued)

Class	**L1H**	**L1S**	**L1HN**	**L1SN**
Hook			1	
Pintle			1	
Wire	2			
Silver Button	1	1		
Lead Kames			6	
Total	**1103**	**115**	**729**	**27**

this impact area) historic artifacts from the L1S impact area and 26 (72.2%of the total recovered in this impact area) from the L1SN impact area. Most of the historic artifacts (n=3429) recovered came from the L1HN impact area with most (n=3154) recovered from N300 E178 (cellarhole) excavation. Testing recovered the remaining 275 artifacts from across the impact area with 275 artifacts, 99 (36%) being historic materials.

Historic material from the Lot 1 impact area dated to the eighteenth to middle nineteenth century (Table 3). Artifact classes included ceramics, bottle and window glass, coal, and metal architectural and household materials. Window glass from the cellar hole included diamond shaped quarrels. These quarrels and the associated window leads, indicate a house that was probably constructed in the first half of the eighteenth century. The recovery of complete window quarrels in the cellar hole indicate that the house probably had its old casement windows replaced at some point and stored in the cellar. All artifacts recovered were typical of what one would find associated with an eighteenth to nineteenth century household.

Artifacts from the Lot 2 impact area were similar to those from the Lot 1 impact area, indicating a probable connection between the two (Table 4). The artifacts from Lot 2 may have arrived at the site either as field or yard scatter.

Table 4. Lot 2 Historic cultural material

Class	L2H	L2S
Ceramics	**319**	**45**
Brick	60	6
Clay Tobacco Pipe	5	3
Earthenware	3	
Creamware	79	11
Pearlware	25	3
Whiteware	2	
Slipware	1	
Stoneware	1	
Porcelain	1	
Redware	137	22
Clay Marble	1	
White Salt-Glazed Stoneware	4	
Coal	**97**	**4**
Glass	**29**	**2**

Table 4. (Cont)

Class	L2H	L2S
Flat	21	
Curved	8	2
Metal	**49**	**7**
Cuprous	2	1
Iron		
Cabinet Key	1	
Can Fragment	1	
Button		1
Flat Fragment	4	1
Chain Links	2	
Hand-Wrought Nails	13	
Machine-Cut Nails	24	3
Nail Fragment		1
Total	**494**	**58**

As field work moved away from north end and the houses that are and were there, historic artifacts became less common. Artifacts from lots 4 to 6 dated from the eighteenth to nineteenth centuries, establishing a probable link with the material from lots 1 and 2 (Tables 5-7).

Table 5. Lot 4 Historic cultural material

Class	**L4H**	**L4S**
Ceramics	**95**	**45**
Brick	46	19
Clay Tobacco Pipe	7	6
Earthenware	1	
Creamware	10	7
Pearlware	1	
Whiteware	8	3
Redware	19	10
Ironstone	1	
Stoneware-Westerwald	1	
Porcelain	1	
Coal	**47**	**136**
Glass	**31**	**53**
Flat	23	50
Curved	7	2
Button	1	1
Metal	**92**	**61**
Cuprous		6
Tin	1	
Iron		
Buckle	1	

Table 5. (continued)

Class	L4H	L4S
Kettle Fragment	1	
Flat Fragment	4	1
Hinge		1
Nail Fragments	1	
Hand-Wrought Nails	8	4
Machine-Cut Nails	76	56
Synthetic	4	
Total	**269**	**295**

Table 6. Lot 5 Historic cultural material

Class	L5H	L5S
Ceramics	**145**	**6**
Brick	32	3
Clay Tobacco Pipe	12	
Earthenware	1	
Creamware	8	
Pearlware	7	2
Whiteware	2	
Redware	74	1
Ironstone	1	
Slipware	1	
Tin-glazed	2	
White salt-glazed stoneware	5	
Coal	**2**	
Glass	**5**	
Flat	3	
Other	2	
Metal	**20**	
Cuprous	3	
Iron		
Fragment	1	
Kettle Fragment		
Flat Fragment		
Tool Tooth		
Tool Handle		
Hand-Wrought Nails	5	
Machine-Cut Nails	11	
Wire		
Silver Button		
Total	**173**	**6**

Table 7. Lot 6 Historic cultural material

Class	L6H	L6S
Ceramics	**107**	**14**
Brick	12	3
Clay Tobacco Pipe	1	3
Earthenware	1	
Creamware	6	3
Pearlware	41	1
Whiteware	6	
Ironstone		1
Redware	39	2
Fulham Stoneware	1	
Coal	**6**	
Glass	**3**	
Curved	3	
Metal	**12**	**6**
Iron		6
Fragments	4	
Hand-Wrought Nails		1
Machine-Cut Nails	8	4
Wire		1
Total	**125**	**20**

All of this historic cultural material probably arrived at the site as field scatter from the home site identified in L1HN.

Artifacts from lots 7 and 8 appeared to date later than those from the lots to the west (Tables 8 and 9)

Table 8. Lot 7 Historic cultural material

Class	L7H	L7HN
Ceramics	**9**	**5**
Brick		2
Clay Tobacco Pipe	1	1
Creamware	1	
Pearlware	1	
Whiteware	4	2
Redware	2	
Coal		**1**
Glass	**3**	
Curved	3	
Metal	**1**	**1**
Iron		
Machine-Cut Nails	1	1
Total	**13**	**7**

Table 9. Lot 8 Historic cultural material

Class	L8H	L8HN
Ceramics	**5**	**10**
Clay Tobacco Pipe	3	4
Creamware	1	2
Whiteware	1	2
Redware		2
Coal		**3**
Glass		**3**
Flat		3
Metal	**5**	**3**
Cuprous		2
Iron	5	1
Oxen Shoe	1	
Hand-Wrought Nails	2	1
Machine-Cut Nails	2	
Total	**10**	**19**

The ceramic assemblage from these lots contained more nineteenth century materials. The source of the artifacts was probably similar though, from one of the home sites located along north end .

Lithic Analysis

Lithic analysis investigated the following research questions:

- Is there a difference in reduction strategies for the quartz versus non-quartz components of the assemblage? Do any differences noted possibly relate to differential desired end product? There are five possible end products for core reduction at the site:
  1) processing cobbles bifacially for tools resulting from the core of the cobble;
  2) processing cobbles with the desire of creating long flake blades as the end product;
  3) striking flakes off the cobbles that were then utilized and were the end product of reduction;
  4) producing long blade-like flakes that were subsequently bifacially reduced further to create tools;
  5) a combination of reduction strategies with more than one desired end product.
- Were raw materials used in the same way or were flakes used in and of themselves the final product versus biface production?
- What were the sources for the raw materials? Were they beach cobbles or quarried veins?
- Does the technology evident at the site in the lithic debitage relate to the level of mobility practiced by the people living at the site in the various periods?
- To what extent does quartz reliance span time periods? Was there a preference for quartz in one period over another?
- How does Late Woodland quartz use differ or compare with Late Archaic use?

The analyst selected attributes for the analysis that were the standard ones used by most researchers to ensure that others researching the field can readily use this analysis. Analysis of the lithic artifacts followed the following procedure. Initial sorting separated the material type and recorded the color of the debitage followed by shatter, cores and flakes/ flake-like debris separation . Analysis counted, weighed and measured the shatter for length, width and maximum thickness and identified it to type (block and plate) and identified cortex. Shape (rectangular, triangular, square or amorphous) and flake scars were also noted. Analysis of the shatter helped determine the reduction sequence and the amount of waste generated by it.

Flakes and flake-like pieces analysis counted the pieces and recorded the overall length, width, weight and thickness and the flake platform measured for width, thickness, and striking angle (Appendix C). Previous studies showed a steep (80-90° angle) for flakes that were essentially driven into the core during the early stages of biface manufacture and shallower angles for later stages. Measurements of the bulb taken recorded the maximum thickness just below it. Dorsal flake scars on the flake will also be counted and if possible measured for length and width and angle.

One of the main research issues related to the lithic component of the site is the heavy reliance on local quartz. During the Late Archaic, this characterizes the Small Stemmed/ Squibnocket industries, during the Late Woodland, it is common to find Levannas predominantly made of this material. Hoffman postulated that the reliance on quartz, especially in the Late Archaic was the result of environmental changes including the rise in sea level and major desiccation that happened in southeastern Massachusetts during the 4th millennium (Hoffman 1985: 65). This ongoing process that occurred from 6000-2000 BP may have led to group territorial restriction that resulted, or in a breakdown of interregional trade and thus a need to rely on locally available quartz. The dramatic increase in the number of Late Archaic sites in southeastern Massachusetts may have been the result of a reorganization of social structure to adapt to scarce resources by maintaining a base camp and dispersing groups to collect floral and faunal resources at specialized task camps (Hoffman 1985:65). Hoffman sees the incorporation of the quartz technology into the social system of the Late Archaic as being the real indicator of increased social complexity and the trigger to increased site density and population growth in southeastern Massachusetts (Hoffman 1985: 65). He does not see environmental change as a significant factor for the change in population size and site density. Hoffman believes that due to the greater opportunities for resource procurement and settlement caused by decrease in the reliance on specific exotic or traded lithics, New England populations made a conscious choice against aggregation and decided to split up and settle over a wider area (Hoffman 1985:65). Quartz essentially provided a viable alternative to the concentration on trade networks or lowland lithic resources. The Late Woodland was another period that saw a high reliance on quartz, possibly for reasons similar to that in the Late Archaic, or possibly for other reasons altogether.

The quartz component from the site may date to either the production of Squibnocket points, Levanna points, or to an unidentified industry. Analysis compared the Squibnocket Triangles and the Levannas production techniques to the debitage recovered. The working hypothesis was that there was not a great deal of difference between the techniques used to produce either point. Production of both point styles involved the use of soft hammer (antler) production and pressure flaked edge retouch. Boudreau in 1981 found that on Squibnocket Triangles Native knappers accomplished the edge work through a series of collateral flakes removed from the edge to the median (Boudreau 1981:9). Analysis also explored Leslie Shaw's hypothesis that small triangle points (commonly identified as Squibnocket Triangle points) production continued after the Late Archaic well into the Middle and possibly the Late Woodland period (Shaw 2000).

Quartz does not lend itself well to functional or micro-wear studies due to the fact that even the differences between hard and soft hammer percussion are difficult to distinguish (Callanan 1981:77; Boudreau 1981:14). This is predominantly due to the fact that quartz shatters upon detachment from the core, resulting in four main types of debitage (as recorded by Boudreau 1981:18): 1) unflake-like pieces of debitage bearing no flake scars. These pieces are rough and irregularly shaped and are found to be any size, most of which bear square edges resulting from the separation of the pieces on flaw planes.; 2) many flake-like pieces of shatter with square edges that are the result of simple breakage. Their uniform flat nature is very different from angled pieces produced during biface manufacture and is due to the fact that they were accidentally separated from a flat core face. Flat pieces with humped dorsal faces are also found that result from the purposeful trimming of the core and removal of irregularities.; 3) flakes from bifacial reduction that usually display a curvature associated with the production of biconvex cross-sections. Another distinct type of bifacial reduction flake has a thickness of .2 cm. Bifacial production flakes have a platform angle of about 70 degrees, are free of irregularities and are often ground for strength. Primary reduction flakes are either moderately large flat flakes greater than 2 cm, thin with parallel faces, or block flakes with greater thickness that tend towards chunkiness and bear obscure bulbs (Barber 1981:54). ; 4) Finally, the exhausted core is the eventual result of quartz manufacture. These may in fact be worked down so much as to look like thick flakes trimmed around the edges by perpendicular flaking. Evidence for bipolar splitting of cobbles will also be looked which should take the form of crushing on one or both ends of a large core piece.

While the initial cataloging of the collection used terms such as primary, secondary and tertiary when describing the flake debitage, during the analysis phase I attempted to stay away from these terms due to the fact that these classes are too linked to the percentage of cortex remaining and represent an invariant sequence of flake reduction with no technological dependency between them and core reduction (as outlined by Sullivan and Rozen 1985). The amount of cortex on a flake is the result of a number of other factors aside from the "stage " of reduction. These include 1) raw material type 2) nodule or core size 3) intensity of reduction 4) nature of raw material procurement and reduction system 5) stylistic and functional factors (Sullivan and Rozen 1985:756). Essentially "stage" typologies based on the assumption that it is possible to determine the technological origins of each artifact through a combination of key attributes alone have long been used by researchers. By applying Sullivan and Rozen's mutually exclusive debitage categories of complete flakes, broken flakes, flake fragments, and debris, a more factual representation of the lithic reduction process and the possible technological reason behind became clear.

Analysis compared the results of the analysis to Sullivan and Rozen's findings from Arizona. In the series of Archaic sites that they examined, they found five varieties of assemblages characterized by varying proportions of the categories outlined above. These assemblages were:

Group I: (core use only) which had a higher percentage of cores and complete flakes, a lower percentage of flakes and flake fragments and bore more evidence to core reduction.

Group IA: (unintensive core reduction) which had an extremely high percentage of cores and complete flakes, a very low percentage of broken flakes and flake fragments and was an exaggerated expression of Group I. Group IA flakes are large, cortical, and thick assuming flakes become smaller, less cortical and relatively thinner once more reduction takes place.

Group IB1: where the percentage of debris was lower than IB2 and appears to have not been the result of intensive core reduction and may in fact represent both core reduction and tool manufacture. The amount of flakes and flake-like pieces present in this group is intermediate between tool manufacture and core reduction with respect to flake size, relative thickness, cortex while the frequencies of platform lipping and faceting are lower than II but greater than IB2.

Group IB2: (intensive core reduction) which had a very high percentage of debris pieces with shattered striking platforms and the bulbs of percussion were increasing abundant as core reduction became more intensive and core platform angles increase. These were the products of intensive core reduction and not core reduction and tool maintenance. The amount of flakes and flake-like pieces present in this group is intermediate between tool manufacture and core reduction with respect to flake size, relative thickness, cortex while the frequencies of platform lipping and faceting are lower than II but less than IB1

Group II: (bifacial tool manufacture) which had the lowest percentage of cores and complete flakes, the highest percentage of broken flakes and flake fragments and represent mainly the byproducts of tool manufacture. The flakes that expected for this group are small, noncortical, and thin especially if soft hammer used, characterized by abundant faceting and lipping. (Sullivan and Rozen 1985: 759-764) (Table 10).

Table 10. Artifact categories for each Technological group (Sullivan and Rozen 1985: 762).

Artifact Category	Technological Group (%s)			
	IA	IB1	IB2	II
Complete Flakes	53.4	32.9	30.2	21
Broken Flakes	6.7	13.4	8.1	16.8
Flake Fragments	16	35.3	34.7	51.3
Debris	6.1	7.9	23	7.3
Cores	14.7	2.8	2	0.6
Retouched Flakes	3.1	7.5	2	3.1

Analysis then compared these results to those obtained by Cowan's 1999 study in interior New York state. Cowan found a strong relationship between lithic technology strategies and the degree of mobility practiced by the populations who created the debitage (Cowan 1999:593). The variation in tool design and production can then be used as clues to social organization in prehistoric settlement systems and to the organizational roles of the sites within settlement systems (Cowan 1999:593). Cowan's study focused on interior sites dating to the Late Archaic, Early Woodland and Late Woodland. Subsistence models previously developed predict that small interior sites played different roles during the three periods under consideration and are the result of different patterns of mobility. Because mobility places constraints on the technological options available to the society, researchers can predict the kinds of tool production and use strategies that occur in different situations.

