APPENDIX F:

THERMALLY ALTERED STONE REFIT STUDY

Thermally Altered Stone Refitting Study

Introduction

The re-assembly of archaeological remains, including fauna, ceramics, chipped stone, and thermally altered stone, has led to a more refined understanding of prehistoric technology and site formation (e.g., Cziesla et al. 1990; Hofman and Enloe 1992). Archaeologists working in the Middle Atlantic region have used artifact refitting at various sites to assess site and feature formation processes (Custer and Watson 1985; Carr 1986; Petraglia 1994; Petraglia and Knepper 2001; Petraglia et al. 2002; Lee Decker et al. 2002). Refitting has also proven valuable for interpreting the integrity of stratigraphic deposits and for determining the degree to which archaeological patterns may be the result of either natural or cultural processes, highlighting spatial clustering within deposits that might not otherwise be obvious in the raw data.

Research Goals and Objectives

Thermally altered stone is increasingly recognized as an important source of archaeological information. Quantification and systematic characterization of this artifact type has provided evidence of use in various activities (Cavallo 1987; Pagoulatas 1992; Latas 1992; Petraglia et al. 1998, 2002). The current refitting study was undertaken to explore some of these characteristics at the Frederick Lodge Site Complex. Data resulting from refits across horizontal and vertical proveniences was used to address questions pertaining to spatial and functional relationships between features, and to feature function and use life.

Thermally altered stone features were encountered in the western portion of the site, in Blocks A, B, and D. The features in two of the blocks, B and D, were the focus of this study. Two types of feature were encountered in this area, distinguished by the relative amount of spatial concentration they exhibited. The features in Block D, Features 30 and 60, were recorded as small, relatively discrete clusters of stone (Figure F-1). In Block B, an elongated scatter of thermally altered stone, Feature 49, extended across half of the excavation area. Feature 56 was a small cluster identified within Feature 49, while Features 2 and 31 were clusters located adjacent to the scatter (Figure F-2).

Three main research goals were developed for the refitting study: 1) assessing temporal association between features; 2) assessing feature function; and 3) assessing formation processes.

Temporal Association

The refitting of thermally altered stone feature elements is seen as an important tool for assessing the potential contemporaneity of individual features on an archaeological site and as such, can help to refine the chronology of site occupation. Information of this form can be of particular utility in cases such as the Frederick Lodge site, in which deposits were present that appeared largely intact but that often lacked conclusive temporal data.

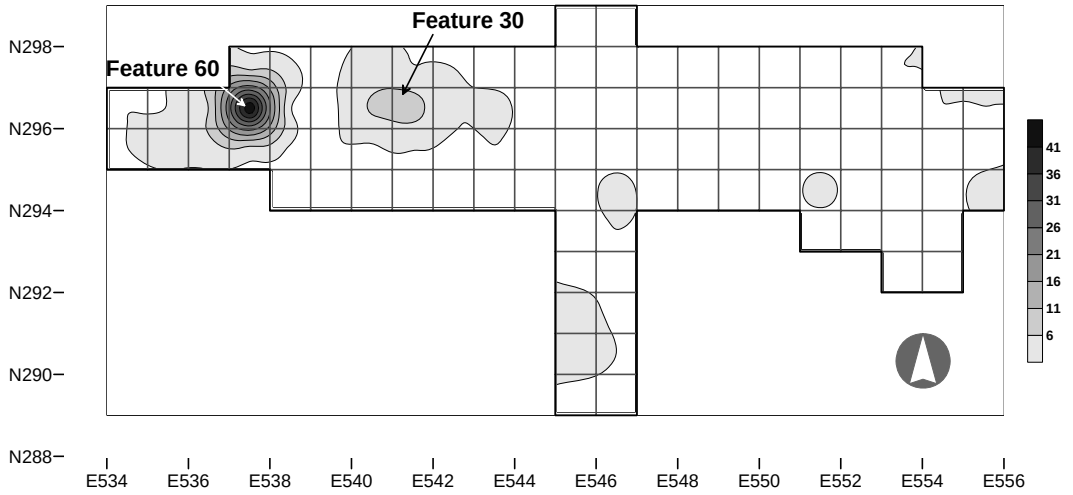

Figure F-1. Location of Feature 30 and Feature 60 in Block D.

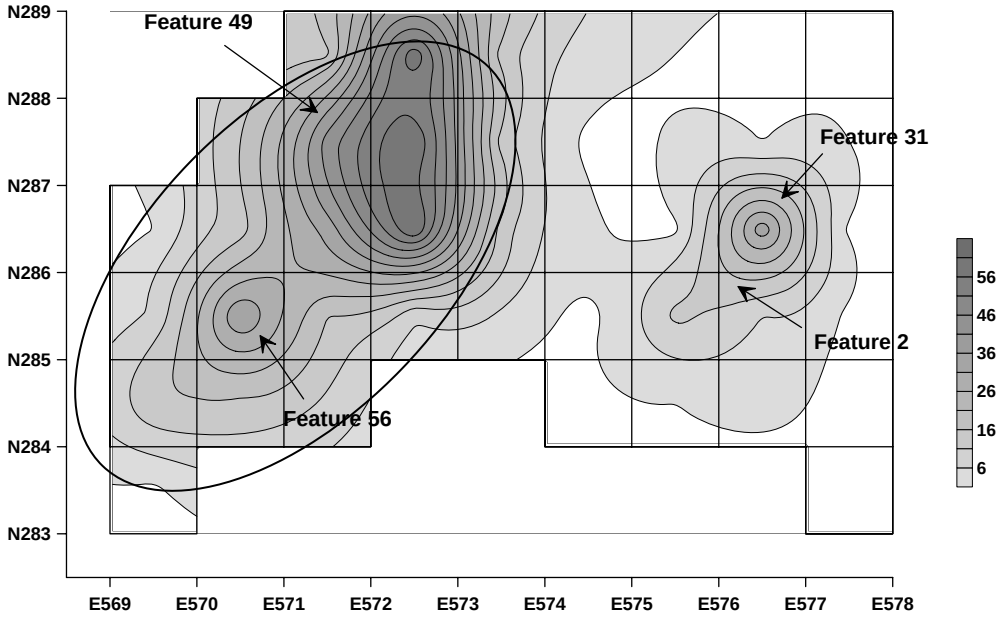

Figure F-2. Location of Features 2, 31, 49 and 56 in Block B.

Feature Function

A second objective of the refitting study was to assess thermally altered stone feature function and use life. Specifically, the study sought to determine whether the concentrations of thermally altered stone represented 1) primary hearth locations, as would be evidenced by refits within feature boundaries; 2) part of a disposal or discard area, evidenced by few or widely scattered refits; or 3) unrelated, redeposited artifacts that had been scattered and mixed extensively by post-depositional factors, as would be evidenced by a general absence of refits. In terms of use life, a goal of the study was to gauge whether the features functioned as individual, short-term heating or cooking facilities, or, alternatively, whether they were part of an integrated system, possibly associated with a formal, communally organized activity.

Feature/Site Formation and Preservation

The study also sought to assess the role of post-depositional forces on thermally altered stone features at the site. Specifically, results of the study were seen as potentially useful in measuring the structural integrity of the thermally altered stone features. By implication, the data might then be used to assess overall stratigraphic integrity by providing a quantitative measure of vertical and horizontal mobility of artifacts within the sediments.

Methods

Comprehensive refitting was employed for artifacts related to four features in Block B (Features 2, 31, 49 and 56) and two features in Block D (Features 30 and 60). These two data sets, both part of the Early/Middle Woodland component at the site, represented the majority of the thermally altered stone features recorded in the excavations.

