5.0 METHODS

5.1 Archival Research

Archival research conducted in association with the site evaluation portion of the project consisted of a records search, a review of historical maps, and research into regional and local historical backgrounds. Information concerning the historical development of the Frederick Lodge vicinity was obtained from land use planning documents and deed and tax records at the New Castle County Building, in Wilmington. Acts of the General Assembly, Clerk of the Peace Records, probate records, historical maps, and photographs were reviewed at the Public Archives in Dover. Information regarding the Blackbird Historic District was obtained from the NRHP Nomination form on file with the DESHPO. Details of the historical findings are included in Appendix C.

5.2 Field Methods

The archaeological field investigations at the Frederick Lodge Site Complex were conducted in two phases consistent with conventional cultural resource management practices in the State of Delaware and across the Middle Atlantic: site evaluation (Phase II); and data recovery (Phase III). Each phase of investigation had distinct goals, and field methods varied according to these goals.

5.2.1 Site Evaluation (Phase II)

The purpose of the site evaluation was to determine the significance of the cultural resources discovered at the Frederick Lodge Site Complex as a result of the original archaeological survey (Phase I). Significance was assessed on the basis of criteria required for nomination of the resources for inclusion in the NRHP, and the ability of the sites to address specific research questions formulated in existing management plans for the State of Delaware (Custer 1986a, 1994; Custer and De Santis 1986).

Site evaluation fieldwork was undertaken by the CR Division beginning in April 1999. The initial work involved relocation of the site, refinement of horizontal boundaries, and identification of areas of artifact concentration within those boundaries. Review of LBA's shovel test data and field inspection of the site locations showed a consistent occurrence of prehistoric artifacts across the project area. Following consultation with DelDOT and DESHPO, the three sites were treated as a single site complex in order to better assess the occupations in context. To accommodate the entire site complex, a common reference grid was established across an area of approximately 28 acres representing the relevant portions of the landform within the proposed wetland mitigation area and highway right-of-way. The grid was oriented parallel to the proposed right-of-way centerline. At the request of DESHPO, the original site numbers were maintained for management purposes, with boundaries roughly congruent with the limits defined by the LBA shovel test data.

The CR Division conducted the site evaluation fieldwork in two stages. The first stage entailed a controlled surface collection that resulted in the identification of several areas containing prehistoric and historical artifact concentrations. At the beginning of the investigation, the cultivated field in which the Frederick Lodge Site Complex was situated

had been fallow for some time. The area was heavily overgrown, and ground surface visibility was limited. To increase the effectiveness of the surface collection, the field was plowed, disked, and left open until the ground surface had been rain-washed to provide maximum ground surface visibility (Plate 5-1).

Plate 5-1. Plowing and Disking the Frederick Lodge Site Complex in Preparation for Controlled Surface Collection.

The area was divided into 10 x 10 m surface collection units (SCUs) marked with pin flags (Plate 5-2). Each SCU was traversed by a line of five crew members spaced an equal distance apart (Plate 5-3). Transects were walked at a slow, steady pace, and all observed cultural material was collected by SCU provenience. Finds were inventoried in the field, and exact counts were recorded. All prehistoric artifacts, diagnostic historical artifacts, and architectural debris were retained. Coal, slag, and shell fragments were inventoried and discarded. The results of the surface collection were entered into a computerized database, and artifact distribution maps were generated for the entire site area. Initially, 900 SCUs were surveyed in this manner, covering the three prehistoric sites as recorded by LBA. Analysis of the distribution maps suggested that the surface collection may not have fully encompassed the site boundaries, because a light-density scatter of prehistoric artifacts continued to the west of 7NC-J-98, beyond the limits of the area surveyed. Therefore, an additional 253 SCUs were collected in an area lying north and west of the initial survey using identical methods, resulting in full coverage of the wetland mitigation property. SCUs located west of grid line E530 were designated as within an adjacent historical site, 7NC-J-224. In total, the surface collection comprised 1,153 SCUs, representing an area of ca. 11.5 hectares, or 28.4 acres (Figure 5-1). Surface collection of the portion of the site complex comprising 7NC-97, 7NC-J-98, and 7NC-J-99 totaled 731 SCUs (7.3 hectares or 18.0 acres).