The lithic technology employed at these sites was in the form of either the striking off of flakes from a core to use them as such, core reduction to create a biface or a combination of technologies. The flake tools struck from cores are easy to produce but they also have short use lives, the consume a large amount of raw material, they are difficult to haft, they have very little multifunctional utility and it is difficult to transport a large core to make more tools. On the other hand bifacial tools take a longer amount of time and need more skill to produce but they have a long use life, they consume a smaller amount of raw material, are easier to haft, used for a variety of functions, and are easy to transport (Cowan 1999: 594). As a result of these advantages and disadvantages to the two forms of technology, it is possible to predict the mobility of the users. Interior Late Archaic sites in New York are small and sparse in artifacts, representing a short-term residential camp for a small group of people who were highly mobile (Cowan 1999:596). They have an eclectic tool kit present representing the diverse tool needs of these seasonal activity residential camps. Early Woodland interior camps were special purpose sites that were the focus of resource procurement activities and maintenance tasks that required a diverse mostly bifacial tool kit (Cowan 1999:597). Small Late Woodland interior sites are highly variable in function, structure and content with tool production and use strategies varying with the activities being preformed at the sites and whether or not the sites are seasonal base camps or short-term task group sites (Cowan 1999:597). The expected assemblages at these sites are as shown below:

Table 11. Cowan's expected tool production and use strategies (Cowan 1999:597)

Period	**Site Role**	**Tool Production Strategy**
Late Archaic	Residential Camps	Biface and moderate core use
Early Woodland	Logistical Camps	Bifaces
Late Woodland	Logistical Camps	Bifaces
	Seasonal Base Camps	Cores

In order to investigate these strategies, Cowan analyzed the assemblages by focusing on seven measures to summarize them. These were the proportions of cortex to non-cortex bearing flakes, proportion of flakes with angular or irregular dorsal surface cross sections, proportions of flakes with platforms edge (core face) trimming, proportion of flakes with platform edge grinding or abrasion, median flake thickness, median maximum-dimension-to-thickness ratios (Cowan 1999: 600). A high occurrence of thick flakes bearing cortex on their dorsal surface that are angular in cross-section with little or no platform preparation are characteristic of Late Woodland seasonal base camps and to a moderate degree the late Archaic camps. This indicates that raw material arrived as cores and thus worked down at the site. The Early Woodland and Late Woodland Logistical camps showed the opposite occurrence with only evidence of biface reduction present. Bifacial reduction leaves a larger amount of thinner flakes bearing smaller cortical patches with well-formed platforms (Cowan 1999: 604). The logistical camps also showed a high presence of thin noncortical flakes with well-formed platforms edges while the other sites yielded thick noncortical flakes that were angular in cross-section and cortical striking platforms, or a mixture of the two types (Cowan 1999:604).

Cowan's findings show that the Late Archaic people lived in small social groups that moved often to exploit a variety of resources with a mixed tool kit containing a broad range of tools and production methods. The resource being exploited and the tool that best suited the job determined the tools and methods used at various sites or times. Early Woodland populations were extremely mobile groups that exploited resources and returned to a base camp. Their tool assemblages reflected this, being composed of bifaces and preforms without much core reduction. Archaeological testing shows Late Woodland seasonal base camps occupied by small family groups tending crops near a main village and logistical camps for the procurement and processing of game and other forest resources transported away from the sites (Cowan 1999:605).

Donna Ingham has applied Cowan’s findings to the Nourse/ Andrews 1, 2 and 3 sites in Westborough (Ingham 2002). Here she found that the Middle Archaic component of the site, consisting of 24 projectile points, 29 bifaces, 41 retouched flakes and six cores, was evidence of moderate mobility with mixed tool production (Ingham 2002: 106). Lithic analysis of the Muttock-Pauwating site compared Cowan's and Ingham’s findings with those from this site to determine the degree of mobility and see if this site was a task camp focusing on the river or as a larger residential camp. Lithic analysis also focused on the variety of materials found and sources that they likely derived from. Distributions of certain lithic types reflected settlement systems and group territories, especially during the Late Woodland period (Ritchie 2002: 105; Luedtke 1997, 1998a, 2002). In the simplest sense, there are essentially only two varieties of lithics: generic and name brand. Generic lithic include quartz, gray and black rhyolites, and quartzites, materials that have a widespread distribution, are common, and obtained from more than one source. Quartz outcrops everywhere in southeastern Massachusetts, and rhyolites, especially gray and black varieties, occur in glacial drift deposits along with quartzite and quartz. Name-brand lithics include Melrose green rhyolites, Saugus Jasper, Pennsylvania Jasper, hornfels and New York cherts. These lithics are visually distinct and restricted to small dikes in specific places. Ritchie sees the name-brand lithics as having the “potential to serve as useful markers of lithic procurement behavior of specific source areas that supplied material to native American groups” (Ritchie 2002: 107). The control of specific lithic sources by sachemships in the late prehistoric and early historic period is likely an example of the river basin territorial that has its roots in the Middle Archaic (Ritchie 2002: 107). This control may have replaced the long distance trade in exotic lithics such as Pennsylvania jasper and New York cherts that was common from the Late Archaic to Middle Woodland periods, perhaps reflecting the ongoing process of increased sedentism, decline in long distance interaction and differentiation of group territories (Goodby 1992: 3). An excellent example of group territories potentially affecting name-brand lithic distribution is the fact that in the Middleborough/ Bridgewater area, the north side of the Taunton River at the Native Settlement of Titicut, was under the control of the sachem of Massachusetts Bay, while the south side was not. Would the north side of the river have greater access to lithics which had their origins around the greater Boston area than the south side did? Did Middleborough in general see more lithic types from the Boston area than other areas, due to the close ties to the Massachusett Natives? The overall question of lithic types and their distributions from source and across temporal periods, will be part of the focus of the lithic analysis of the artifacts from the data Recovery program and the earlier surveys.

Debitage

Debitage and other stone tool debris dominated the assemblage, consisting of nine raw material types, but quartz and rhyolite dominated the assemblages from all impact area (Tables 12 and 13).

Table 12. Comparison of lithic debitage recovered

Location	Quartz	Rhyolite	Quartzite	Chert	Hornfels	Saugus Jasper	Argillite	Penn. Jasper	ARF	Totals
L1H	963	27	3	5	0	0	1	0	0	**999**
L1HN	169	70	7	0	1	0	0	0	0	**247**
L1S	197	27	1	1	2	0	0	1	0	**229**
L1SN	14	0	2	0	0	0	0	0	0	**16**
L2H	1282	178	30	4	60	0	23	0	10	**1588**
L2S	44	3	0	0	1	0	0	0	0	**48**
L4H	1517	183	6	9	8	2	2	4	0	**1731**
L4S	6043	475	33	42	22	13	6	13	1	**6648**
L5H	2143	482	17	36	7	8	9	6	0	**2708**
L5S	1	5	0	0	0	0	0	0	0	**6**
L6H	1556	291	32	29	5	80	6	1	0	**2000**
L6S	360	53	2	2	3	5	1	0	1	**427**
L7H	303	23	1	1	1	0	0	0	0	**329**
L7HN	113	13	4	1	0	1	0	0	0	**132**
L7S	25	5	0	0	1	0	0	0	0	**31**
L7SN	200	33	0	1	4	0	1	0	0	**239**
L8H	149	12	2	2	0	0	0	0	0	**165**
L8HN	41	5	0	1	0	0	1	1	0	**49**
L8S	53	1	0	0	0	0	0	0	0	**54**
Totals	**15173**	**1886**	**140**	**134**	**115**	**109**	**50**	**26**	**12**	**17646**

Table 13. Recovered debitage by percentage of total debitage recovered

Material	Percentage of Total
Quartz	86%
Rhyolite	10.7%
Quartzite	.8%
Chert	.76%
Hornfels	.65%
Saugus Jasper	.6%

Table 13. (continued)

Material	Percentage of Total
Argillite	.3%
Pennsylvania Jasper	.15%
Attleboro Red Felsite	.07%
Total	**17646/ 100.03%**

Quartz and rhyolite (local lithics) made up over 96% of the total recovered lithic chipped stone assemblage, local exotics (Massachusetts exotics- Hornfels, Attleboro Red Felsite, Saugus Jasper) made up 1.3%, followed by other locally obtained lithics (quartzite, argillite) at 1.1%, while far exotics (out-of-state exotics-chert, Pennsylvania Jasper) made up only .9%. The occurrence of local, local exotics, and far exotics indicates that the lithic technology at the site focused on locally obtained materials with other raw materials occurring proportionate to their distance from the site: the farther from the site the raw material came from the lower the occurrence at the site. Flaking debris (shatter, cores, flakes and flake fragments) total 17,646 (97.53%) pieces. Bifaces, including projectile points, point fragments and preforms, total 414 tools, dominated mostly by Late Archaic Squibnocket Triangle points of two varieties, elongated and truncated. Other artifacts included utilized flakes, hammerstones, lithic heavy tools, and ornaments.

Local Lithics

Crystalline Silicates

This class includes quartz and quartzites. Quartz is a vein forming mineral deposited in the fissures in other rocks and may include crystalline, milky or smoky varieties. Quartz accounted for 86% of the total lithic assemblage (Table 13) with a total of 15,431 quartz artifacts (flakes, shatter, projectile points, cores, bifaces, unifaces, hammerstones, and crystals) being recovered (Table 14). Most of the quartz debitage and tools (36%) came from a large lithic dump in the

Table 14. Quartz artifact occurrence

Location	Flake/ Frags	Shatter	Core	Uniface	Biface	Preform	Scraper	Drill	Point	Crystal	Hstn	Totals
L1H	284	664	5	1	4		1		2	2		963
L1S	81	109	2		1	1			2	1		197
L1HN	56	101	2	1	4				4	1		169
L1SN	6	7							1			14
L2H	345	909	8	6	10				3		1	1282
L2S	7	35	1						1			44
L4H	253	1222	9	2	12				19			1517
L4S	1111	4855	8	4	28			1	35	1		6043
L5H	374	1745	1	4	10				8	1		2143
L5S	1											1
L6H	258	1527	4	8	2				12	3		1556
L6S	59	291	1	2	4				3			360

Table 14. (continued)

Location	Flake/ Frags	Shatter	Core	Uniface	Biface	Preform	Scraper	Drill	Point	Crystal	Hstn	Totals
L7H	35	255	4	1	1				7			303
L7S	5	20										25
L7HN	10	95	2	1	1				3	1		113
L7SN	23	165	4		1		1		6			200
L8H	36	113							3			149
L8S	18	35										53
L8HN	15	25	1									41
Total	**2719**	**12173**	**52**	**30**	**78**	**1**	**2**	**1**	**109**	**10**	**1**	**15431**

Lot 4 Septic impact area. This dump dated to the Late Archaic period and associated Squibnocket Triangle point production. A total of five of the impact areas excavated were found to yield over 1000 pieces of quartz and in every case quartz was found to vastly outnumber that of any other raw material recovered. Analysis identified cortex on between .3 and 4% (excluding Lot 5S) of the quartz debitage (Table 15). Overall cortex occurrence on quartz debitage was very low with

Table 15. Cortex occurrence on quartz debitage

Location	Total Debitage	Cortex Count	% Cortex of Total
L1H	963	15	1.2%
L1S	197	3	3.1%
L1HN	169	3	1.8%
L1SN	14	0	0
L2H	1282	24	1.9%
L2S	44	1	2.3%
L4H	1517	6	.4%
L4S	6043	19	.3%
L5H	2143	23	1.1%
L5S	1	1	100%
L6H	1556	9	.6%
L6S	360	5	1.4%
L7H	303	1	.3%
L7S	25	1	4%
L7HN	113	1	.9%
L7SN	200	5	2.5%
L8H	149	3	2%
L8S	53	0	0
L8HN	41	1	2.4%
Total	**15431**	**121**	**7.9%**

only 36.1% of the total assemblage having cortex occurring at over 1%. The low occurrence of cortex on quartz debitage indicates that most of the raw material was probably initially worked elsewhere and only semi-finished preforms arrived at the site, indicating an off-site source for the glacial cobbles that provided the raw material.

Comparison of the length to width ratios for the complete quartz flakes supports an overall emphasis on later stage reduction over early stage **(Figure 1)**. Research found that the earlier

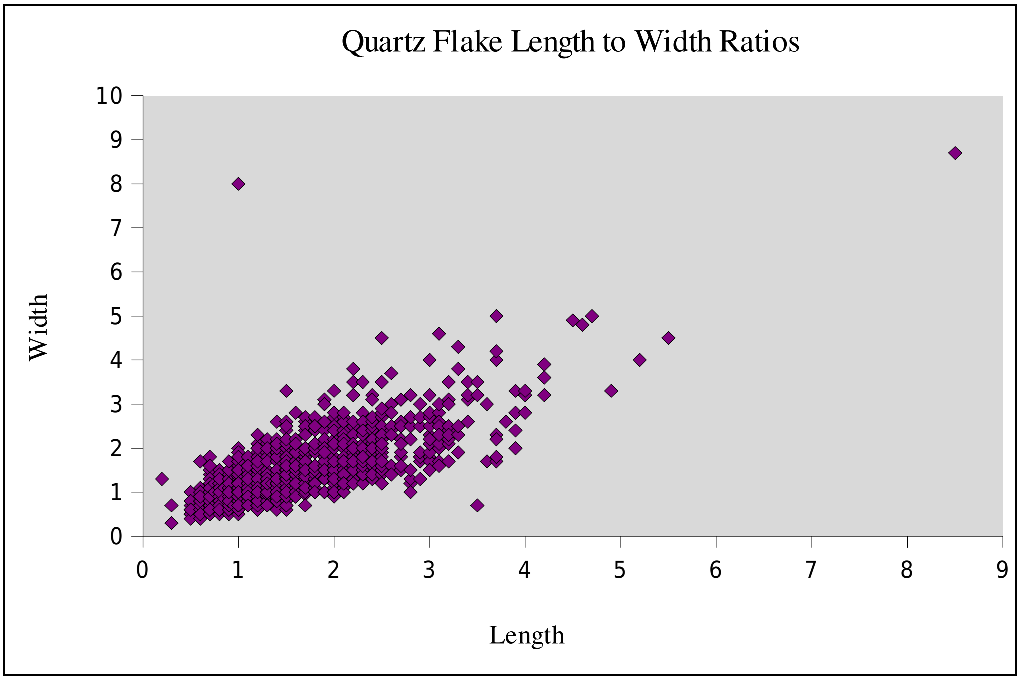

Figure 1. Complete quartz flakes length to width ratios comparison

stages of reduction produced flakes with larger length to width ratios (longer than wide) and that are closer to a 1:1 ratio are the result of later stage reduction.