In this appendix and throughout the report, the term *thermally altered stone* is employed rather than the more commonly used term *fire-cracked rock*. Thermally altered stone is considered a more inclusive expression, as it implies the inclusion of all stone that appears to be altered due to heating (reddened or blackened, crazed, or pot-lidded), rather than only those items that were fractured. The term thermally altered stone does not include items that were heat treated as part of lithic reduction practices.

During the initial processing and inventorying of artifacts from the site, a number of refits were found, generally from the same vertical or horizontal provenience. These initial refits were marked along mended edges, and in instances where refits were found in different proveniences, notes were made indicating the bag number of the conjoined artifacts. Prior to the formal study, artifacts were labeled with bag numbers in order to maintain provenience information. Artifact bags were then laid out in respective provenience order so that the spatial juxtapositions of potentially conjoinable pieces could be observed. The artifacts were sorted by unit, stratum, and level, and artifacts of similar type and material were examined. Grouping of the stone by material type in this manner proved successful as a first step in locating refit groups. Spatially, refitting focused on the features and materials recovered from units within two meters of feature boundaries (Table F-1).

Not all artifacts were piece-plotted in the field. The finest level of precision for discussion of the refit data thus consists of the general excavation proveniences at the site: horizontally, a one-meter unit, and vertically, a 10-cm level. Artifact proveniences in the figures that accompany the following text are illustrated by point notation within unit and level proveniences, but the points do not depict exact positions—they have been scattered within their provenience locations for graphical clarity.

Table F-1. Refit Study Proveniences.

	Surrounding Units		
Block B	**northing range**	**easting range**	**total area**
Feature 2	N284-286	E574-576	9 m^2
Features 31	N285-287	E575-577	9 m^2
Features 49, 56	N284-286	E569-571	9 m^2

Block D			
Feature 30	N295-297	E540-541	6 m^2
Features 60	N295-297	E536-538	8 m^2

Findings

Block D: Feature 30 and Feature 60

Feature 30 and Feature 60 were located in the western half of Block D (Figure F-1). Feature 30 was recorded as a small, circular cluster of stone containing 17 individual fragments (Table F-2) and measuring 40 cm in diameter. Feature 60 was significantly larger, comprised of 32 individual fragments grouped in a somewhat irregularly shaped cluster which measured 90 cm in greatest dimension. The center points of Feature 30 and Feature 60 fell approximately 3.5 m apart, with 3 m separating the edges of the clusters. Both features rested on a plane approximately 5 cm below the plow line. Relatively little plow disruption of the features was evident based on field observations and initial spatial analysis.

Table F-2. Refit Frequencies Among Feature and Non-Feature Thermally Altered Stone in Block D.

	artifact total	refits	refit frequency
Feature 30	17	6	35%
Feature 60	32	22	69%
non-feature	241	28	12%
total	290	57	20%

Refit Data

A substantial number of refits were discovered within Block D: 57 of 290 fragments, or 20 percent of the total of thermally altered stone fragments in the excavation block (Figure F-3). The refits occurred as three types: directly between Feature 30 and Feature 60; between Feature 60 and non-feature stone in the surrounding units; and between sets of non-feature stone. Refits did not occur between Feature 30 and non-feature proveniences in surrounding units. Refit frequencies for the individual features are summarized in Table F-2. A total of 18 refit groups were recorded in the study, ranging in size from two-piece groups to multi-fragment groups: 6 groups of 2 fragments; 7 groups of 3 fragments; 2 groups of 4 fragments; 2 groups of 5 fragments; and 1 group of 6 fragments. Descriptions and illustrations of the individual groups are included in Attachment A, at the end of this appendix.

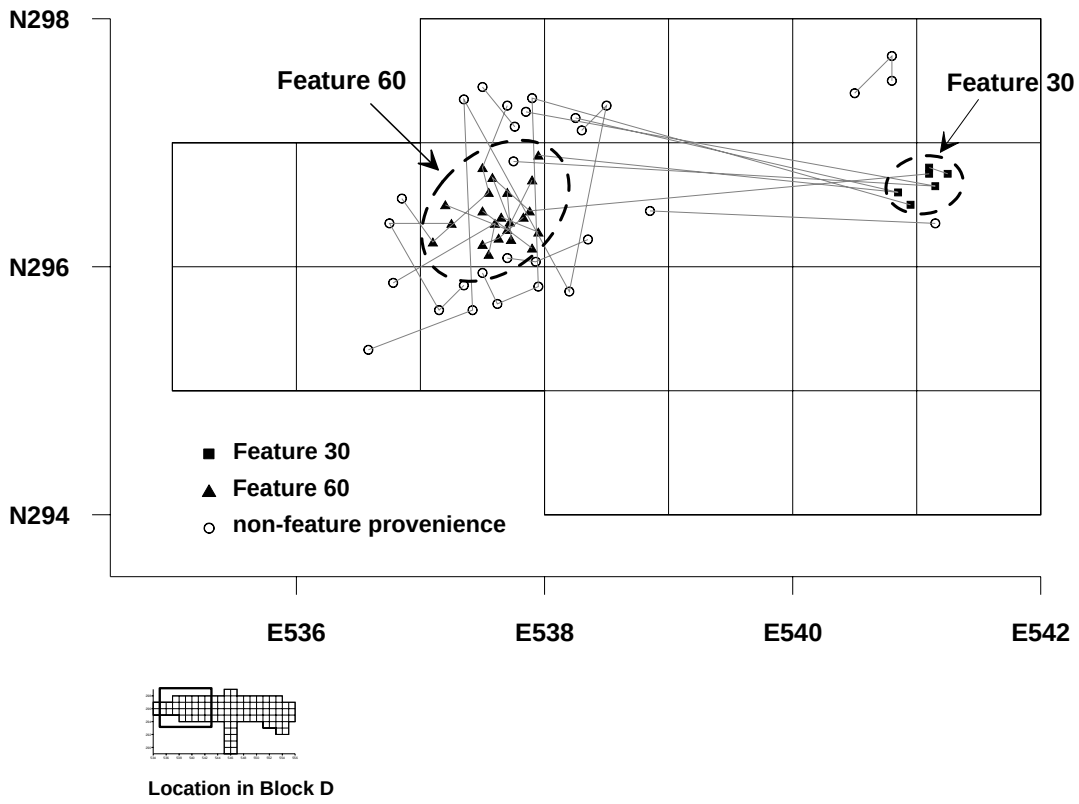

Figure F-3. Thermally Altered Stone Refits Between Feature 30, Feature 60, and Fragments Not Provenienced in Features, Block D.

In the field, Feature 60 was recorded as an irregularly shaped, or sub-round concentration of stone (Figure F-4). Almost 70 percent of the fragments within the boundaries of the feature refitted, demonstrating the concentrated nature of the cluster. Yet in addition, 8 fragments from outside the feature bounds refit to fragments in the feature, suggesting that the distribution was more diffuse than first recorded. Feature 60 may thus be characterized as a small, but broad-area deposit with a central concentration, rather than a distinct cluster. No refits were documented between Feature 30 and stones outside its defined boundaries, suggesting that the discrete configuration recorded in the field accurately represented the feature (Figure F-5).

Thermally Altered Stone Attributes

Considerable differences were noted in the attributes of the stone fragments between the two features, particularly in terms of fragment size. Table F-3 summarizes the stone from each feature by frequency, material type, and weight.