Plate 5-2. Surveying Surface Collection Grid.

Plate 5-3. Controlled Surface Collection.

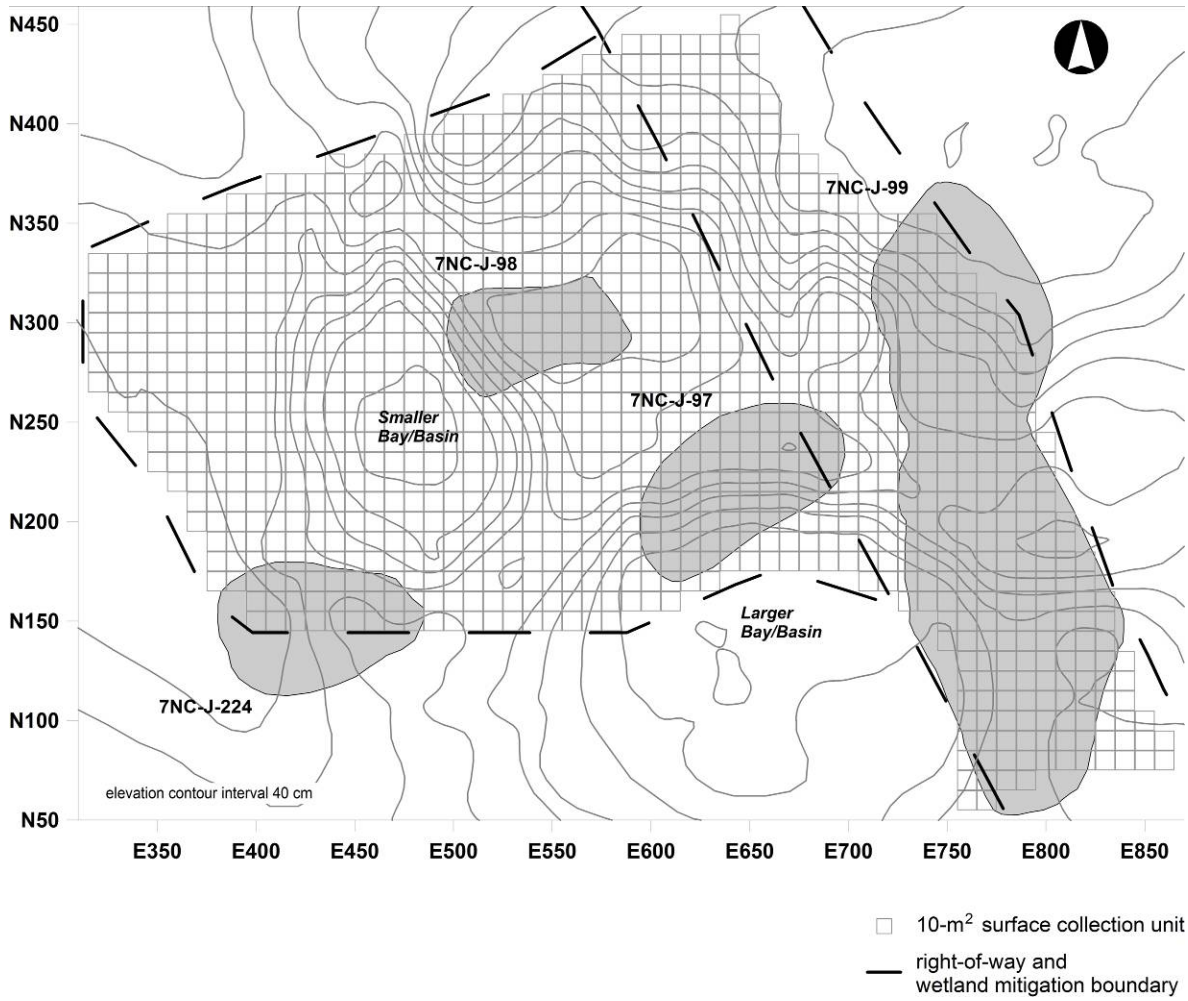

Figure 5-1. Controlled Surface Collection Grid.