Flake lengths and striking platform angles were also measured and the findings from these measurements support the hypothesis that later versus earlier manufacture was occurring across the project area. Table 16 presents the striking platform angle and complete flake length data by

Table 16. Quartz striking platform angles and complete flake lengths

Location	**Angles**	**Count**	**%**	**Lengths**	**Count**	**%**
L1H	25-35°	4	2.8	.1-.9 cm	30	20.8
	40-50°	29	20.2	1-1.9 cm	76	52.7
	55-65°	73	50.7	2-2.9 cm	22	15.3
	70-80°	290	20.2	3-3.9 cm	14	9.7
	85-90°	9	6.3	4-4.9 cm	2	1.4
Totals		**144**				

L1HN	25-35°	2	8.7	.1-.9 cm	0	0
	40-50°	3	13	1-1.9 cm	8	34.8
	55-65°	6	26	2-2.9 cm	9	39.1
	70-80°	10	43.5	3-3.9 cm	5	21.7
	85-90°	2	8.7	4-4.9 cm	0	0
				5 cm	1	4.3
Totals		**23**			**23**	
L1S	25-35°	0	0	.1-.9 cm	5	11.1
	40-50°	6	13.3	1-1.9 cm	32	71.1
	55-65°	33	73.3	2-2.9 cm	5	11.1
	70-80°	5	11.1	3-3.9 cm	1	2.2
	85-90°	1	2.2	4-4.9 cm	1	2.2
				5 cm	1	2.2
Totals		**45**			**45**	
L1SN	25-35°	0	0	.1-.9 cm	4	80
	40-50°	2	40	1-1.9 cm	1	20
	55-65°	2	40	2-2.9 cm	0	0
	70-80°	0	0	3-3.9 cm	0	0
	85-90°	1	20	4-4.9 cm	0	0
Totals		**5**			**5**	
L2H	25-35°	6	3.3	.1-.9 cm	17	9.3
	40-50°	38	20.8	1-1.9 cm	99	54.1
	55-65°	74	40.4	2-2.9 cm	51	27.9
	70-80°	51	27.9	3-3.9 cm	13	7.1
	85-90°	14	7.7	4-4.9 cm	3	1.6
Totals		**183**			**183**	

Table 16. (continued)

Location	**Angles**	**Count**	**%**	**Lengths**	**Count**	**%**
L2S	25-35°	1	20	.1-.9 cm	1	20
	40-50°	3	60	1-1.9 cm	4	80
	55-65°	1	20	2-2.9 cm	0	0
	70-80°	0	0	3-3.9 cm	0	0
	85-90°	0	0	4-4.9 cm	0	0
Totals		**5**			**5**	
L4H	25-35°	13	12.5	.1-.9 cm	16	15.4
	40-50°	26	25	1-1.9 cm	62	59.6
	55-65°	34	32.7	2-2.9 cm	23	22.1
	70-80°	16	15.4	3-3.9 cm	2	1.9
	85-90°	15	14.4	4-4.9 cm	1	1
Totals		**104**			**104**	
L4S	25-35°	46	11.7	.1-.9 cm	84	21.4
	40-50°	103	26.3	1-1.9 cm	232	59.2
	55-65°	135	34.4	2-2.9 cm	63	16.1
	70-80°	65	16.6	3-3.9 cm	11	2.8
	85-90°	43	11	4-4.9 cm	1	.3
				5 cm	1	.3
Totals		**392**			**392**	
L5H	25-35°	9	8.6	.1-.9 cm	35	33.3
	40-50°	27	25.7	1-1.9 cm	49	46.7
	55-65°	41	39	2-2.9 cm	17	16.1
	70-80°	24	22.9	3-3.9 cm	4	3.8
	85-90°	4	3.8	4-4.9 cm	0	0
Totals		**105**			**105**	
L6H	25-35°	6	5.3	.1-.9 cm	40	35.7
	40-50°	35	31.3	1-1.9 cm	44	39.3
	55-65°	31	27.7	2-2.9 cm	21	18.8
	70-80°	27	24.1	3-3.9 cm	7	6.3
	85-90°	13	11.6	4-4.9 cm	0	0
Totals		**112**			**112**	
L6S	25-35°	3	.8	.1-.9 cm	6	15.4

Table 16. (continued)

Location	Angles	Count	%	Lengths	Count	%
	40-50°	13	33.3	1-1.9 cm	25	64.1
	55-65°	7	17.9	2-2.9 cm	6	15.4
	70-80°	12	30.8	3-3.9 cm	1	2.6
	85-90°	4	10.3	4-4.9 cm	1	2.6
Totals		**39**			**39**	
L7H	25-35°	0	0	.1-.9 cm	3	30
	40-50°	4	40	1-1.9 cm	6	60
	55-65°	3	30	2-2.9 cm	1	10
	70-80°	2	20	3-3.9 cm	0	0
	85-90°	1	10	4-4.9 cm	0	0
Totals		**10**			**10**	
L7HN	25-35°	0	0	.1-.9 cm	0	0
	40-50°	3	42.8	1-1.9 cm	3	42.8
	55-65°	1	14.3	2-2.9 cm	3	42.8
	70-80°	2	28.6	3-3.9 cm	1	14.3
	85-90°	1	14.3	4-4.9 cm	0	0
Totals		**7**			**7**	
L7S	25-35°	0	0	.1-.9 cm	2	50
	40-50°	1	25	1-1.9 cm	1	25
	55-65°	3	75	2-2.9 cm	1	25
	70-80°	0	0	3-3.9 cm	0	0
	85-90°	0	0	4-4.9 cm	0	0
Totals		**4**			**4**	
L7SN	25-35°	0	0	.1-.9 cm	0	0
	40-50°	2	15.4	1-1.9 cm	10	76.9
	55-65°	5	38.5	2-2.9 cm	1	7.7
	70-80°	4	30.8	3-3.9 cm	1	7.7
	85-90°	2	15.4	4-4.9 cm	1	7.7
Totals		**13**			**13**	
L8H	25-35°	0	0	.1-.9 cm	4	28.4
	40-50°	5	35.7	1-1.9 cm	6	42.9
	55-65°	7	50	2-2.9 cm	2	14.2
	70-80°	1	7.1	3-3.9 cm	2	14.2

Table 16. (continued)

Location	**Angles**	**Count**	**%**	**Lengths**	**Count**	**%**
	85-90°	1	7.1	4-4.9 cm	0	0
Totals		**14**			**14**	
L8HN	25-35°	0	0	.1-.9 cm	0	0
	40-50°	2	28.6	1-1.9 cm	4	57.1
	55-65°	1	14.3	2-2.9 cm	2	28.6
	70-80°	3	42.8	3-3.9 cm	1	14.3
	85-90°	1	14.3	4-4.9 cm	0	0
Totals		**7**				
L8S	25-35°	1	14.3	.1-.9 cm	1	14.3
	40-50°	4	57.1	1-1.9 cm	4	57.1
	55-65°	1	14.3	2-2.9 cm	1	14.3
	70-80°	1	14.3	3-3.9 cm	1	14.3
	85-90°	0	0	4-4.9 cm	0	0
Totals		**7**			**7**	

impact area. Striking platform angles are shallower in the later stages of biface manufacture with flakes struck off of a steeper edge towards the center of the in-production biface versus strikes from a shallower-angled edge earlier stage biface. Later stage platform angles range below 65° and earlier stage platform angles are greater than this. Table 16 shows that in most of the impact areas, flakes with striking platforms that were 65° or less **(Figure 2)**. It was also expected that,

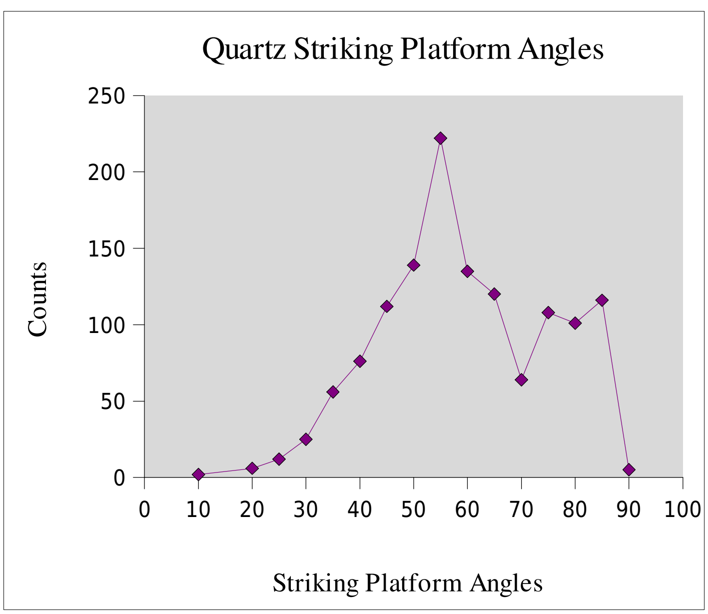

Figure 2. Overall occurrence of striking platform angles on quartz debitage

due to the physical properties of the raw material and the greater difficulty in working it, quartz in general would yield somewhat steeper angles than commonly found in other raw materials (Boudreau 1981).

Flake lengths were shorter during the later stages of biface manufacture. Early Stage reduction flakes were larger than 2 cm in length, Late Stage reduction flakes ranged from 1-1.9 cm in length, while finishing and retouch flakes were smaller than 1 cm in length. Most of the flakes measured between 1 and 1.9 cm in length in all the lots except L1SN and L7S where flakes shorter than 1 cm dominated and L7HN where flakes ranging from 1-1.9 cm and 2-2.9 cm occurred in the highest frequency. It is important to note that in these exceptional impact area flake counts ranged between four and seven pieces and may not offer a good representative sample. If the lithic reduction activities represented in an assemblage reflect finishing of points from preforms brought to a site versus preform production (and not necessarily finished points) from raw materials brought to a site, then projectile point fragments present in an assemblage would show this. Table 17 shows projectile point fragments and complete quartz points and point

Table 17. Occurrence of complete quartz projectile points and point fragments

Location	**Complete**	**Tip**	**Tip/ Midsection**	**Midsection**	**Base/ Midsection**	**Base**	**Half**	**N**
L1H	100.0%							3
L1HN	20.0%		40.0%				40.0%	5
L1S	66.6%				33.3%			3
L1SN			100.0%					1
L2H	28.6%	28.6%		14.3%	14.3%		14.3%	7
L2S	100.0%							1
L4H	57.1%	14.3%	4.8%	4.8%	19.1%			21
L4S	55.6%	11.1%	8.9%	2.2%	11.1%	8.9%	2.2%	45
L5H	40.0%		10.0%		10.0%	10.0%	30.0%	10
L6H	53.9%	7.7%	7.7%		23.1%	7.7%		13
L6S	25.0%				50.0%	25.0%		4
L7H	71.4%	28.6%						7
L7HN	33.3%				33.3%	33.3%		3
L7SN	42.9%				42.9%		14.3%	7
L8H	66.6%	33.3%						3

fragments from across the project area. Most impact areas yielded a higher percentage of complete points, half points, point tips, tip and midsection and midsection fragments, all of which are what would be expected in locations where the manufacture of points versus the replacement of points broken during a hunt, occurred. The fact that so many impact areas bore evidence of point manufacture supports the interpretation of this site as a base camp/ village versus repeatedly occupied short-term hunting camps.

The types of fractures present on projectile points can also help to determine if on site manufacture of the points occurred or if the represent points discarded when replaced during a hunt. Table 18 shows the identified projectile points and the fracture types that were present

Table 18. Fracture types present on recovered quartz points

Location	**Crystal Planer**	**Perverse**	**Impact**
L1H			1 Levanna
L1HN		2 Squibnocket 1 Levanna	
L1S		1 Squibnocket	
L1SN		1 Levanna	
L2H	1 Squibnocket	2 Levanna	1 Small Stemmed 1 Squibnocket
L4H	2 Levanna 1 Small Stemmed	1 Levanna 1 Squibnocket	1 Levanna 2 Squibnocket 1 Small Stemmed
L4S	1 Squibnocket	2 Squibnocket	1 Brewerton? 1 Levanna 2 Small Stemmed 5 Squibnocket
L5H	1 Small Stemmed 1 Squibnocket		1 Levanna 1 Small Stemmed
L6H		1 Squibnocket	2 Levanna 1 Small Stemmed
L6S	1 Levanna		2 Levanna
L7H		2 Levanna	1 Levanna
L7HN			2 Levanna
L7SN	1 Squibnocket	1 Levanna	1 Squibnocket 1 Levanna
L8H			1 Levanna
Totals	4 Squibnocket 2 Small Stemmed 2 Levanna	7 Squibnocket 8 Levanna	9 Squibnocket 13 Levanna 6 Small Stemmed 1 Brewerton?

on them. Breakages that probably occurred during manufacture (crystal planer and perverse) were found across the project area except in L7HN and L8H. Impact fractures, often on tip and ears of triangular points, occurred across the entire project area except in L1HN, L1S, L1SN. This distribution shows that triangular (Squibnocket and Levanna), and Small Stemmed manufacture across the project area, probably to replace broken points that returned to this camp from hunting expeditions carried out away from the site. This appears to have been common practice except in L1S, L1SN, and L1HN where production happened more often than replacement and in L7HN and L8H where replacement dominated production. Plowzone testing in L7HN and L8H did yield low artifact yields per test pit possibly reflecting either shorter term occupation or more intensive refuse disposal in specific areas outside of the Data Recovery impact areas.

Summary of Quartz

Quartz represented the most commonly occurring lithic raw material across the project area. This material was probably acquired locally, but the low occurrence of cortex on the debitage present indicates that cobbles were probably initially reduced elsewhere with Stage I bifaces or roughed out cores being brought to the project area for further reduction. Comparison of the length to width ratios of the complete flakes recovered indicates a higher occurrence of later stage reduction versus initial reduction (a conclusion supported by the low cortex occurrence). This finding was also supported by the relatively small-size of the flakes and the shallow striking platform angles. The higher occurrence of point tips and tip to midsection fragments as well as more manufacturing breaks versus impact fractures indicates that in most impact areas manufacture of new points was more common than the replacement of points broken during the hunt. These findings show it was a site of sedentary versus transitory occupation and that occupation probably lasted for more extended periods of time.

Quartzite

Data recovery excavations recovered141 quartzite artifacts in a variety of colors with most coming from the L2H, L4S, L6H, and L5H impact areas (Table 19).

Table 19. Recovered quartzite

Location	Pink-Maroon	Tan-Brown	Green Gray	Gray- Dark Gray	Purple Gray	Totals
L1H	2	2				3
L1HN		3	1	1	2	7
L1S	1					1
L1SN				2		2
L2H	4	17	1	7	1	30
L4H		1	1	4		6
L4S		9	8	12	4	33
L5H		5	1	11		17
L6H	1	11	9	9	2	32
L6S		2				2
L7H				1		1
L7SN		1	1	2		4
L8			2			2
Total	**8**	**51**	**24**	**49**	**9**	**141**

impact areas with only limited amounts being recovered elsewhere. The principal colors represented were tan to brown followed by gray to dark gray and finally green gray. Reduction debitage was most common in the L2H, L6H, and L4S impact areas (Table 20). Analysis found the variety of projectile

Table 20. Quartzite artifacts recovered from lots with highest artifact counts sorted by color

Color	Artifact	L1HN	L2H	L4H	L4S	L5H	L6H	L7SN	Totals
Pink-Maroon	Flake/ Flake Fragment		2				1		3
	Point			1 Lev.					1
	Shatter		2						2
Tan-Brown	Flake/ Flake Fragment	2	15		6	4	11	1	39
	Point	1 Brewerton	1 Neville		1 Squib.				3
	Biface		1						1
	Shatter				2				2
	Pestle					1			1
Green Gray	Flake/ Flake Fragment			1	7	1	7	1	17
	Point		1		1 Orient				2
	Biface	1							1
	Shatter						2		2
Gray-Dark Gray	Flake/ Flake Fragment	1	6	3	10	8	7	1	36
	Point		1 Frag.		1 Frag.	2 Rossville	1 Lev.	1 Frag.	6
	Shatter		1		1	1	1		4
	Hoe			1					1
Purple Gray	Flake/ Flake Fragment	2			3		2		7
	Point				1 Frag.				1
Totals		**7**	**30**	**6**	**33**	**17**	**32**	**4**	**128**

points represented limited to Late Archaic Squibnocket Triangles and one Orient Fishtail; Early Woodland Rossvilles; and Late Woodland medium and large size triangles (Levannas) (Table 21).