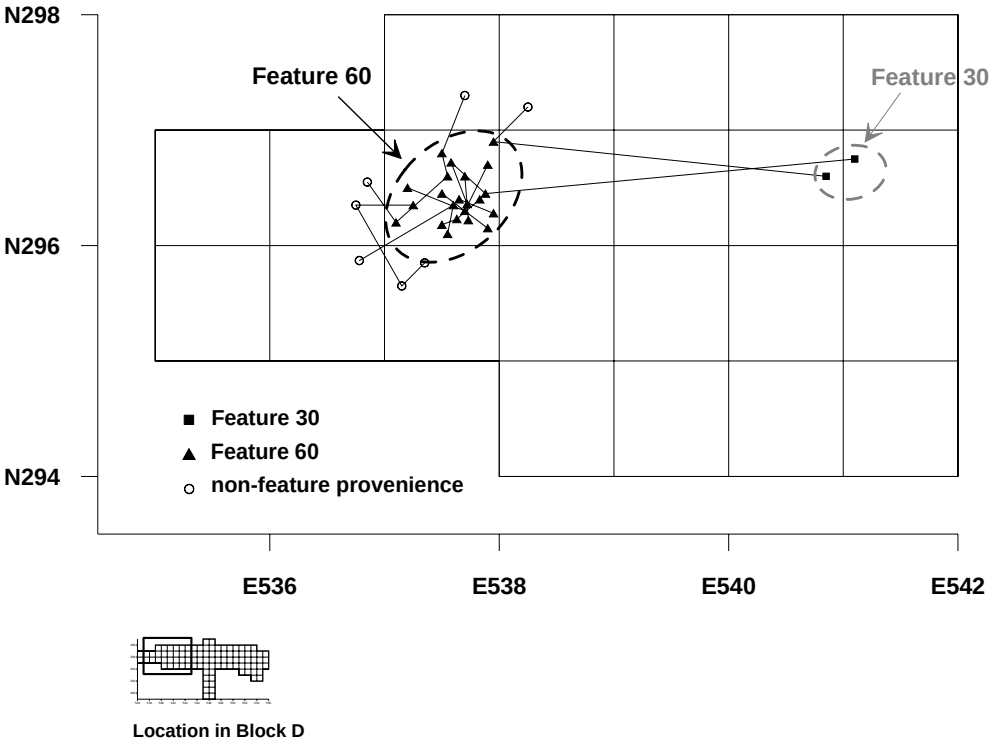

Figure F-4. Feature 60 Refits.

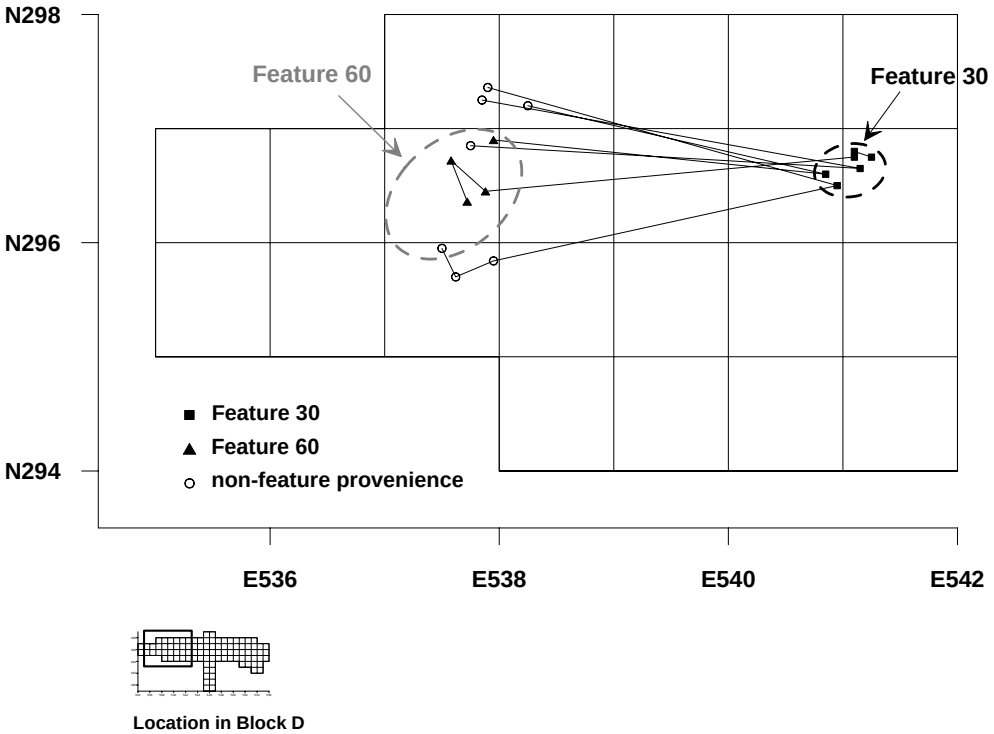

Figure F-5. Feature 30 Refits.

Table F-3. Thermally Altered Stone Attributes, Block D.

	material	count	total weight	mean weight	median weight
Feature 30	quartzite	14	2,092.4 g	149.5 g	156.4 g
	quartz	1	19.6 g	n/a	n/a
	sandstone	2	299.1 g	149.6 g	149.6 g
Feature 60	quartzite	25	2,127.3 g	85.1 g	45.4 g
	quartz	7	356.7 g	51.0 g	41.9 g

Quartzite dominated the thermally altered stone fragments in Block D, as it did in all the features identified at the site. Quartz represented a small minority, in terms of count and weight, in both features. Feature 30 also contained fragments of sandstone, a material not identified in Feature 60. The individual quartzite fragments were smallest in Feature 60, as indicated by mean fragment weights: 85.1 g, in Feature 60; and 149.5 g, in Feature 30. Median fragment weight was higher than mean weight in Feature 30, indicating that the distribution was skewed toward larger fragments, while the opposite was true for Feature 60. The finding emphasized differences in the relative sizes of the quartzite fragments in the two features. Overall, the large fragment sizes and the tight configuration of Feature 30 suggested that it was a single deposit, possibly a primary feature location. The more widespread distribution and smaller fragment sizes associated with Feature 60 suggested that it represented multiple deposits of heavily used stone, such as a discard area. The number and form of refits between the two features indicated that they were contemporaneous and likely shared a functional association.

Block B: Features 2, 31, 56, and 49

Feature 2 was located in the eastern half of Block B (Figure F-2). The feature consisted of a discrete cluster of 11 thermally altered stones (Table F-4) covering an area roughly 40 cm in diameter. Feature 31, also in the eastern half of the block, was recorded as a circular cluster of 21 thermally altered stones that similarly measured 40 cm in diameter. Feature 49 consisted of a diffuse scatter of stones that covered much of the western half of Block B. The scatter exhibited a roughly elliptical configuration, with the long axis oriented southwest-to-northeast and measuring 600 cm, the short axis measuring 360 cm. Feature 56 consisted of 15 thermally altered stones recorded in a tight cluster, roughly circular in shape, and measuring approximately 25 cm in diameter. Feature 56 was fully contained within Feature 49.