The second stage of the site evaluation (Phase II) field work involved excavation of 97 1-m^2 test units in selected locations. The unit excavations were aimed at obtaining data on the types and depths of artifacts in the soil column, to augment the artifact sample from the sites and identify areas with sub-plow zone cultural deposition or features. The test units were placed at 10-m intervals along selected transects (Figure 5-2). The transect locations were chosen to cover specific landforms, such as minor dune crests in which contexts buried by aeolian deposits might be expected, as well as areas of concentrated prehistoric activity as indicated by high artifact counts from surface collection data. Plow zone sediments were removed in a single level, while the remaining sediments were excavated in arbitrary 10-cm levels within natural strata (Plates 5-4, 5-5).

Test units were excavated at least two arbitrary levels into culturally sterile subsoil. All excavated soil was screened through one-quarter-inch mesh hardware cloth. Representative profile sections were drawn to scale and photo-documented. Features exposed in the test units were drawn in plan view, bisected, and profiled before being fully removed. Larger features that reached outside the limits of the test units in which they occurred were not excavated beyond the test unit boundaries; the remaining portions were covered pending full excavation with the implementation of data recovery (Phase III) investigations.

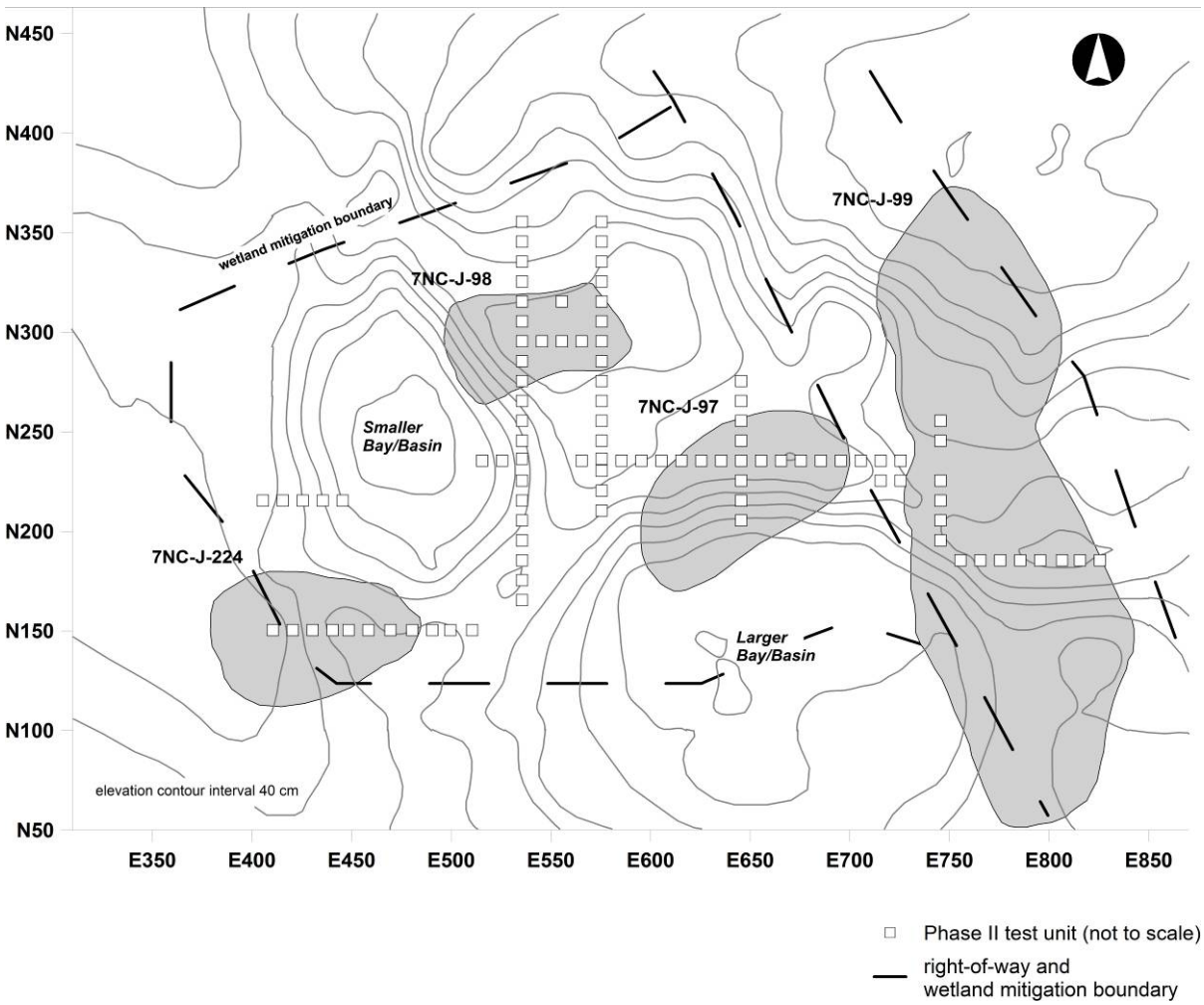

Figure 5-2. Site Evaluation (Phase II) Test Unit Locations.

5.2.2 Data Recovery (Phase III)

The results of the site evaluation (Phase II) surface collection and test unit excavation confirmed the presence of discrete concentrations of prehistoric artifacts across the site, including intact subsurface deposits below the plow line. Taken as a whole, the Frederick Lodge Site Complex was found to retain sufficient integrity and information potential to meet eligibility Criterion D for listing in the NRHP, and on that basis, data recovery (Phase III) excavations were recommended (Bupp and Auman 1999). Field methods for this phase of the investigation were aimed at addressing specific research topics developed in a Data Recovery Plan (Parsons 1999b), the details of which are presented herein in Section 4.0.

Plate 5-4. Site Evaluation (Phase II) Test Unit Excavation.

Plate 5-5. Site Evaluation (Phase II) Unit Excavation.

Like the evaluation portion of the study, data recovery was conducted in stages, guided throughout by field consultations with DelDOT and the DESHPO to discuss current results and assess the need for follow-on work. Initial efforts consisted of the excavation of individual 1-m^2 units on 10-m grid nodes to further investigate areas identified in site evaluation (Phase II) test units transects in which sub-plow zone artifact deposits or features had been identified (Figure 5-3).