Table 21. Quartzite projectile points recovered

Location	Neville	Brewerton	Squibnocket	Orient	Rossville	Levanna	Total
L1HN		1 Tan					1
L2H	1 Tan						1
L4H						1 Pink tan	1
L4S			1 Tan	1 Green gray	1 Purple tan		3
L5H					2 Gray		2
L6H						1 Dark gray	1
L7HN						1 Dark gray	1
Total	**1**	**1**	**1**	**1**	**3**	**3**	**9**

Knappers made the triangular points from dark gray and pink tan varieties of quartzite, Rossville points from gray and purple tan varieties, Late Archaic points from green gray, and tan varieties, and the one Middle Archaic point from tan quartzite. Archaeologists recovered gray colored quartzite glacially-derived cobbles from the subsoil in several lots, indicating a probable local source for this raw material. The quartzite varieties used for projectile points recovered corresponded in several cases with the varieties with the highest flake counts in the corresponding impact areas. Tan quartzite was the most common variety recovered in L2H which is probably the result of on-site finishing of points during the Middle Archaic, tan quartzite was also one of the most common varieties in L4S where a tan Squibnocket Triangle as recovered Archaeologists recovered green gray quartzite debitage in L4S along with an Orient Fishtail point made from the same material. Gray quantize corresponded with gray quartzite Rossville points in L5H, and dark gray quartzite was common in L6H where testing recovered a dark gray Levanna point. High recovery rates of gray to dark gray quartzite in L2H and L4S may date to the Early or Late Woodland period while the recovery of tan to brown and green gray quartzite in L6H may date to Middle to Late Archaic use of the area.

Archaeologists recovered quartzite flakes and flake fragment debitage (n=102) and shatter (n=10) but no cores. The highest occurrences of flakes and flake fragments were in impact areas L2H, L4S, L5H, and L6H with 95% of the flakes and flake fragments. Complete flakes ranged in size from .5 to 3.9 cm in length with the overall average being 1.7 cm with a trend being clear for smaller flakes that are more common during later stage reduction **(Figure 3)**. Flakes recovered from the four areas with the highest occurrences of quartzite debitage were most commonly of tan to brown and gray to dark gray quartzite varieties (Table 22). The distribution appears to that at least one

Table 22. Comparison of complete quartzite flake lengths from the impact areas with the highest occurrences of quartzite debitage

Location	Pink-Maroon	Tan-Brown	Green Gray	Gray- Dark Gray	Purple Gray	Totals
L2H	.75 cm	.7-3.3/ 1.9 cm		3.2-3.5/ 3.3 cm		**13**
L4S		1.1 cm	1-2.8/ 2 cm	.75-2.2/ 1.3 cm	2.3 cm	**9**
L5H		.9-1.4/ 1.15 cm		.6-1/ .8 cm		**5**
L6H		.7-2/ 1 cm		.5-3.9/ 2.2 cm		**10**
Totals	**1**	**17**	**6**	**12**	**1**	**37**

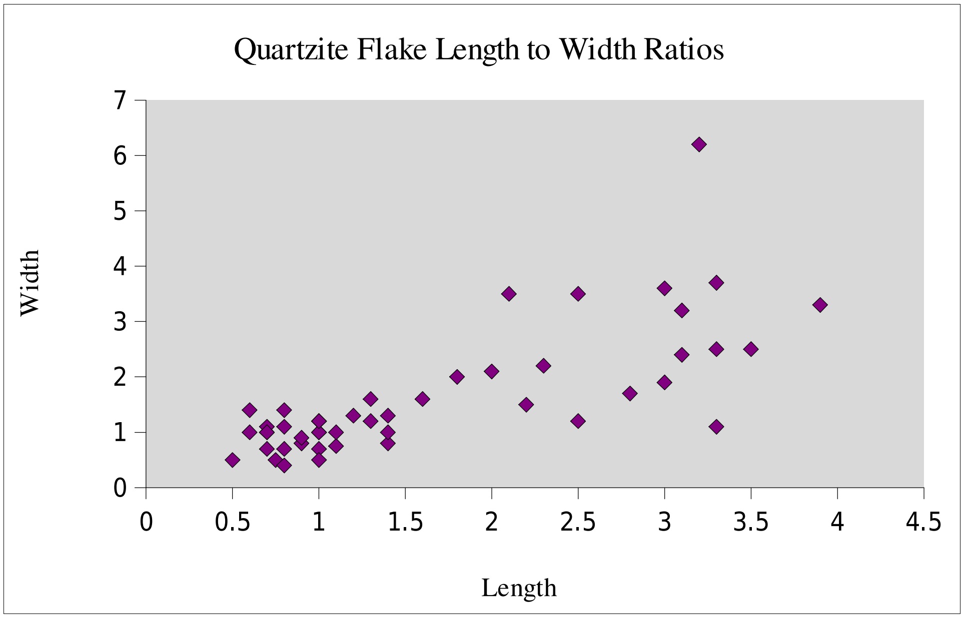

Figure 3. Complete quartzite flakes length to width ratio comparison

one Neville, one Orient Fishtail, and one Levanna point made of quartzite were not produced, but finished on site. Evidence of the late stage finishing or resharpening of quartzite points was also apparent with a comparison of the striking platform angles between impact areas (Table 23). The

Table 23. Comparison of quartzite striking platform angles

Color	Pink-Maroon/ Average	Green Grey/ Average	Gray-Dark Gray/ Average	Tan-Brown/ Average	Purple Grey/ Average
L1H				55°	
L1HN		55°		50-55°/ 52.5°	
L1S					
L1SN			75°		
L2H	45°		40-75°/ 58.75	35-65°/ 51.9°	
L4H			40-80°/ 60°		
L4S		33-65°/ 48°	30-50°/ 43°	35-45°/ 40°	25-45°/ 35°
L5H			45-60°/ 53°	35-45°/ 40°	
L6H		40-55°/ 46°	55-80°/ 67.5°	25-80°/ 48.3°	
L6S				20-25°/ 22.5°	
L7SN		35°	60°	45°	
L8H		60-85°/ 72.5°			

overall average striking platform angle was 49.7° with over half of the flakes bearing striking platforms that were shallower than 50°, indicating more later stage finishing and resharpening versus earlier stage reduction **(Figure 4)**.

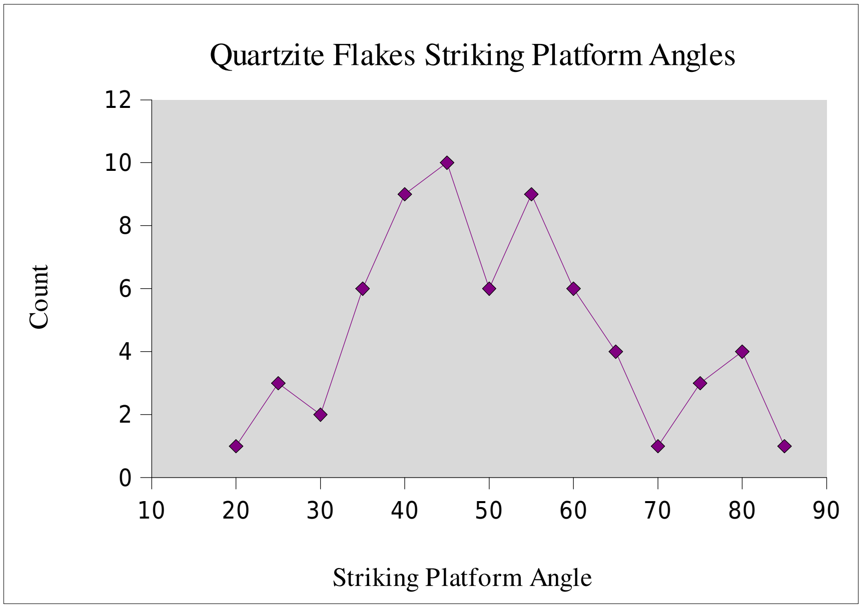

Figure 4. Overall occurrence of striking platform angles on quartzite debitage

Quartzite artifacts recovered from anomaly contexts accounted for 21% of the quartzite artifacts with most being of the gray to dark gray variety. The recovery of Late Woodland Levanna style points from the same contexts help date this debitage to the Late Woodland as well (Table 24).

Table 24. Quartzite anomaly recoveries

Anomaly Type	**Location**	**Anomaly**	**Gray to Black**	**Green**	**White**	**Tan**
Large Deep Pit	L6H	N103.8 E244	3			1
	L6H	N104 E241.6	2			1
	L6H	N104.5 E243	4	1		1
	L6H	N108.8 E235.7	1			
Medium medium Pit	L2H	N268.2 E214.2		1		
	L4H	N150.25 E125.85	1			
	L4S	N147.55 E140.4	1			
	L4S	N148 E146.4	1			
	L4S	N148.3 E141.25		1		
	L4S	N149.1 E144.7	1			
	L6H	N100.6 E237.2		1		
	L6H	N103.7 E237	1			
	L5H	N130.7 E178.7	1			
	L6S	N113.75 E250.8		1		
	L7SN	N70 E255			1	

Table 24. (continued)

Anomaly Type	Location	Anomaly	Gray to Black	Green	White	Tan
Medium shallow basin	L7HN	N66.5 E257.5	1			
Natural	L1H	N311.3 E169.5	1			
	L4H	N141.75 E129.75	1			
	L6H	N102.5 E235		1		
	L6H	N108.3 E241.6	1			
Totals			20	6	1	3

Quartzite use occurred during may of the occupations represented at the site but was most common in the Middle Archaic, Late Archaic, Early Woodland, and Late Woodland periods. Quartzite bifaces or finished points arrived at the site, as evidenced by the lack of cortex, relative small size, and shallow striking platform angles of the flakes recovered. Tan quartzite appears more commonly associated with the Middle Archaic occupation, especially in L2H, green gray quartzite appears associated with the Late Archaic period, gray to dark gray quartzite was more commonly associated with the Late Woodland Period.

Rhyolite

The terms felsite and rhyolite interchangeably used by archaeologists, leading to heated discussions about what is the correct term. Researchers use both to describe the same lithic type, intrusive volcanics formed by the rapid cooling of granite magma. Felsite/ rhyolites are fine-grained with dark or light crystals (phenocrysts), essentially bits of volcanic crystals, embedded within the matrix. They can have no visible phenocrysts (aphenytic felsite/ rhyolite) or have large, prominent ones (porphyritic felsite/ rhyolite). The phenocrysts are large or small and the raw material may also have banding. Felsite/ rhyolites commonly occur in glacial drift deposits and are often found as rounded cobbles on beaches. The original parent source of these stones appears to have been in the northeastern quarter of Massachusetts.

Felsite/ Rhyolites include Black with white phenocrysts (originating in the Newbury Volcanic Complex), Green Fine-Grained, a dark green felsite lacking visible phenocrysts (originating in the Lynn Volcanic Complex in Melrose, Massachusetts), Maroon/ Purple/ Red (originating in the Lynn Volcanic Complex in Marble head, Massachusetts), Grey with dark small phenocrysts (originating in the many volcanic complexes), Blue-Grey with dark phenocrysts (originating in the Blue Hills Complex in Braintree, Massachusetts), Cream and Rust Stained coarse-grained gray green to tan with pyrite crystals (originating in the Mattapan Volcanic Complex in the Sally Rock Quarry in Hyde Park), Red Banded with dark red to pink fine banding or swirls on a light red, tan or cream matrix, also called Mattapan Red Felsite (originating in the Mattapan Volcanic Complex on the Neponset River), Red to Maroon Porphyritic with dark red or white phenocrysts (outcropping in Hingham, Massachusetts), Green porphyritic visible dark glassy and white phenocrysts (outcropping at Mount Kineo on Moosehead lake in Maine), Red light red to pink with a coarse texture phenocrysts may be visible but are pink or tan feldspar or translucent silica glass, banding may occur in same composition as phenocrysts, also known as Attleboro Red Felsite (outcropping in Attleboro, Massachusetts), Banded and Other Porphyritic.

Rhyolite contributed 10.7% (n=1886) to the overall lithic assemblage with most being recovered from L4S, L5H and L6H, a trend that mirrors other raw materials distributions (Table 25).

Table 25. Rhyolite distribution

Loc.	Qrtz	Rhylt	Qztz	Chert	Hornfels	Saugus Jasper	Argillite	Penn. Jasper	ARF	Totals
L1H	963	**27**	3	5	0	0	1	0	0	**999**
L1HN	169	**70**	7	0	1	0	0	0	0	**247**
L1S	197	**27**	1	1	2	0	0	1	0	**229**
L1SN	14	**0**	2	0	0	0	0	0	0	**16**
L2H	1282	**178**	30	4	60	0	24	0	10	**1588**
L2S	44	**3**	0	0	1	0	0	0	0	**48**
L4H	1517	**183**	6	9	8	2	2	4	0	**1731**
L4S	6043	**475**	33	42	22	13	6	13	1	**6648**
L5H	2143	**482**	17	36	7	8	9	6	0	**2708**
L5S	1	**5**	0	0	0	0	0	0	0	**6**
L6H	1556	**291**	32	29	5	80	6	1	0	**2000**
L6S	360	**53**	2	2	3	5	1	0	1	**427**
L7H	303	**23**	1	1	1	0	0	0	0	**329**
L7HN	113	**13**	4	1	0	1	0	0	0	**132**
L7S	25	**5**	0	0	1	0	0	0	0	**31**
L7SN	200	**33**	0	1	4	0	1	0	0	**239**
L8H	149	**12**	2	2	0	0	0	0	0	**165**
L8HN	41	**5**	0	1	0	0	1	1	0	**49**
L8S	53	**1**	0	0	0	0	0	0	0	**54**
Totals	**15173**	**1886**	**140**	**134**	**115**	**109**	**51**	**26**	**12**	**17646**

ARF- Attleboro Red Felsite

Most of the rhyolite artifacts recovered took the form of flakes and projectile points, but evidence of the entire process of bifacial reduction was present across the project area in the form of cores, shatter, preforms and finished forms (Table 26). Six percent of the recovered artifacts bore cortex with most (77.7%) being gray to black in color (Table 29). The greatest number of rhyolite artifacts that bore traces of cortex came from the lots where rhyolite more commonly occurred (Table 28). The percentage of the total rhyolite that bore cortex was highest in lots 1, 2 and 7HN and 8H. This indicates more early stage reduction of rhyolite in these locations versus the others. It also may show a degree of commonality and possibly even contemporaneity between these locations. Low low occurrence of cortex in the other impact areas may indicate the same.