Table F-4. Refit Frequencies Among Feature and Non-Feature Thermally Altered Stone in Block B.

	artifact total	refits	refit freq
Feature 2	11	6	55%
Feature 31	22	8	36%
Feature 49	156	50	32%
Feature 56	13	5	38%
non-feature	663	46	7%
total	865	115	13%

Refit Data

In total, 115 refits were discovered within Block B, or 13 percent of the total of 865 thermally altered stone fragments in the excavation block (Figure F-6). The refits consisted of fragments directly within and between features, fragments between features and non-feature proveniences, and fragments between sets of non-feature stone. Refit frequencies for the individual features are summarized in Table F-4. Feature 2 displayed the highest refit percentage, with over 50 percent of the fragments refitted. A total of 44 refit groups were recorded in the study, ranging in size from two-piece groups to multi-fragment groups: 29 groups of 2 fragments; 8 groups of 3 fragments; 4 groups of 4 fragments; 1 group of 5 fragments; and 2 groups of 6 fragments. Descriptions and illustrations of the individual groups are included in Attachment B, at the end of this appendix.

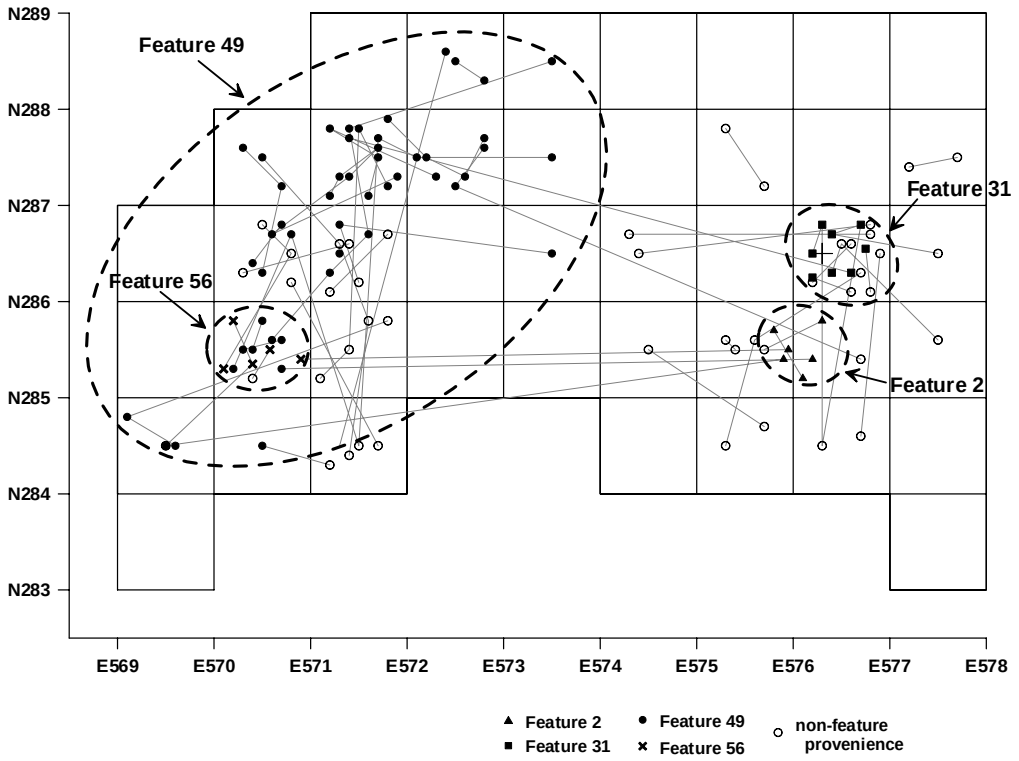

Figure F-6. Thermally Altered Stone Refits Between Features 2, 31, 49, 56, and Fragments Not Provenienced in Features, Block B.

The large scatter, Feature 49, displayed the lowest refit frequency among the features in the block. Refits occurred between Feature 49 and both of the smaller clusters, Feature 2 and Feature 31 (Figure F-7), suggesting contemporaneity and a functional relationship between the features. In contrast, no refits occurred between Feature 2 and Feature 31 (Figures F-8, F-9), although they were located in adjacent units. The latter finding implied that while the two clusters were related through Feature 49, they may not have been strictly contemporary. Refits also occurred between Feature 2 and Feature 56 (Figure F-9), further indicating the functional inter-relationship among the features in the block. In contrast, no refits occurred between Feature 56 and Feature 49, within which Feature 56 was located (Figure F-10). Refits between thermally altered stone fragments not included in features, some of which stretched across several meters, suggested the post-depositional movement of artifacts.

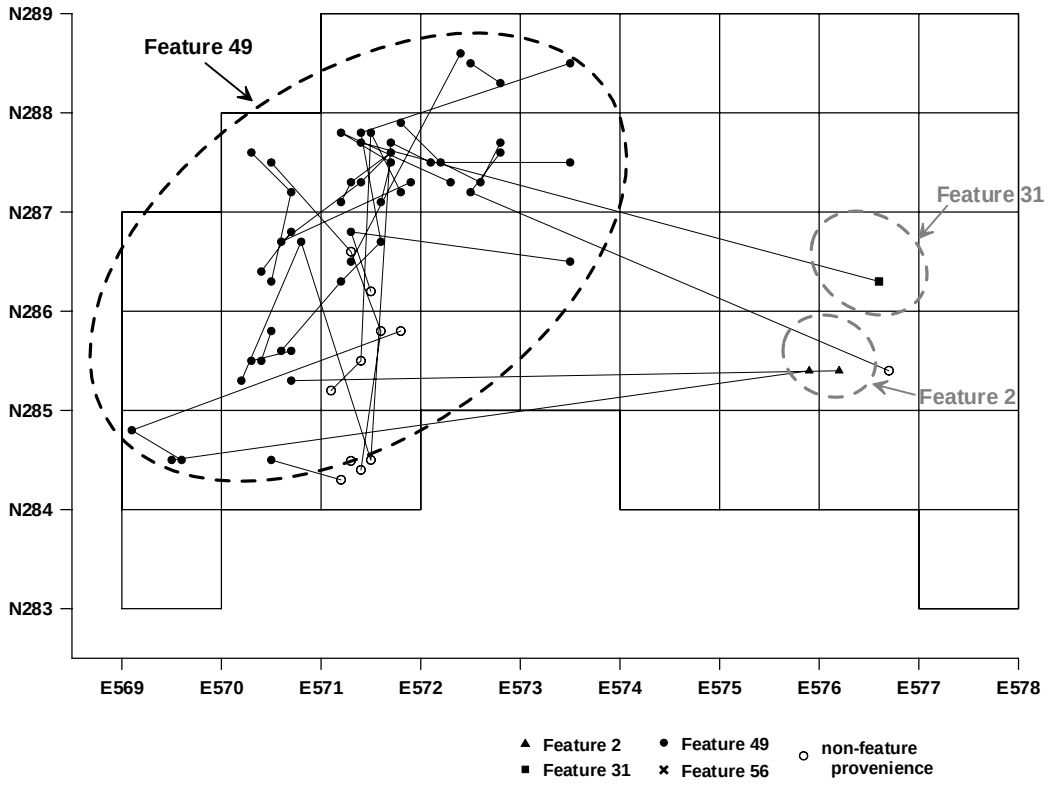

Figure F-7. Feature 49 Refits.