Table 26. Rhyolite artifacts recovered

Lot	Flakes	Shatter	Cores	Bifaces	Points	Unifaces
L1H	21	2		1	3	
L1HN	63	2		1	4	
L1S	20	1		1	3	1
L2H	139	11	4	10	12	2
L2S	3					
L4H	169	3	2	9	11	
L4S	428	8	3	5	30	1
L5H	447	19	3	7	9	
L5S	1					
L6H	272	10			9	
L6S	46	1	1	1	2	1
L7H	21	1			2	
L7HN	28	1			3	2
L7S	1					
L7SN	28	1			3	2
L8H	8			1	3	
L8HN	4			1		
L8S	1					

Table 27. Rhyolite debitage bearing cortex compared by color

	Gray to Black	Green to Green-Gray	Maroon	Purple
Biface	1			1
Uniface	1			
Point	1 (Rossville)			
Shatter	9		1	3
Core				1
Flake/ Flake Fragments	82	3	11	7
Total	**94**	**3**	**12**	**12**

Table 28. Comparison of rhyolite debitage with cortex by lot and color

Location	Rhyolite Total	Gray to Black	Green to Green-Gray	Maroon	Purple	Totals
L1H	27	5		1		**6/ 22.2%**
L1HN	70	16			1	**17/ 24.2%**
L1S	27	4	1		1	**6/ 22.2%**
L2H	178	16	1	6	1	**24/ 13.5%**
L2S	3					
L4H	183	4			2	**6/ 3.3%**
L4S	475	10	1	1		**12/ 2.5%**
L5H	482	20		1	3	**24/ 5%**
L5S	5					
L6H	291	10		2	2	**14/ 4.8%**
L6S	53	2		1		**3/ 5.7%**
L7H	23					
L7HN	13	3				**3/ 23%**
L7S	5					
L7SN	33	2			1	**3/ 9%**
L8H	12	1			1	**2/ 16.7%**
L8HN	5					
L8S	1	1				**1/ 100%**
Totals	**1886**	**94**	**3**	**12**	**12**	**121**

A number of different colored varieties including gray to black, purple, green, tan to brown and pink to maroon made up the rhyolite assemblage. These varieties probably all originated from the Boston Basin rhyolite sources and many having been carried south by the last glacial advance and deposited during the later retreat. Gray to black-colored rhyolite accounted for over 50% (55.6%) of the total rhyolite assemblage (Table 29). Field testing recovered artifacts of this

Table 29. Recovered rhyolite colors

Location	Gray-Black	Purple	Green	Tan-Brown	Pink-Maroon	Totals
L5H	254	140	53	29	6	482
L4S	242	119	52	44	18	475
L6H	157	85	13	7	29	291
L4H	94	56	14	18	1	183
L2H	106	34	31	2	5	178
L1HN	62	7			1	70
L6S	30	15	3		5	53
L7SN	28	4			1	33

Table 29. (Cont.)

Location	Gray-Black	Purple	Green	Tan-Brown	Pink-Maroon	Totals
L1S	13	4	4		6	27
L1H	18	5			4	27
L7H	15	3	4	1		23
L7HN	9	1	1	2		13
L8H	4	5		1	2	12
L7S	4	1				5
L8HN	5					5
L2S	2	1				3
L8S	1					1
Totals	**1044**	**480**	**175**	**104**	**78**	**1881**

color rhyolite from every context tested. Excavation recovered cobbles of this material and of the purple, the second most common variety, from the B1 subsoil, indicating its local availability in the glacial till. Purple rhyolite was also found to widespread across the project area but was less common in the eastern lots (lot 7 and 8 testing) where rhyolite was relatively scarce. Across the project area, the various colored varieties of rhyolite occurred in similar frequencies.

The recovered rhyolite projectile points (Tables 30 and 31) showed a preference for gray-colored

Table 30. Comparison of temporally diagnostic rhyolite points

	Gray	Green	Purple	Other (Maroon, Tan, Pink)	Totals
Early Archaic	**3.20%***				
Bifurcate	1				1
Middle Archaic	**6.50%**	**16.60%**	**18.20%**		
Stark	2	1	2		5
Neville		1	2		3
Late Archaic	**16.10%**	**16.60%**	**36.30%**		
Brewerton	1	1	1		3
Small Triangle	3	1	1	1	6
Small Stemmed	1		6		7
Transitional Archaic	**25.80%**	**33.20%**	**4.50%**	**40.00%**	
Susquehanna	3		1		4
Mansion Inn		1			1
Wayland	3	1		1	5
Atlantic		1			1
Orient	1	1			2

Table 30. (Cont.)

	Gray	**Green**	**Purple**	**Other (Maroon, Tan, Pink)**	**Totals**
Perkiomen	1			1	2
Early Woodland	**16.10%**	**8.30%**	**18.20%**	**20.00%**	
Rossville	5	1	4	1	11
Middle Woodland	**9.60%**	**8.30%**	**9.00%**		
Fox Creek	1		1		2
Jack's Reef	1				1
Greene	1	1	1		3
Late Woodland	**22.60%**	**16.60%**	**13.60%**	**20.00%**	
Levanna	7	2	3	1	13
Totals	**31**	**12**	**22**	**5**	**80**

% shown represents % of the total for that color rhyolite

Table 31. Relative occurrence of rhyolite colors by period

Period	Gray	Green	Purple	Other
Early Archaic	100.00%			
Middle Archaic	25.00%	25.00%	50.00%	
Late Archaic	31.25%	12.50%	50.00%	6.25%
Transitional Archaic	53.30%	26.70%	6.70%	13.30%
Early Woodland	45.50%	9.10%	36.40%	9.10%
Middle Woodland	50.00%	16.70%	30.00%	
Late Woodland	53.80%	15.40%	23.10%	7.70%

rhyolite in the Transitional Archaic and Late Woodland periods, a preference for green-colored rhyolites in the Transitional Archaic, purple-colored rhyolites in the Late Archaic, and maroon in the Transitional Archaic. Analysis noted the following trends related to the use of various colors over time:

-the use of gray colored rhyolites increased over time, which may represent an increase in reliance on locally available versus traded lithic raw materials
-Transitional Archaic populations followed a gray rhyolite color utilization pattern similar to that employed by Late Woodland populations
-Transitional Archaic populations used more green-colored, less purple-colored, and more other-colored rhyolites
-there was a reduction in the reliance on purple colored rhyolite over time (especially in the Transitional Archaic)
-the Transitional Archaic appears to have used a wider variety of Other-colored rhyolites than during previous and subsequent periods
-Rhyolite colors can not be used to predict what period non-temporally diagnostic artifacts date.

Testing recovered 485 rhyolite non-debitage artifacts across the project area. Most of them manufactured from rhyolites in various shades of gray (n=283) and purple (n=107) with maroon (n=41), green (n=35) and tan to brown (n=16) being less well-represented. Rhyolite recoveries from anomalies, mainly medium and large size pits dating from the Middle to Late Woodland periods, the findings from the projectile point analysis are supported- gray and purple rhyolite use occurred more than any other color in the Middle and especially the Late Woodland periods.

It was found that rhyolite flakes and flake fragments distribution was inversely related to the projectile points in most of the impact areas. The impact areas that had low flake and flake fragment counts had higher projectile point occurrences while the impact areas with higher flake occurrences generally had lower projectile point occurrences **(Figure 5).**

Analysis excluded impact areas containing very small samples of rhyolite artifacts from Figure 5. The reason for this inverse relationship is probably the result of slightly different reduction stages being carried out in impact areas LHN, L8H, L1S and L1H, the impact areas with projectile point occurrences above 11%, versus the remaining impact areas. By comparing the length of the complete rhyolite flakes recovered from the impact areas with the greatest number of flakes, **Figure 6** shows that as the flake number increased the size of the flakes decreased indicating more late stage reduction, finishing and resharpening was occurring in the impact areas with the low projectile point recoveries and higher flake/ flake fragment recoveries. Early stage reduction appears to have been more of the focus of the lithic reduction carried out in the impact areas with low flake counts and more finishing carried out in the impact areas with high flake counts.

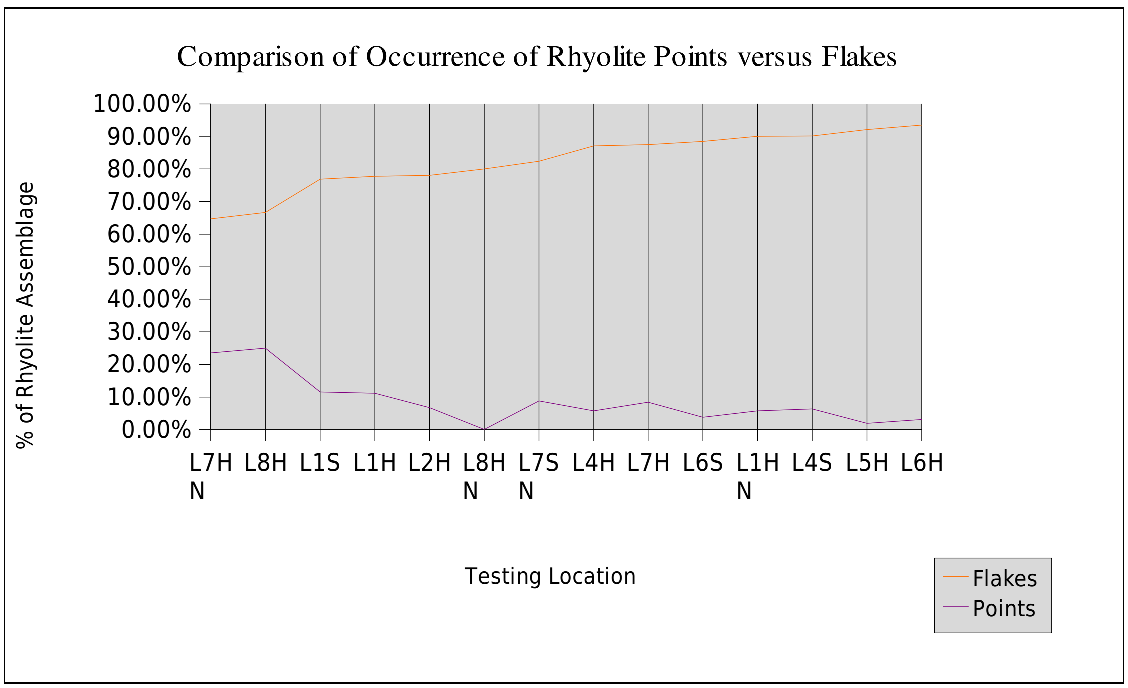

Figure 5. Comparison of rhyolite flake/ flake fragment versus projectile point occurrences

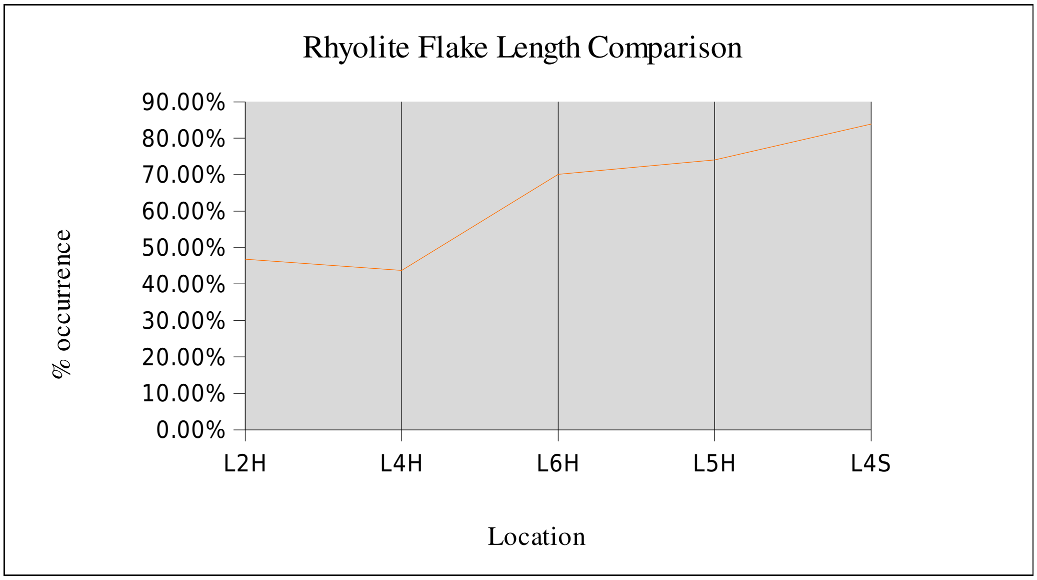

Figure 6. Comparison of rhyolite flake length distributions between impact areas

The presence of cortex on rhyolite artifacts (Table 28) indicates that more primary reduction occurred in the Lot 1 (H, HN, S), L2H and in L8H than in other contexts. The percentage of the total rhyolite assemblage that contained cortex was highest in these contexts than in others, a finding that supports the flake and point data. Locations L1HN, L8H, L1S, L2H and L1H showed evidence of primary reduction occurring more than secondary reduction and finishing, indicating possible shorter-term occupation in these locations. Locations L7SN, L6S, L6H, L5H, L4H and L4S showed more evidence of secondary reduction and finishing, possibly indicating primary reduction elsewhere and the secondary reduction and finishing of preforms being the principal lithic reduction activity at these locations, possibly implying extended occupation.

The five contexts compared in **Figure 2** also yielded the highest counts of rhyolite bifaces, cores and shatter Table 32. A direct correlation is present with L2H's higher occurrence of larger flakes

Table 32. Occurrence of bifaces, cores and shatter in contexts with highest flake/ flake fragment and point occurrences

Location	**Bifaces**	**Cores**	**Shatter**
L2H	10	4	11
L4H	9	2	3
L6H	0	0	10
L5H	7	3	19
L4S	5	3	8

and the abundance of bifaces, cores and shatter, supporting the hypothesis that primary reduction was an important activity at this location. This correlation is generally supported by the findings from the other higher occurrence locations as well. Location L5H appears somewhat anomalous though, with a higher occurrence of bifaces, cores and shatter than expected. One explanation for this is that two temporally separate rhyolite reduction actions occurred here. If the lithic reduction activities represented in an assemblage reflect finishing of points from preforms brought to a site versus preform production (and not necessarily finished points) from raw materials brought to a site, then it projectile point fragments present in an assemblage would reflect this. Table 33 shows projectile point fragments and complete points distribution from the

Table 33. Occurrence of complete projectile points and point fragments

Location	Complete	Tip	Tip/ Midsection	Midsection	Base/ Midsection	Base	N
L1HN	33.3%	0	0	0	66.6%	0	**3**
L7H	50%	0	0	0	50%	0	**2**
L7HN	60%	0	0	0	40%	0	**4**
L1H	33.3%	33.3%	33.3%	0	0	0	**3**
L1S	66.6%	33.3%	0	0	0	0	**3**
L6S	0	0	50%	0	22.2%	0	**2**
L7SN	0	33.3%	0	0	33.3%	33.3%	**3**
L8H	0	33.3%	0	0	33.3%	33.3%	**3**
L1S	66.6%	33.3%	0	0	0	0	**3**
L2H	63.6%	0	9.1%	9.1%	9.1%	9.1%	**11**
L4H	45.5%	9.1%	18.2%	0	27.3%	0	**11**
L4S	48.3%	17.2%	13.8%	6.9%	13.8%	0	**29**
L5H	33.3%	11.1%	11.1%	11.1%	22.2%	11.1%	**9**
L6H	33.3%	11.1%	11.1%	0	22.2%	22.2%	**9**

impact areas. The assemblages from L1HN, L7H, L7HN, L1H, L1S, L6S, L7SN, and L8H probably represent assemblages where a limited amount of lithic reduction took place to replace points broken during the hunt (as represented by the basal fragments which would have been left in haft when a hafted point broke during the hunt). The remaining assemblages, L2H, L4H, L4S, L5H, and L6H are again the lots that had the highest occurrence of points and point fragments as well as lithic refuse. Comparing these five assemblages (Table 34), analysis shows that the impact areas with a higher occurrence of whole points were also the impact areas with a higher occurrence of larger flakes **(Figure 2).** Inversely, the locations with the greater number of larger flakes had a lower occurrence of point tips and tip/ midsection fragments. Tips are often broken off of a biface being reduced during the later stages of reduction when pressure flaking the edges of the points to finish them. The opposing pressure of the antler flaker and the biface often causes twisting or perverse fractures to occur at this stage. The relative abundance of tip and tip/ midsection fragments indicate that finishing of points was the principle lithic reduction stage carried out at the locations with the higher occurrence of smaller flakes. The abundance of bases and base/ midsection fragments may relate to the recovery of broken hafted projectile points during the hunt but it may result from breakage during manufacture.