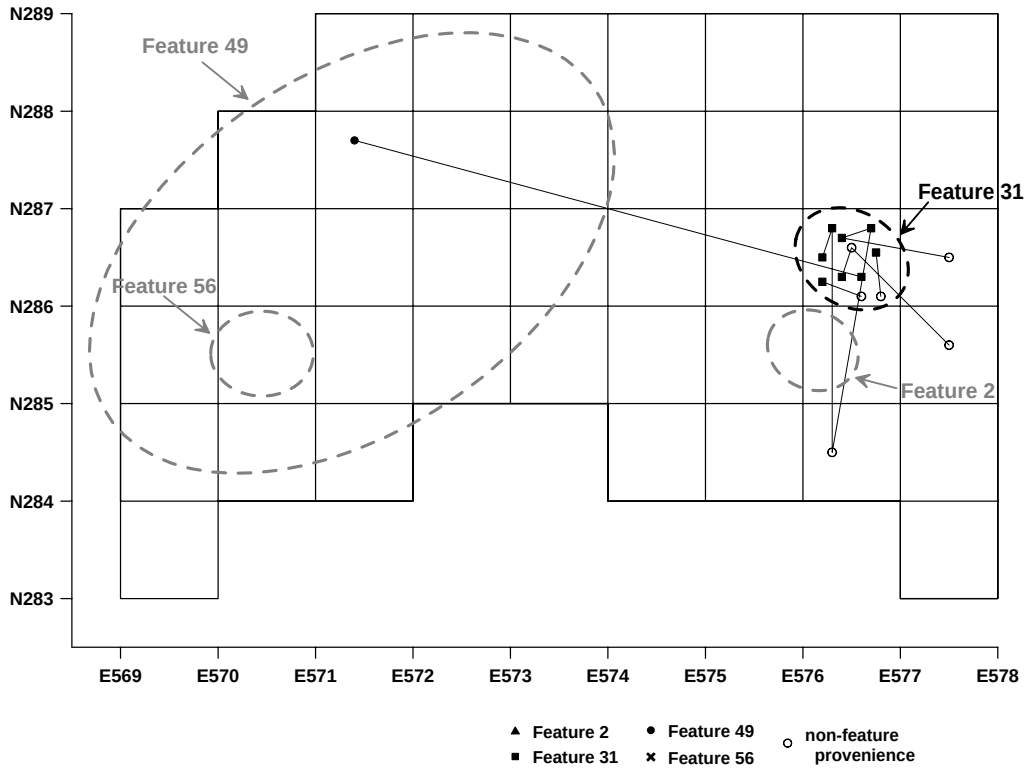

Figure F-8. Feature 31 Refits.

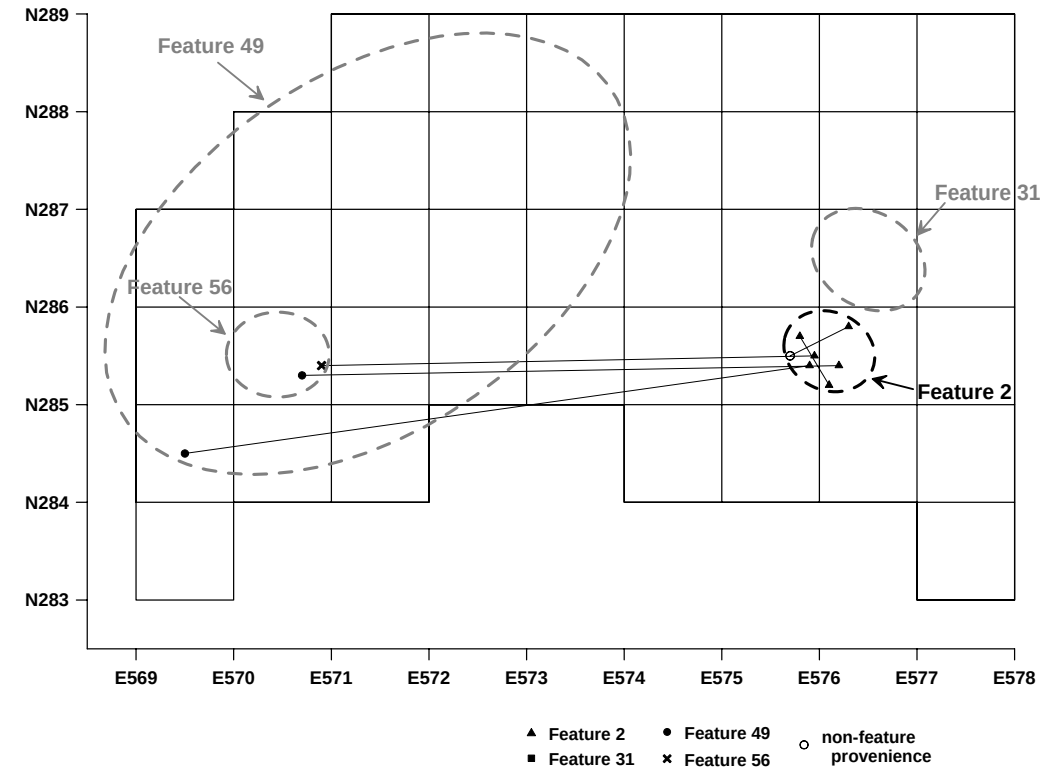

Figure F-9. Feature 2 Refits.

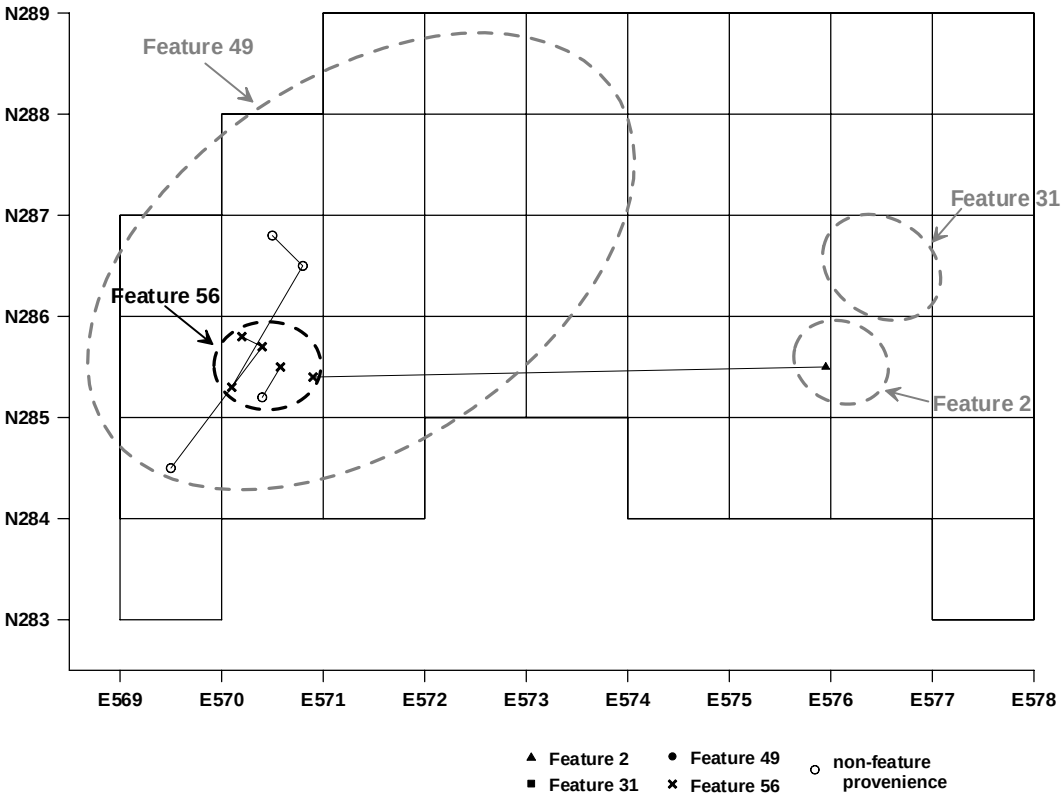

Figure F-10. Feature 56 Refits.