Table 34. Occurrence of complete projectile points and point fragments from locations with high flake/ flake fragment counts

Location*	Complete	Tip	Tip/ Midsection	Midsection	Base/ Midsection	Base	N
L2H	63.6%	0	9.1%	9.1%	9.1%	9.1%	**11**
L4H	45.5%	9.1%	18.2%	0	27.3%	0	**11**
L6H	33.3%	11.1%	11.1%	0	22.2%	22.2%	**9**
L5H	33.3%	11.1%	11.1%	11.1%	22.2%	11.1%	**9**
L4S	48.3%	17.2%	13.8%	6.9%	13.8%	0	**29**

*Locations arranged by occurrence of larger flakes highest to lowest (top to bottom of table)

Breakage patterns (Table 35) indicate that the following was occurring in each impact area: L1H

Table 35. Projectile point breakage patterns

Loc	Frag	SS	Lev	Squi	Ori	Ross	Stark	Greene	Way	FC	Boat	Jack	Bifur	Susq
L1H	2P	P												
L1HN			P, 3I											
L1S	2P													
L2H	3P	I	I		I	I, P	3P, I							
L4H	3P		P			I		P	I					
L4S	3P, I	P, 2I		2P		2I	I		2I	P				
L5H		2I						P			I, P	I		
L6H	P		2I					I, P	I				I	
L6S	P									I				
L7H		I												
L7HN														I
L7SN			P											
L8H			I											

P: perverse fracture I: Impact fracture

Small Stemmed points manufactured; L1HN Levanna points manufactured to replace ones broken in haft during the hunt; L1S some type of point manufactured; L2H Small Stemmed, Levanna, Rossville, Orient and Stark points broken in haft discarded and Rossville and Stark points produced; L4H Rossvilles and Wayland Notched points broken in haft discarded and Levannas and Greene points produced; L4S Small Stemmed, Starks, and Wayland Notched points broken in haft discarded and Small Stemmed, Squibnocket, and Fox Creek points produced; L5H Small Stemmed, Boats, and Jack's Reef point broken in haft discarded and Greene and Boats points produced; L6H a Levannas, a Greene point, a Wayland point, and a Bifurcate broken during the hunt discarded and a Greene point manufactured; L6S a Fox Creek broken during the hunt discarded; L7H a Small Stemmed point broken during the hunt discarded; L7HN a Susquehanna broken during the hunt discarded; L7SN a Levanna point produced; and L8H a Levanna broken during the hunt discarded.

Summary of Rhyolite

Analysis found that the rhyolite assemblage of 1886 pieces (10.7% of the overall assemblage), chiefly flakes and flake fragments with shatter, cores, point, bifaces, and unifaces, appeared to represent episodes of later stage manufacture and finishing of points roughed out elsewhere. Analysts reached this conclusion based on the small size of the flakes and the low occurrence (6%) of cortex on the pieces. Gray to black varieties of rhyolite dominated the assemblage across the project area. Rhyolite in shades of purple was also common. Shades of gray appeared to have been the preferred colors for projectile points during all periods and especially during the Woodland period.

Argillite

Argillites are fine-grained sedimentary rocks (like mudstone and slate) metamorphosed to varying degrees. As a result, these stones are harder than their original sedimentary rock and thus suitable for limited stone knapping to produce tools. Unfortunately, argillites still maintain a degree of sedimentary platyness and have a tendency to flake in layers, making them somewhat difficult to work. Types of argillite include Black (originating in the Delaware River Valley of New Jersey and Pennsylvania), Maroon (originating from the Chicopee shales in western Massachusetts), Blue-Grey, Tan, Grey (all originating from either the Cambridge slates in the Boston basin or Barrington, Rhode Island), Green Platy (originating in Barrington, Rhode Island and also occurring in glacial drift deposits in the Taunton River Basin), Banded (originating in the Cambridge slates in the Boston basin) and Coarse grained green (Originating in Hull, Massachusetts). Argillites are common in glacial drift deposits in many locals in eastern Massachusetts and occur predominantly in the Late Archaic, although they were also used to a lesser degree in other time periods.

Field work recovered 51 argillite artifacts (flakes/ flake fragments, shatter, bifaces, points, unifaces, drills, hammerstone, sharpening stones, and hoes) from across the project area (Table 36).

Table 36. Argillite artifacts recovered

Color	**Artifact**	**L1**	**L2**	**L4H**	**L4S**	**L5H**	**L6H**	**L6S**	**L7SN**	**L8HN**	**Totals**
Green	Flake/ Flake Fragment		9		1		4				14
	Biface		1	1							2
	Point		2	1		1	1	1			6
	Uniface		3			1					4
	Drill		1		1						2
	Hammerstone		1								1
	Sharpening Stone				1						1
	Shatter		1			1					2
	Hoe								1	1	2
Gray-Dark Gray	Flake/ Flake Fragment				1	4					

Table 36. (continued)

Color	Artifact	L1	L2	L4H	L4S	L5H	L6H	L6S	L7SN	L8HN	Totals
	Shatter					1					1
Tan-Brown	Flake/ Flake Fragment		4								4
Ppl Gray	Flake/ Flake Fragment				1						1
	Preform		1								1
	Biface					1					1
Pnk-Mrn	Flake/ Flake Fragment		1								1
	Point	1			1		1				3
Totals		**1**	**24**	**2**	**6**	**9**	**6**	**1**	**1**	**1**	**50**

Testing recovered most of the argillite from the L2H impact area (which had large glacial pieces of unmodified argillite in the subsoil), and from L4S, L5H, and L6H. Recovered point forms consisted of Nevilles (L2H), Orient Fishtail (L4H), Wayland Notched (L6S), Greene (L6H), and Levanna (L1H). Heavy tools made of argillite were also recovered: a large sharpening stone and two hoes. Archaeologists recovered a variety of colors of argillite, with the most common being green and green gray. Argillite, used in the Middle Archaic to make projectile points and expedient tools such as unifaces and in the Late Woodland to make sharpening stones and hoes, had a more limited distribution than other lithic raw materials. Striking platform angles ranged from 40 to 60° with the most being in the 40-48° range (Table 37).

Table 37. Argillite flake striking platform angles

Location	Green	Tan-Brown	Gray
L2H	55°	40-55°	40°
L5H			40-45°
L6H	55-60°		

The striking platform angles indicate later stage reduction and finishing of artifacts versus initial reduction. Nine anomalies yielded argillite artifacts or debitage with medium size medium depth pits in L2H yielding most of it (Table 38).

Table 38. Argillite recovered from anomalies

Anomaly Type	Location	Anomaly	Green	Gray-Dark Gray	Tan-Brown
Large Deep Pit	L5H	N135 E186.5	1	1	
Large Medium Pit	L8HN	N64.5 E307.8	1		
Medium medium Pit	L2H	N267.7 E215.5	1		
	L2H	N268.2 E214.2	1		
	L2H	N268.85 E214.75			1

	L2H	N270.4 E215.1	1		
	L7SN	N74.5 E257.5	1		
Hearth Dump	L6S	N113 E253		1	
Large shallow basin	L4S	N146 E145.3	1		

Local Exotic Lithics
Attleboro Red Felsite
Attleboro Red Felsite is a poor to moderate grade light-colored siliceous volcanic rock commonly occurring in the Wamsutta Formation near Attleboro, Massachusetts (Strauss and Murray 1988:43). This lithic occurs in a variety of colors and textures, varying from red-purple to brown color and from a coarse and sandy to a homogeneous and fine-grained texture (Strauss and Murray 1988:43). This material was commonly used for projectile points and tools during the Middle Archaic period as evidenced at the Knoll C site in Attleboro, Massachusetts (Strauss and Murray 1988: 43).

Two Attleboro red felsite bifaces, one piece of shatter, five flakes and two flake fragments were recovered from the Lot 2 House impact area. These were found associated with projectile points temporally assignable to the Middle Archaic period. Testing recovered one projectile point tip and midsection and one flake from the Lot 4 Septic and Lot 6 Septic impact areas. A Middle Archaic association of this material is consistent with findings from the Knoll C site. The presence of shatter, flakes, flake fragments and an unfinished biface from L2H indicates that the Middle Archaic occupants of the site transported the raw material in the form of a quarry block or rough preform that was further reduced at the site.

Saugus Jasper
Data Recovery testing recovered 109 pieces of Saugus Jasper lithic refuse and tools from the south half of the project area and none from lots 1 or 2. The Lot 4 septic impact area to the Lot 6 house impact area were the focus of Saugus Jasper concentration with the majority (67.9% of the total) being recovered from L6H (Table 39). This area also had the widest range of debitage and

Table 39. Saugus Jasper recoveries by location

Artifact	L4H	L4S	L5H	L6H	L6S	L7HN	Totals
Flake/ Flake Fragment	2	12	8	74	4		100
Biface				1			1
Point					1		1
Uniface				1			1
Shatter		1		3			4
Core				1		1	2
Totals	2	13	8	80	5	1	109

tool types. Testing recovered 100 flakes and flake fragments, 40% of which retained their striking platforms. Measurement of the striking platform angle produced a project wide scatter point graph with two peaks **(Figure 7)**, one under 50° and the other over 50°. This pattern, interpreted as representing two stages of lithic reduction-primary (over 50°) and secondary (thinning) (50° and under), had an average platform angle of 52.9° with averages from the locations ranging from 45° to 66.3° (Table 40).

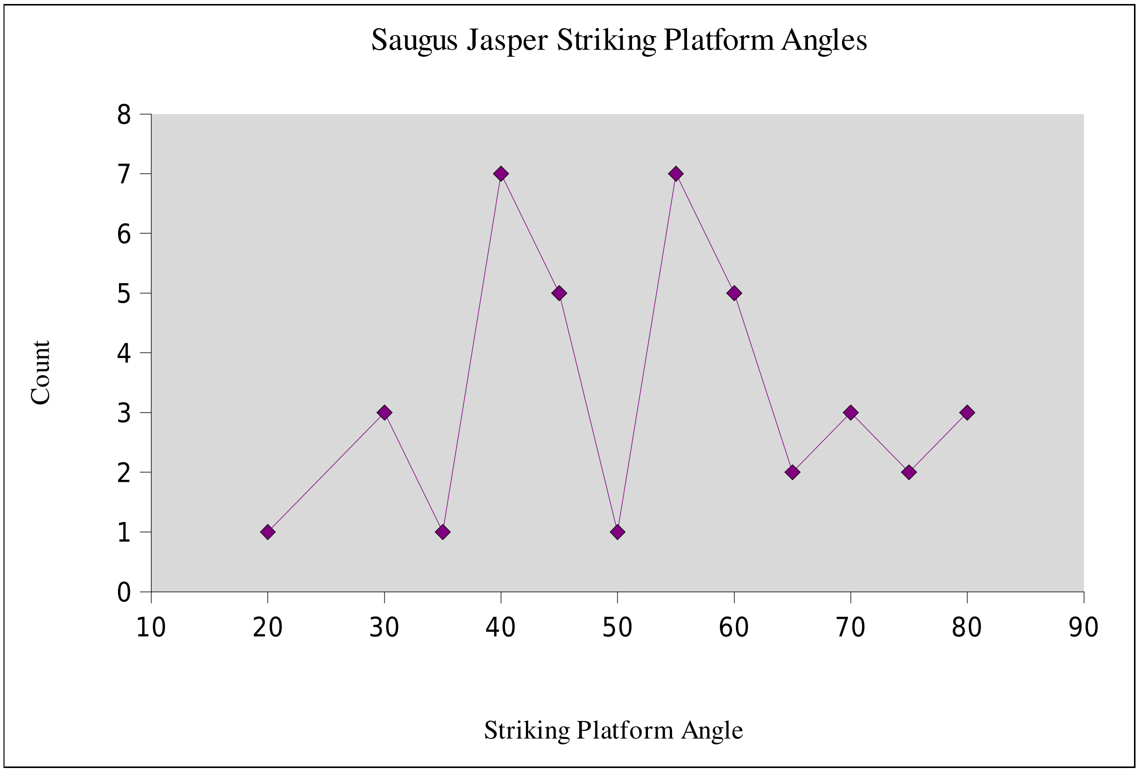

Figure 7. Saugus Jasper striking platform angles

The three locations that had the highest occurrences of Saugus Jasper debitage (L4S, L5H, and L6H) yielded slightly different average platform angles (Table 40). The platform angles from L4S and L5H were steeper on average than those from L6H possibly indicating more primary reduction from these locations and more of the complete reduction sequence represented in L6H.

Table 40. Saugus Jasper striking platform angles

Location	Platform angle range	Platform angle average
Lot 4H	45°	45°
Lot 4S	30-80°	55.8°
Lot 5H	40-80°	66.3°
Lot 6H	20-80°	50.7°
Lot 6S	40-60°	50°
Average	20-80°	52.9°

When the lengths to widths of the Saugus Jasper flakes were scatter plotted **(Figure 8)** two

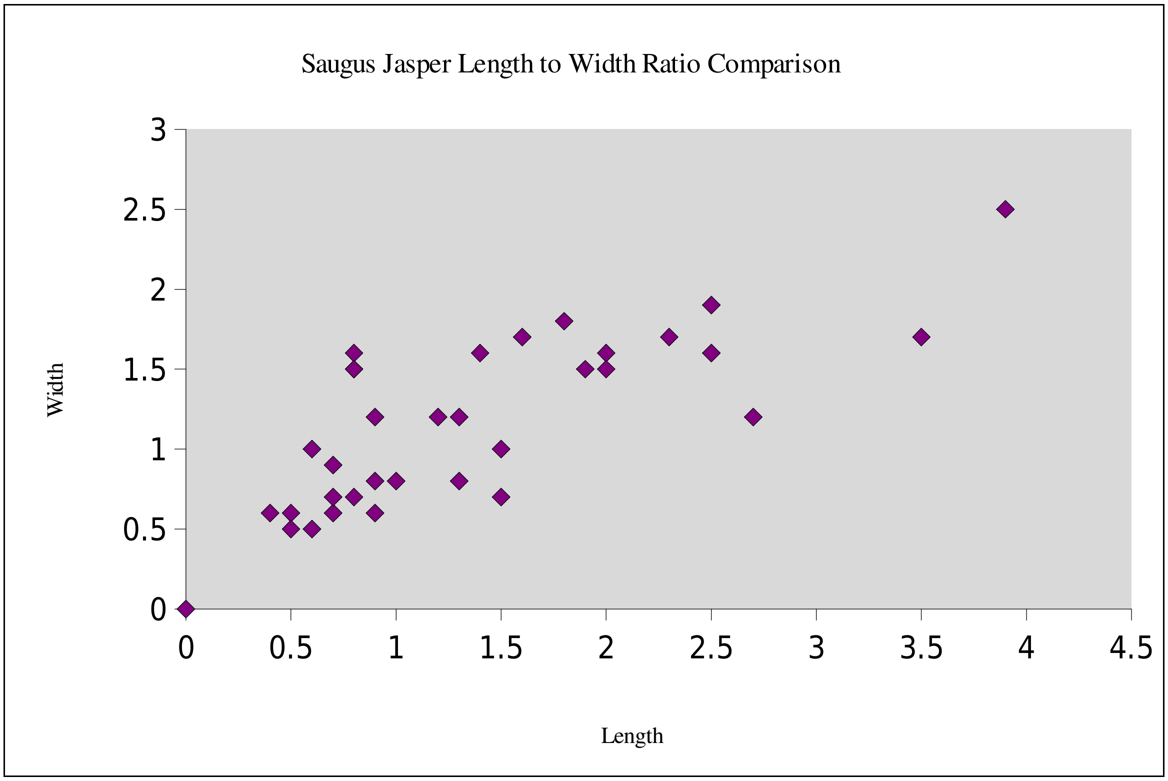

Figure 8. Comparison of Saugus Jasper flake lengths versus widths

concentrations were again present- flakes with shorter lengths and narrower widths (under 1.6 cm long and under 1.3 cm wide) and flakes with longer lengths and narrow to wide widths (1.5 cm and over long and 1.5 cm and over wide). These two distributions are more evidence of the to phases of reduction present at the site. This pattern was present for the flakes from L6H but not for the flakes from L4S and L5H. The flakes from these locations were generally wider and longer **(Figure 9)** (in the case of L4S) or wider and narrower **(Figure 9)** (in the case of L5H) than those from L6H **(Figure 9).** This supports the data from the striking platform angles that L4S and L5H were loci where primary reduction of Saugus Jasper occurred versus final finishing.

Testing recovered four pieces of shatter and two cores from L4S (1 shatter), L6H (3 shatter, 1 core) and L7HN (1 core). The presence of cores and shatter at L6H supports the proposition that the complete reduction sequence took place here. The shatter from L6H was smaller (.6, .8 and 2 cm wide) than the single piece from L4S is larger (4.2 cm). This may indicate that the pieces from L6H came from core reduction while the piece from L4S was a piece of quarried stone.

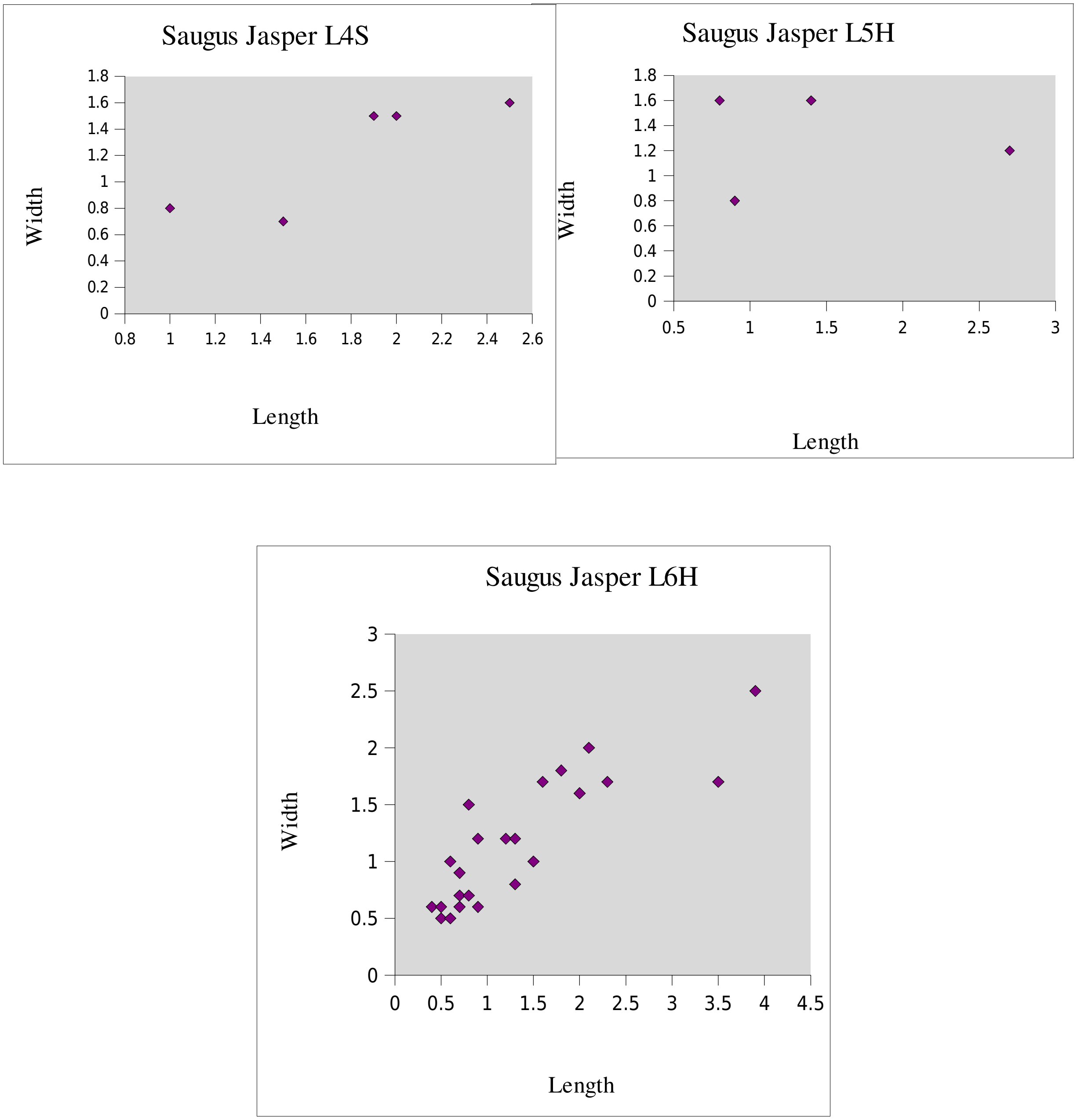

Figure 9. Comparison of flake length to width ratios from L4S, L5H and L6H

One flake from L5H and two flakes from L6H bore weathered cortex on their surfaces, further evidence of primary reduction in these locations, possibly from cobble cores.

Excavations recovered a limited number of tools fashioned from Saugus Jasper including one utilized flake and one biface fragment from L6H and one Wayland Notched projectile point from L6S. The Wayland Notched point has an impact/ bending fracture at its tip and shows signs of in-haft resharpening.

Testing recovered 76 of the 106 pieces of Saugus Jasper from anomaly contexts (Table 41)

Table 41. Saugus Jasper anomaly recoveries

Anomaly Type	Location	Anomaly	Count
Large size medium depth pit	L4H	N147.8 E147.4	1 shatter, 1 flake
Lithic Concentration	L4S	N144 E147	1 flake fragment
Medium size medium depth pit	L6H	N100.6 E237.2	1 shatter
Medium size deep pit	L6H	N103.6 E238.75	1 flake, 3 flake fragments
Large size deep depth pit	L6H	N103.8 E244	6 flakes, 21 flake fragments, 1 shatter
Large size deep depth pit	L6H	N104 E241.6	1 flake, 4 flake fragments
Large size deep depth pit	L6H	N103.8 E244	1 flake
Large size deep depth pit	L6H	N104.5 E243	1 biface, 8 flakes, 22 flake fragments, 1 shatter
Natural with Cultural	L6H	N108.3 E241.6	1 flake
Hearth Dump	L6S	N113 E253	1 Wayland Notched Point

with most being recovered from L6H and most from deep pit features, interpreted as storage pits with secondary use as refuse disposal locations. Archaeologists recovered the remaining 30 pieces of Saugus Jasper during plowzone sampling. The co-occurrence of Saugus Jasper between similar anomalies, especially in L6H indicates a likely concurrent use of these anomalies, meaning they all represent one occupation at the site.

Far Exotic Lithics

New York State Cherts

Cherts recovered from sites in New England arrived in the area through trade with Native people from New York state. New York State cherts include green (Normanskill, Stuyvesant Falls, Mt. Merino, Austin Glen, Deepkill, gray (Western Onondaga, Little Falls, Mt. Merino, Ticonderoga), brown and red (Indian River east of the Hudson River and north of the Hudson Valley), and black (Heldeberg, Glen Erie, Oriskany, Eastern Onondaga [along north and eastern escarpment of Allegheny Plateau]) (Hammer 1976: 54). Minor varieties include tan, which in the western Onondaga is a tan to khaki through light gray to milky light blue, in the Central Onondaga is cloudy dark to brownish blue, and in the eastern Onondaga formation is a dark brownish blue to blueish black to black with a general continuum of lighter blues and tans in the west to dark muddy blues and blacks in the east, and the red to red-brown (Hammer 1976:47). The red to red-brown is very similar in color to what is commonly referred to as "Pennsylvania Jasper" and occurs in substantial outcrops of in Washington and Duchess Counties (Hammer 1976: 54). This New York State red to red-brown chert may actually be the source of the "Pennsylvania Jasper" identified from New England sites.

Testing recovered four gross color varieties of chert: gray to black, green, tan, and white. Gray to black was the most common variety encountered with pieces being recovered from all lots with a higher concentration in lots 4 to 6 (Table 42).

Table 42. Chert color occurrence by lot

Color	Lot 1	Lot 2	Lot 4	Lot 5	Lot 6	Lot 7	Lot 8
Gray to Black	3	1	37	24	23	2	2
Green	3	2	13	7	3	0	0
Tan	0	1	0	2	5	0	0
White	0	0	1	3	0	1	1
Totals	**6**	**4**	**51**	**36**	**31**	**3**	**3**

Testing found chert tools and debitage concentrated in lots 4, 5 and 6 with much lower occurrences, amounting to a very minor percentage of the total lithic count, in the remaining lots. Gray to black and green colored chert occurred more often in Lot 4 than in any other lot, while testing found tan and white chert concentrated in lots 5 and 6 respectively. The septic impact area in Lot 4 contained most (n=30) of the gray to black and green colored chert from this lot. In Lot 6, most of the gray to black and green chert came from the house impact area (n=21). Archaeologists recovered gray to black chert from the Lot 7 and 8 house and new house impact areas. The disproportional distribution of chert debitage across the site differential use and disposal during different occupations. Gray to black and green colored chert co-occur in the same locations, indicating a high likelihood of contemporaneous use of these colored chert.

The dominant chert artifact type for all chert colors is flakes and flake fragments (Table 43).

Table 43. Chert artifact class distribution by location and color

Color	Artifact	L1	L2	L4H	L4S	L5	L6H	L6S	L7	L8	Totals
Gray to Black	Flake/ Flake Fragment	2		4	29	22	18		2	2	**79**
	Biface	1		2		2					**5**
	Point		1	1	1		2	1			**6**
	Uniface						1	1			**2**
Green	Flake/ Flake Fragment	3	1	2	11	5	2				**24**
	Point		1			1	1				**3**
	Uniface					1					**1**
Tan	Flake/ Flake Fragment		1			1	5				**7**
	Point					1					**1**
White	Flake/ Flake Fragment				1	3					**4**
	Point									1	**1**
	Shatter								1		**1**
Totals		**6**	**4**	**9**	**42**	**36**	**29**	**2**	**3**	**3**	**134**

Archaeologists recovered 115 chert flakes and flake fragments, 60 of which retained measurable platform angles with 42 of these 60 being complete flakes with measurable lengths and widths. Plotting of the lengths and widths of these 42 pieces (**Figure 10**) indicates the occurrence of small flakes under

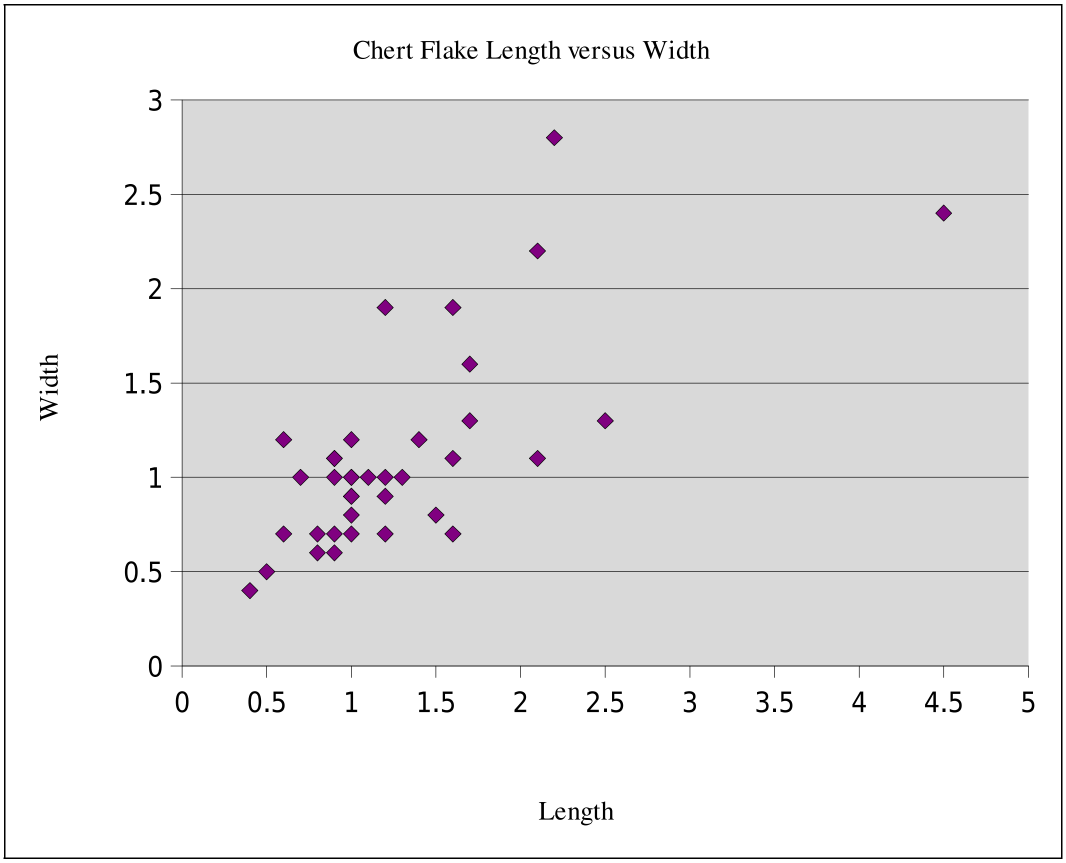

Figure 10. Comparison of Chert flake lengths versus widths

1.25 cm in width and 1.5 cm in length. Platform angles clustered in the 35 to 55° range (**Figure 11**, Table 44), indicating secondary and tertiary thinning of bifaces that had been previously worked