Vertical refits were documented between fragments in feature and non-feature proveniences below the plow zone and fragments in the plow zone. Each feature contained at least one plow zone refit (Table F-5). The percentage of the total number of stones in each feature that were recovered from the plow zone provided a rough estimate of the amount of each feature that may have been displaced by the plow disturbance. The figure ranged from 4 percent to almost 20 percent. These figures are considered informal estimates that may be subject to error due to a variety of factors, such as undiscovered refits in the plow zone, or variations in the proportions of the original cobbles represented by the discovered refits. Nonetheless, the calculations furnish a very general estimate of the degree of disturbance.

Table F-5. Estimates of the Amount of Feature Displacement Based on the Frequency of Refitted Thermally Altered Stone Fragments in the Plow Zone, Block B.

	vertical refit groups	refitted frags in plow zone	total frags in feature	frequency of frags in plow zone
Feature 2	1	1	11	9%
Feature 31	2	4	22	18%
Feature 49	4	6	156	4%
Feature 56	1	2	13	15%

Thermally Altered Stone Attributes

As in Block D, quartzite dominated the features in Block B. Quartz occurred as a minority type throughout, while individual fragments of sandstone and jasper were also present. Field documentation indicated that the individual stones comprising Feature 49 were mostly small and highly fragmented, an observation confirmed by analysis (Table F-6). The feature displayed the highest fragment count and the smallest fragment sizes among those in the block. This, along with the scattered spatial distribution of the stones, suggested that Feature 49 represented an area of spent and discarded stone. Based on the rate of fragmentation and small fragment sizes, the debris probably resulted from a form of indirect heating in which the stone was repeatedly heated and quickly cooled. Feature 56 appeared to have been a cluster of discarded stone within the larger distribution comprising Feature 49. Feature 2 and Feature 31, both comprised of larger stone fragments that were distinctly clustered, may have represented the primary locations in which the stone was heated.

Summary and Discussion

In Block D, Feature 30 appeared to have been a primary feature location. The stone was tightly clustered, fragments were large, and few refits occurred beyond the limits of the feature. Feature 60, in contrast, appeared to have been an area in which used stone was discarded. Fragments were small and distributed across a relatively wide area. Refits occurred with fragments outside the boundaries of Feature 60, indicating that the feature probably had less formal boundaries than Feature 30. Refits between the two features implied a close association between them, both temporally and functionally. Feature 30 appeared to have been the remains of a hearth in which stone was warmed for indirect heating, possibly connected with an activity such as stone boiling. Feature 60, located 3 m to the west, would have served as an area in which used stones were discarded, and possibly sorted for fragments suitable for recycling.

Table F-6. Thermally Altered Stone Attributes, Block B.

	material	count	total weight	mean weight	median weight
Feature 2	quartzite	8	1,314.5 g	164.3 g	146.8 g
	quartz	3	241.4 g	80.5 g	53.8 g
Feature 31	quartzite	19	1863 g	98.1 g	83.2 g
	quartz	1	60.9 g	–	–
	sandstone	1	627.3 g	–	–
Feature 49	quartzite	122	4,716.8 g	38.7 g	26.1 g
	quartz	26	1,409.2 g	54.2 g	35.4 g
	jasper	4	104.6 g	26.2 g	25.6 g
	sandstone	3	84.6 g	28.2 g	23.1 g
Feature 56	quartzite	11	1,279.9 g	116.4 g	92.1 g
	quartz	2	50.5 g	25.3 g	25.3 g

The features in Block B shared similar morphological and spatial characteristics with Features 30 and 60, in Block D. The broad and dispersed configuration of Feature 49, along with small size of its constituent fragments, suggested that it represented the remains of a disposal area. Feature 2 and Feature 31, discrete clusters containing larger fragments than occurred in Feature 49, were interpreted as hearths in which stone was heated. Refits occurred between Feature 49 and fragments from surrounding non-feature proveniences, suggesting that the boundaries of Feature 49 were not as formal as those of Feature 2 or 31. Refits between the larger feature and the two clusters indicated relationships between them. No refits occurred between Feature 49 and Feature 56, although Feature 56 was contained within Feature 49, and the two features were related through refits with Feature 2. The findings suggesting that Feature 56 represented the remains of an individual depositional incident within the broader distribution of Feature 49.

Along with demonstrating the inter-relationships between the various features in the excavation blocks, the number and character of the horizontal refits in both blocks suggested the degree of depositional integrity that was present in the feature-bearing levels in this part of the site. Individual features were visible and relationships between them could be described on the basis of artifact reconstructions. Vertical refits provided indications of the amount of disturbance to the prehistoric cultural levels that had resulted from historical agriculture. The thermally altered stone features in Block B occurred at the transition between plowed and unplowed parts of the soil profile. Spatial analysis showed that similar artifact distributions were present in both plow zone and sub-plow zone levels, suggesting that while some horizontal displacement of the artifact clusters had occurred, the distances involved were not extensive. Data from refits between the levels provided very general estimates of the amount of feature material that may have been displaced—in most instances, less than 20 percent.

Refits were not documented between the blocks. However, given the distance of 30-35 m separating the locations, this finding did not necessarily represent evidence against

contemporaneity among the feature groups. The features in both Block D and Block B were interpreted as functionally linked to indirect heating activities, such as stone boiling, and the features in both blocks were spatially associated with Woodland I Stemmed points, linking them temporally. Additional similarities noted between the sets of features included their relative elevations immediately below the plow zone, and the internal structure or arrangement of each group. In Block D, for example, a 3-m space, within which few artifacts and no refits occurred, separated the small cluster, Feature 30, and the larger distribution, Feature 60. The same spatial configuration was recorded in Block B, where discrete clusters, Feature 2 and Feature 31, occurred on one side of the block, and a more diffuse group, Feature 49, occurred on the opposite side, with a relatively empty space of approximately 3 m in between. The clear repetition of this pattern supported the interpretation of a common function and time frame for the features across the two blocks. As note above, artifact fragmentation rates suggested that the function involved an activity such as stone boiling that employed indirect heating. Given the aceramic nature of the artifact assemblages and the lack of evidence of pits or basins that may have served as processing features, it seems likely that non-durable containers were employed in such an activity.

Attachment A. Refit Group Descriptions, Block D.

56-A
Two large fragments of sedimentary quartzite conglomerate. Highly friable with cemented quartz gravel imbedded in the matrix. Not reddened, but highly cracked, oxidized, and weathered. Partial cortex, but most is eroded away. Light mineralization, manganese, evident.

60-A
Six fragments of tight-grained quartzite mend to form a portion of a quartzite cobble. Cortex on three faces is weathered and oxidized. Pieces show differential reddening. Quartz granules noted in matrix but quite small. Mended portion comprised of blocky chunks with small thin, cortical spalls missing from several edges.
60-B
Three fragments mend to form an "L" shaped portion of a large quartz pebble. Large-grained quartz with cracked yellowish–brown cortex. Mend portion appears to be less than 50% of a tabular to subround pebble.

60-C

Two large-grained quartzite fragments mend to form the end of a subround pebble or small cobble. Cortex is weathered and matrix contains small quartz granules, most less than 1 mm. Cortex exhibits weathering and light oxidation.

60-D

Three fragments mend to form a fragment of a large quartzite pebble. Cortex spalled and oxidized, although exhibits little reddening. Matrix contains thin quartz bands or striations as well as small quartz granules. Material has spalled generally along these inclusions. Matrix exhibits darkening but little reddening.