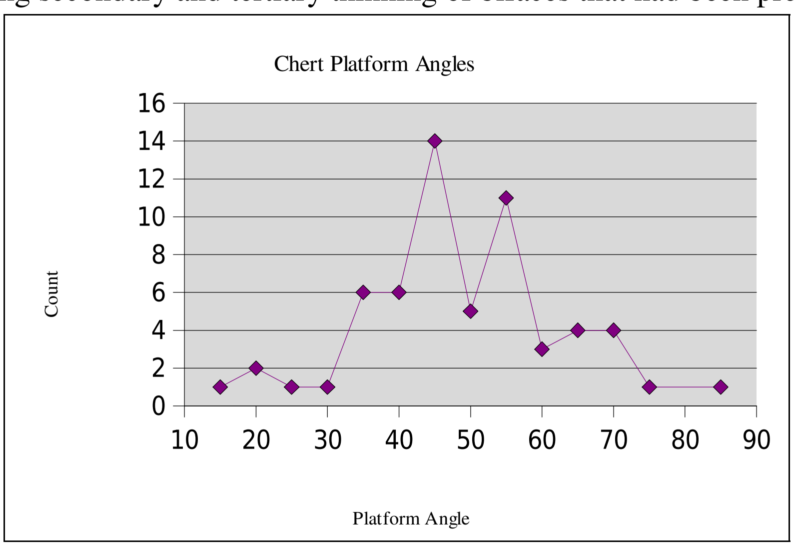

Figure 11. Chert striking platform angles

Table 44. Chert striking platform angles

Color	Gray to Black Range/ Average	Green Range/ Average	Tan Range/ Average	White Range/ Average
Lot 1H	85°/ 85°	55°/ 55°		
Lot 1S	40°/ 40°			
Lot 2H		65°/ 65°	55°/ 55°	
Lot 4H	35-55°/ 48.3°	25-45°/ 35°		
Lot 4S	15-75°/ 48.8°	35-55°/ 46°	45°/ 45°	70°/ 70°
Lot 5H	45-65°/ 55°	20-55°/ 38°		
Lot 6H	40-70°/ 48.75°		20-70°/ 45°	
Lot 6S				
Lot 7H	40°/ 40°			
Lot 7HN	55°/ 40°			
Lot 8H	45°/ 40°			
Lot 8HN	45°/ 40°			

through the first stages of reduction and resharpening of dulled bifaces and projectile points. The data on the length to width ratios and the platform angles show that the bifaces and projectile points arrived at the site in a previously reduced form, supporting their association with transitory versus semi-permanent or permanent occupation and use of the site. Table 44 shows the range of platform angles by color for each location where testing recovered chert. Individual location averages mirror the overall chert averages and compliment each other indicating the same or similar processes resulted in the removal of chert flakes in all the locations.

Testing recovered 30 pieces of chert from anomaly contexts (Table 45). Twenty (66.7%) were in the gray to black range. The rest were green (20%), tan (10%), and only one white. Four types of

Table 45. Chert recovered from anomaly contexts

Anomaly Type	Location	Anomaly	Gray to Black	Green	White	Tan
Large Deep Pit	L6H	N103.8 E244	3			1
	L6H	N104 E241.6	2			1
	L6H	N104.5 E243	4	1		1
	L6H	N108.8 E235.7	1			
Medium medium Pit	L2H	N268.2 E214.2		1		
	L4H	N150.25 E125.85	1			
	L4S	N147.55 E140.4	1			
	L4S	N148 E146.4	1			
	L4S	N148.3 E141.25		1		
	L4S	N149.1 E144.7	1			

Table 45. (Cont.)

Anomaly Type	Location	Anomaly	Gray to Black	Green	White	Tan
	L6H	N100.6 E237.2		1		
	L6H	N103.7 E237	1			
	L5H	N130.7 E178.7	1			
	L6S	N113.75 E250.8		1		
	L7SN	N70 E255			1	
Medium shallow basin	L7HN	N66.5 E257.5	1			
Natural	L1H	N311.3 E169.5	1			
	L4H	N141.75 E129.75	1			
	L6H	N102.5 E235		1		
	L6H	N108.3 E241.6	1			
Totals			**20**	**6**	**1**	**3**

anomalies were found to contain chert debitage- one medium-sized shallow basin in L7HN;eleven medium-sized medium depth (cache) pits in L2H, L4H, L4S (n=4), L5H, L6H (n=2), L6S, and L7SN; four large-sized deep (storage) pits in L6H; and four natural anomalies that saw refuse deposition in L1H, L4H, and L6H (n=2). Testing recovered tan-colored debitage from the large deep pit and white colored debitage in one medium-sized medium depth pit.

Green colored debitage was more often recovered in medium-sized medium depth pits with occurrences in 36.4% of this type of anomaly versus a 25% occurrence in large deep pits. Excavation found gray to black colored chert more often in the large deep pits, accounting for 33.3% of the overall total, versus a 20% occurrence in the medium-sized medium depth pits. The differences in the occurrences of gray to black versus green chert have resulted from either differential use of the materials or as a result of the origins of the fill in the two types of pits. Tools manufactured from green chert consisted of two Levanna points, one Wayland Notched point, and one uniface, while those made of gray to black chert consisted of unfinished bifaces, unifaces, Middle Woodland period Greene points, a bifurcate base point, two possible Wayland Notched point midsections to tips and one possible Levanna point fragment. Gray to black chert was obviously more common and used for a wider variety of tools, possibly due to its prevalence

Chert tools consisted of unifaces, bifaces, and projectile points. Testing recovered three unifaces, one each from L5H, L6H and L6S. The L5H and L6S unifaces were utilized-flakes that retained their striking platforms. They measured 1.7 and 2.1 cm long from dark gray and green brown cherts respectively and came from the plowzone in both cases. The L6H uniface was a thumbnail scraper manufactured from gray chert. The presence of unifaces indicates that the occupants of the site engaged in activities other than just projectile point manufacture and lithic tool maintenance Unifaces were probably used to reduce wood or bone through sharpening, shaving or scraping, for collecting and processing floral and faunal resources ,and for preparing hides. Use wear studies were not conducted but do represent an area of future research for this collection.

Testing recovered five bifaces from L1H, L4H (n=2), L5H, and L8H with all but one of the l4H bifaces being recovered from plowzone contexts. Archaeologists recovered the remaining biface from anomaly N141.75 E129.75 in L4H, a natural depression used as a convenient location to dispose of refuse. This biface was oval in shape and measured 3.8 cm long, being manufactured from dark gray chert. The L1H and L5H bifaces were fragmentary, possibly having broken during manufacture or reduction (both gray chert) while the L8H biface was a biface tip and midsection of white chert possibly having been broken in production. The remaining L4H biface began its use life as the tip of a dark gray chert lenticular projectile point. The point broke during manufacture and the tip distal end of the broken tip resharpened into a 2.2 cm long steep-edged scraper. Native people used steep-edged scrapers to work hide, wood or bone.

Projectile points consisted of bifurcate, Wayland Notched, Greene, and Levanna projectile points and three projectile point fragments. The small bifurcate base point base from L6H anomaly N104.5 E243, a large deep pit interpreted as a Late Woodland storage pit. Manufactured from dark gray chert, it broke during use, as evident by the bending fracture present on it. This break was found to run laterally across the point from edge to edge at a point just above the stem, indicating an in-haft break. The fragment was .9 cm high and base was 1.4 cm wide. The Wayland Notched point was found during the source of surface scraping following machine stripping of the L4H impact area. It was complete and made of light green gray chert. The total length of the point was 4.4 cm and it did not bear and evidence of use wear or hafting evidence. Plowzone sampling resulted in the recovery of two Middle Woodland Greene point bases made of dark brown gray (L4S) and black (L6H) chert. Both appear to have broken during sharpening or reduction as they both bear perverse fracture, which are characteristic of breaking during the twisting motion of pressure flaking. The L4S base was 2.4 cm wide while the other was 3.1 cm wide. Excavation of anomalies in L2H and L6S resulted in the recovery of two Levanna points, both manufactured of green gray chert. Excavation identified both anomalies, L2H anomaly (N268.2 E214.2) and L6S anomaly (N113.75 E250.8), medium-sized medium depth pits. The L2H point bore an impact/ bending fracture two-thirds along the length up the blade from the base, while the other Levanna was complete with no evidence of use or hafting. Both bore equally proportioned ears and moderately deep basal concavities. The L2H point was 3.2 cm wide while the L6S point was 2.3 cm wide. The remaining projectile point fragments consisted of a black chert broad bladed point tip and midsection from the L2H plow zone, a tan chert edge fragment and a gray brown broad point tip and midsection from L5H plow zone and a triangular (possible Levanna) point tip fragment of mottled light and dark gray chert from the L6H plow zone. The point tips and midsections are similar in dimensions and proportions to the complete Wayland Notched point from L4H, possibly indicating that they too were from Wayland Notched points. They both also bear perverse fractures indicative of manufacturing breakage.

Chert from the Muttock-Pauwating site showed a Transitional Archaic, Middle and Late Woodland occupation and possibly Early Archaic association. The varieties are consistent with those found in New York State, indicating potential trade between New England and New York in the Transitional, Middle and Late Woodland periods. Chert arrived at the site in a semi-finished form as either roughed blanks or more commonly as preforms and finished projectile points. Testing recovered smaller finishing flakes with steeper striking platform angles indicative of primary reduction at another location.

Pennsylvania Jasper

Data Recovery testing recovered 26 artifacts and debitage of Pennsylvania Jasper across the project area (Table 46). This lithic material centered around the lot 4 house and septic

Table 46. Pennsylvania Jasper occurrences

Artifact	L1S	L4H	L4S	L5H	L6H	L8HN	Totals
Flake/ Flake Fragment	1	3	12	6	1	1	**24**
Biface-Roughly-shaped			1				**1**
Point-Greene		1					**1**
Totals	**1**	**4**	**13**	**6**	**1**	**1**	**26**

impact areas to the lot 5 house impact area. Testing recovered one Middle Woodland Greene style projectile point and one roughly-shaped biface from Lot 4. Most of the debitage took the form of flakes (n=8) and flake fragments (n=15). Only eight Pennsylvania Jasper flakes were complete with lengths and widths both preserved enough to allow for a comparison of the ratios of length to width **(Figure 12).** A scatter plot of these lengths compared to widths showed a higher occurrence long, narrow flakes, longer flakes with most (n=5) being one centimeter or less in width. Flakes of this type are reflective of later stage biface reduction where the goal is to reduce the thickness of the biface by striking off flakes that travel as far from the edge to the center of the biface as possible.

Eleven of the flakes and flake fragments bore striking platforms with measurable angles that ranged from 35° to 65° with the average being 45°. Lot 4S impact area yielded the highest concentration of flakes and flake fragments with measurable platforms (n=8) with the average angle being 43.8°. The higher occurrence of steep striking platform angles indicates a later stage of reduction for this lithic (**Figure 13**).

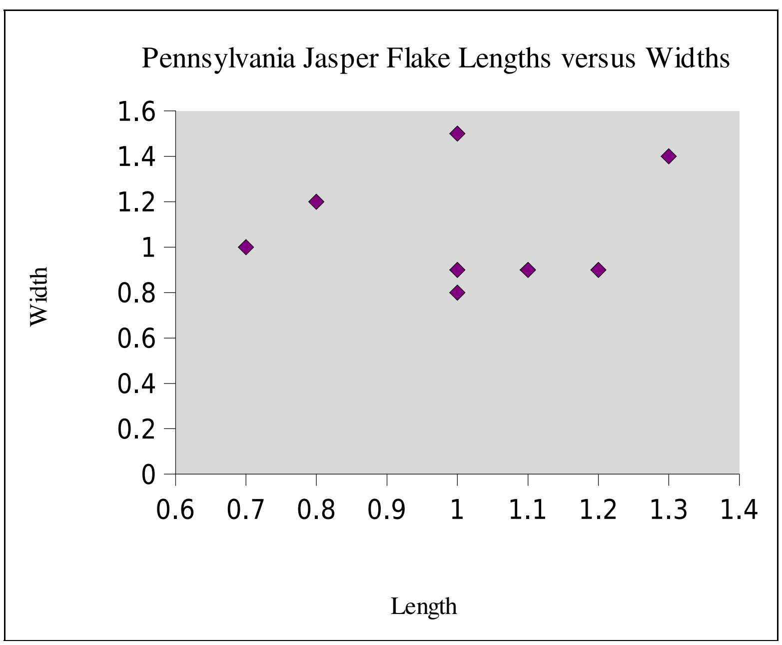

Figure 12. Comparison of Pennsylvania Jasper flake lengths versus widths

Anomaly excavation recovered three flakes or flake fragments, one each, from L5H (N129 E181.7), L6H (N103.7 E237), and L8HN (N65.1 E307.5) all medium-sized medium depth pits. Testing recovered one flake from a lithic concentration in L4S in square N144 E148. The Pennsylvania Jasper appears associated with Middle Woodland occupation of the site associated with the Greene projectile

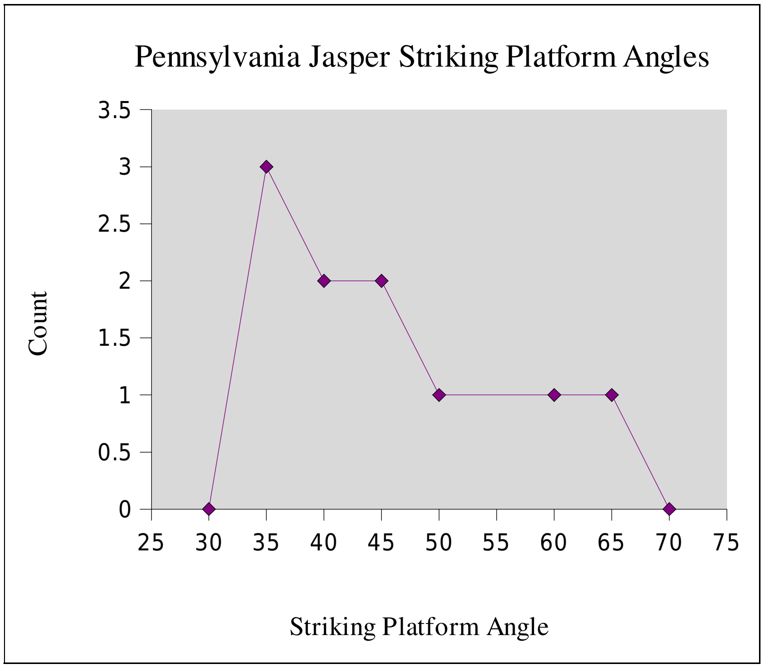

Figure 13. Pennsylvania jasper striking platform angles

point base recovered from L4H. This point base bore a bending or impact fracture that was the result of breakage during use as a projectile point.

Pennsylvania Jasper, like the other exotics from the site, arrived at the site in the form of semi-finished bifaces, such as the one recovered from L4S, subsequently reduced further into projectile points such as the Greene point recovered from L4H. Testing found debitage concentrated between lots 4 and 5, coinciding with the Greene projectile points.