60-E

Five fragments mend to form a cortical portion of a large tabular quartzite cobble. Cortical face is very spalled and oxidized. Much differential reddening with ventral face of one piece (bag 1471) exhibiting the most reddening. Mended fragment broken along jagged breaks perpendicular to long axis, but missing portions likely from the opposite cortical face indicating that the cobble may have also split parallel to long axis. This group comprised of both large and small mends. This quartzite is large-grained but tightly cemented with both quartz and other mineral granules. This is a cross mend between Features 30 and 60.

60-F

Four pieces mend to form a fragment of a large pebble/small cobble. Matrix is a heterogeneous quartz that ranges from glassy to large-grained. Differentially reddened with all fragments retaining some cortex. Breaks are jagged and along interior material flaws.

60-G

Three fragments of a sedimentary quartzite cobble. Very dense heterogeneous material with friable loose large-grained quartzite, large quartz crystals and mineralization. Angular breaks all retain cortex. Breaks along mineralization flaw. Cross mend with Feature 30.

60-H

Three pieces mend to form 60% of a subround, tabular cobble of quartz fossilized wood. Exterior is weathered and pock marked cracked by heat along inclusions. Interior is quite heterogeneous with woody structure evident. Much mineralization evident and provides the tracks for cracking. Cross mend with Features 30 and 60.

60-I

Irregular subround tabular cobble comprised of 5 pieces. Dense coarse-grained quartzite. Light, irregular reddened with largest fragment (bag 1460) reddest. All conjoined pieces are cortical but more than half the cobble was not found. Matrix homogeneous. Heavily cracked in interior but cortex not cracked.

60-J

Three fragments from Feature 60 and one from Feature 30 mend to form 70% of a small, angular quartzite cobble. Smaller fragments show most reddening. Refitted pieces show a number of thin spalls missing. Existing cortex very smooth but cracked. Both the distal ends from the long axes have the most reddening. Matrix very dense and tightly-grained.

60-K

Three pieces form one end of a fine-grained quartzite cobble. Cortex is present along top, bottom and edge of the refit group. Fractures are jagged and angular resulting in a 'top' slab and two pieces forming the 'bottom' slab. Cortex is very mottled, exhibiting some reddening. More intense reddening visible in the interior, especially of the top piece. Cortex edges are very smooth compared with top and bottom which are coarser.

NF-A

Consists of two pieces which refit to form a medium-grained quartzite cobble. The cobble is rectilinear and is broken along a diagonal which crosses the width of the cobble. The two pieces comprise of a very large fragment (approximately 80% of the whole refit) and a spall. Subtle, uneven reddening appears on the cortex. Cortex occurs on four of six facets.

NF-G

Consists of two small pieces which form a thin section of a fine-grained quartzite cobble. Cortex appears on the top and along the edges. Very subtle reddening is visible in the interior. Cortex is smooth and weathered.

NF-J

Consists of two small pieces which form a very small section of a very fine-grained quartzite cobble. Cortex is present only along the edge of one of the pieces. Exhibits reddening in the interior near the cortex, though subtle. No inclusions visible.

NF-P

Small refit group consisting of three pieces of fine-grained quartzite forming the mid-section of a cobble of unknown length. This section spans the entire width of the original cobble, as both facets are cortical. Breaks are irregular. Some slight reddening is visible along the cortical facet where all three pieces conjoin. Cortex is smooth and flat along one cortical face, irregular on the reddened one.

NF-Q

Two cortical pieces of large-grained quartzite form the end of a small, round quartzite cobble. Exhibits slight reddening in uneven patches. A smaller spall exhibits more reddening. Small quartz granules are visible in the matrix. Fractures are very irregular.
NF-R
Three pieces of large-grained quartz mend to form less than 50% of a large quartz pebble. Only slightly reddened, suggesting relatively little heat. But material may have been liable to cracking due to large-grained size.

Attachment B. Refit Group Descriptions, Block B.

2-A

Two fragments form a portion of a reddened quartz pebble. Material is banded and appears to have broken in jagged cortical chunks. Slight reddened, but degree of cracking and crazing suggest that stone was subjected to intense heat.

2-B

Two fragments mend to form most of a large quartzite pebble. Pebble split perpendicular to long axis. Mended edge is jagged and irregular, and appears to be somewhat weathered, with small spalls missing. Cortex only slightly reddened on one of the pieces. Material matrix is dense, large-grained quartzite, but with glassy matrix. Material is quite heavy and dense.

29-A

Two fragments of cortical quartzite mend to form a thin cortical spall. Friable material. Flat cortical portion with deep red and beige mottled cortex. Deep red ventral surfaces, also mottled slightly. Appears to have been significantly thermally altered.

29-B

Six fragments form a large cortical fragment of a very irregularly shaped quartzite cobble. Relatively homogeneous matrix with some quartz granules and light mineralization. Cortex is very smooth, but undulates across mended portion. Cortex also oxidized and weathered. Fragmented into large and small pieces with jagged edges. Cortex also has pot-lidded surfaces and other areas that appear to have once held small pebbles that have weathered out.

31-A

Two fragments of quartz form a portion of a subround quartz pebble. Heterogeneous quartz with large angular quartz crystals exhibits light reddening and breaks on interior inclusions. Only lightly reddened, but exterior and interior very cracked and crazed. Heavily mineralized.

31-B

Large fragment mends with two small cortical fragments forming less than 50% of one side of a large but thin, tabular quartzite pebble. Cortex is weathered and lightly oxidized along breaks. Slightly cracked and lightly reddened on interior portion, with most reddening along mended edges.

49-A1

Red medium-grained quartzite, consists of five tabular fragments, exhibiting little cortex. Blocky homogeneous material. Probably from a large tabular cobble.
49-B1
Highly reddened quartzite, exhibiting partial cortex. Mottled red to beige. Broken irregularly at crystalline inclusions and through homogeneous tight-grained matrix.

49-B2
Three pieces of reddened quartzite, similar to 49-B, with same cortex. Broken through homogeneous matrix into blocky chunks of equal size.
49-B3
Red quartzite mends to form a thin cortical spall, similar to 49-B1 and 2, with same mottled cortex, tight-grained homogeneous material, fragmented into thin angular to rounded spalls.
49-B4
Two fragments of mottled red quartzite, similar in material to 49-B1. Both pieces exhibit extreme exterior reddening. Cortical surface undulates slightly. Smaller piece has a crystalline inclusion that appears to run perpendicular to other breaks.
49-C
Two pieces of mottled gray and red quartzite, similar in appearance to 49-B1. Blocky angular spall that mends to a small, thin spall with cortex.
49-D
Non-cortical refit, two blocky spalls of red to grayish-brown quartzite similar in texture to 49-B1, but not as reddened.
49-E
Two thin, tabular fragments, of red quartzite. Both faces non-cortical. Very similar to 49-D.

49-F1

Reddened quartz. Similar to other quartz refit groups.

49-F2

Heavily burned quartz. Two blocky, cortical chunks exhibiting differential reddening. One piece deep red, the other pinkish.

49-F3

Consists of two fragments. Larger is cortical, refits along non-cortical edge. Smaller piece is much redder than the larger fragment. One half of the mended edge is redder than the other.

49-G

Two cortical fragments which refit to form a small portion of a large, tabular quartzite pebble. Pebble has weathered cortex, and is split along interior inclusion of larger-grained material. Refits with a thin, tabular fragment from Feature 31. All pieces appear evenly reddened.

49-H

Three fragments form a portion of a subround quartz pebble. Pieces of similar material were noted during the study, but could not be physically conjoined.

49-I

Four fragments form approximately 30% of a large quartz pebble. Material is grayer and less reddened than other similar quartz pebbles noted during the study.

49-J

Three fragments form a thin portion of a large quartz pebble, possibly a subround-to-rounded tabular pebble. Highly spalled into small pieces. Interior structure consists of heterogeneous plates of alternating glassy quartz, but with many inclusions and extensive mineralization. A number of very small, angular spalls were noted that likely are part of this pebble but could not be conjoined.

49-K

Two cortical spalls of yellow quartz refit to form part of a small, cortical pebble fragment. Interior inclusions throughout consisting of manganese and mica concretions. Pieces spalled in parallel planes along the inclusions. No other material similar to this group was noted during the study.

49-L

Two fragments of highly burned and weathered sandstone form an angular block of sandstone. Very friable and cortex is weathered. Two faces of the refit are cortical. Difficult to determine complete size based on mended pieces. Both pieces evenly reddened, weathered, and oxidized.

49-M

Four pieces of fine-grained quartzite refit to form part of a large cobble. Quartz granules and crystalline bands are visible throughout the interior and at the surface at the cortex. The interior fragments are more highly reddened than the exterior pieces. Fractures are linear and result in very angular spalls and chunks. Cortex is only slightly smoother than interior, yet very flat.

49-N
A large spall conjoins with a smaller piece to form a portion of a large, subround-to-tabular quartzite pebble. Highly spalled, but no other fragments were observed during the refit study. Material not reddened but is darkened and waxy. Large quartz crystals and specks of manganese noted in the interior of the pebble.
49-O
Two cortical fragments form a large fragment of an angular quartz pebble. Lightly reddened, but not cracked in refitted portion. Matrix consists of angular quartz crystals, but rather heterogeneous, with interior planes evident. Some mineralization is visible.
49-P
Two pieces form a thin slab of a very irregular chert with jagged breaks. Exhibits reddening along the perimeter of half of the refit group, but ends abruptly. The smaller piece exhibits most of the reddening, although the rubefication extends across the conjoined fracture along the edge of the second piece. Small potlids are visible on several facets.

56-B
Three fragments of cortical quartzite conglomerate refit to form a small, cortical spall. Material is highly friable and weathered, with oxidation along cortical edges. Quartz granules in the matrix include some larger pieces in excess of 4 mm.
56-C
Three very reddened fragments form a cortical spall of what appears to be a moderate-sized cobble. Largest cortical face is flat, with material similar to 49-B but without mottled cortex.
56-D
Two cortical pieces refit to form a thin slab from the cortical surface of a medium-grained quartzite cobble. Large quartz granules present, as large as 6-7 mm. Cortex is smooth and exhibits reddening near fracture planes. Some of the quartz inclusions as well as beige-colored mottling are visible at the surface of the cortex. The smaller piece appears more highly reddened and signs of weathering and oxidation occur along several of the fractured edges.

NF-B

Two fragments mend to form part of a large quartz pebble. Lightly reddened. Interior face is smooth, although inclusions are present which may have caused the pebble to split when heated. Cortical surface not complete, but exposed granular portions are much more friable than the interior face.

NF-C

Two fragments refit with a fragment from Feature 2, to form 70% of a rounded, triangular-shaped cobble. Material is homogeneous, dense, brown quartzite. Breaks are jagged and weathered. Refitted cobble missing thin edge spalls. Cobble only slightly reddened but extensively cracked.

NF-D

Consists of two pieces of finely grained quartzite with a talc component. One piece comprises approximately 75% of the refit group, with one small chunk forming a central part of the original cobble. Cortex appears on one face of this fragment, but not along any edges. One fracture plane on the large piece is very tabular with only a thin flat section missing. Darkening is visible on cortex, varying from reddish-brown to brown. No inclusions visible.

NF-E

Consists of two pieces which refit to form part of a small, grainy, quartzite cobble. Cortex is present along one face and the edges of both pieces. The fragments refit along a fracture plane extending into the original cobble. Exhibits little reddening, though a thin layer just under the cortex is very gray. Breaks in the interior appear small but linear. No inclusions visible.

NF-F

Consists of two pieces of medium-grained quartzite which refit to form a section of a medium-sized cobble. A large piece of (90% of refit) and a small spall, both with cortex. Exhibits reddening at the site of the spall break and darkening on the cortex. A band of white crystalline material runs from the interior to the surface across the cortex and appears on the other side in the interior. Some oxidation is visible within the band. Cortex is weathered smooth, although pitted.

NF-H

Consists of two pieces of a thin, subround, fine-grained quartzite cobble. Exhibits reddening along the fracture planes and darkening on the cortex. The larger of the two refit pieces has cortex which extends to the edge, becoming less smooth and uniform in some places. The smaller spall is rectilinear, and refits above a point with visible oxidation and inclusions.

NF-I
Consists of two pieces of quartz with visible crystalline structure. Some crystals appear very clear and glassy. The pieces refit along a semicircular edge to form a flat, subround cobble. Other fissures are visible in the interior, as is cracking along an inclusion with visible oxidation. Subtle reddening is visible on some of the crystals, increasing in intensity near the cortex, where other dark inclusions are prominent.
NF-K
Three pieces refit to form part of a small quartzite cobble. Cortex is very smooth and uniform. Triangular in planview. This finely-grained quartzite exhibits some reddening or darkening near the cortex. One piece has a small white inclusion at the site of a smaller spall which was not found. The cortex also exhibits beige mottling similar to 49-B1.
NF-L
Consists of two pieces of a medium-grained quartzite containing inclusions of small quartz granules. Cortex is smooth but undulating, and is fully intact along the surface where the pieces conjoin. On one piece, cortex extends to the edge, but gives little indication as to the size of the original cobble. The interior of both pieces is highly reddened to purplish in color. The fracture splitting the two pieces is linear and makes each piece triangular in planview.
NF-M
Consists of two pieces of fine-grained quartzite which form an almost cube-shaped corner of a cobble. The pieces are broken along horizontal planes, and the corner and edges align almost perfectly, forming an approximate 90-degree angle with no overhanging pieces. The fragments, though reddened overall, vary in color: one piece is very red, the other is lighter in color and has visible quartz-crystal inclusions. Cortex varies also, on one surface irregular and rough, with inclusions, on the other smooth and more evenly-grained.
NF-N
Consists of two pieces of a medium-grained quartzite cobble. Rough interior, but smooth cortex. The smaller of the two pieces exhibits more intense reddening and refits with the larger piece along an angular fracture. The fracture plane does not show any inclusions, although some possible oxidation is visible. A thin, crystalline band extends across the width of the larger piece.
NF-O
Consists of two pieces of fine-grained quartzite. Cortex is very smooth. The breaks are linear, resulting in a very angular chunk. The interior exhibits some reddening, which is more pronounced along the fracture plane between the two refit pieces. The smaller cortical spall exhibits black discoloration on the cortex which appears to extend inward approximately 1 to 2 mm. Beige-colored mottling also occurs on the cortex.
NF-S
Two pieces of red sandstone refit to form a thin fragment of sandstone. The spall break is through relatively homogeneous material and may have been post-depositional, as both fragments show identical thermal alteration (rubefication) of both the largest faces. Very friable material.
NF-T
Consists of two cortical fragments of quartz forming a small portion a cobble. A small circular opening appears in the interior along the fracture plane within which very glassy quartz crystals and other inclusions are visible. Cortex is smooth, yet there are several indentations on the surface, possibly more inclusions. Exhibits reddening on the surface which extends into the interior, becoming lighter in color.

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