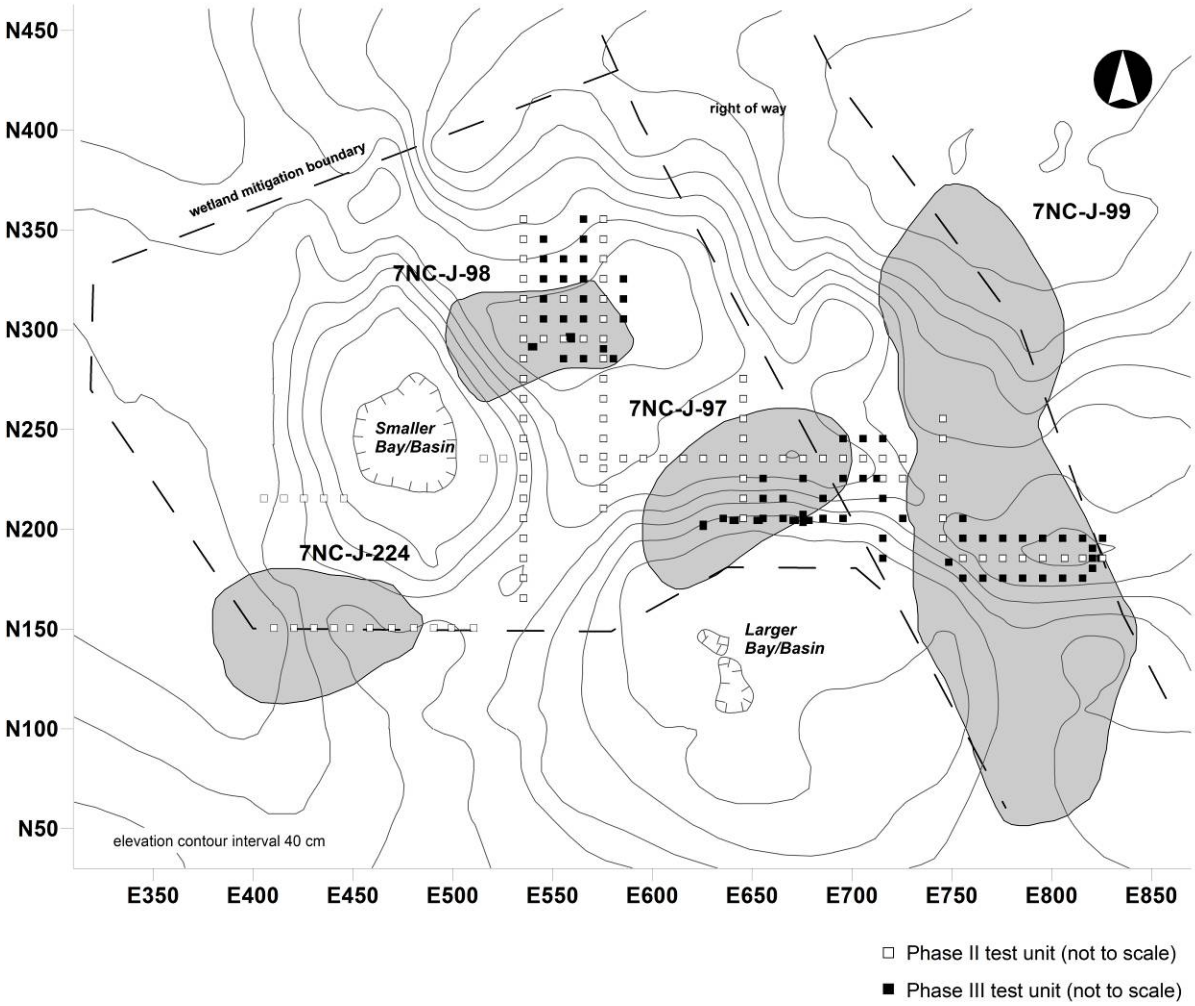

Figure 5-3. Additional Test Unit Locations, Data Recovery (Phase III).

The second stage of the mitigation process focused on area exposure, with blocks of contiguous excavation units employed to recover data from specific parts of the Frederick Lodge Site Complex (Figure 5-4, Plate 5-6). On the dune crest at the west end of the site, four blocks (A,B,C and E) were used to investigate two large pit or basin features and two thermally altered stone feature locations, while a fifth and larger excavation (Block D), overlooking the adjacent smaller bay/basin, investigated an area with high artifact counts (Plates 5-7, 5-8). Two excavations (Blocks G and H) were placed at the foot of the larger bay/basin slope to investigate an area of sub-plow zone deposits. Block I was placed on the edge of the high terrace overlooking the larger bay/basin (Plate 5-9). Lastly, Block K was

placed on the crest of a minor knoll overlooking the adjacent bay/basin in a setting analogous to Block D on the west side of the site.

Blocks layouts were developed incrementally, beginning with single transects of excavation units spaced at two- or three-meter intervals. The separate units were joined with additional units to form blocks based on the discovery of artifact concentrations or features. In total, block excavations encompassed 297 m^2. Table 5-1 lists the total number of excavation units by phase and stage of the investigation.

Block excavation procedures were identical to those employed in the excavation of transect and grid units, with 1-m^2 horizontal provenience maintained within the blocks (Plate 5-5). The plow-disturbed surface layer was removed as a single level, and the remaining sediments excavated in 10-cm levels within natural strata. Basin features were excavated in their entirety; they were drawn in plan, sectioned, and an appropriate profile recorded. Constant volume soil samples (2-liter) were retained from excavated basins for flotation and the potential recovery of carbonized botanical remains. Thermally altered stone features were recorded in plan, and soil samples from the around component stones were retained for flotation. All cultural features were photographed in black-and-white-print and color-slide film.

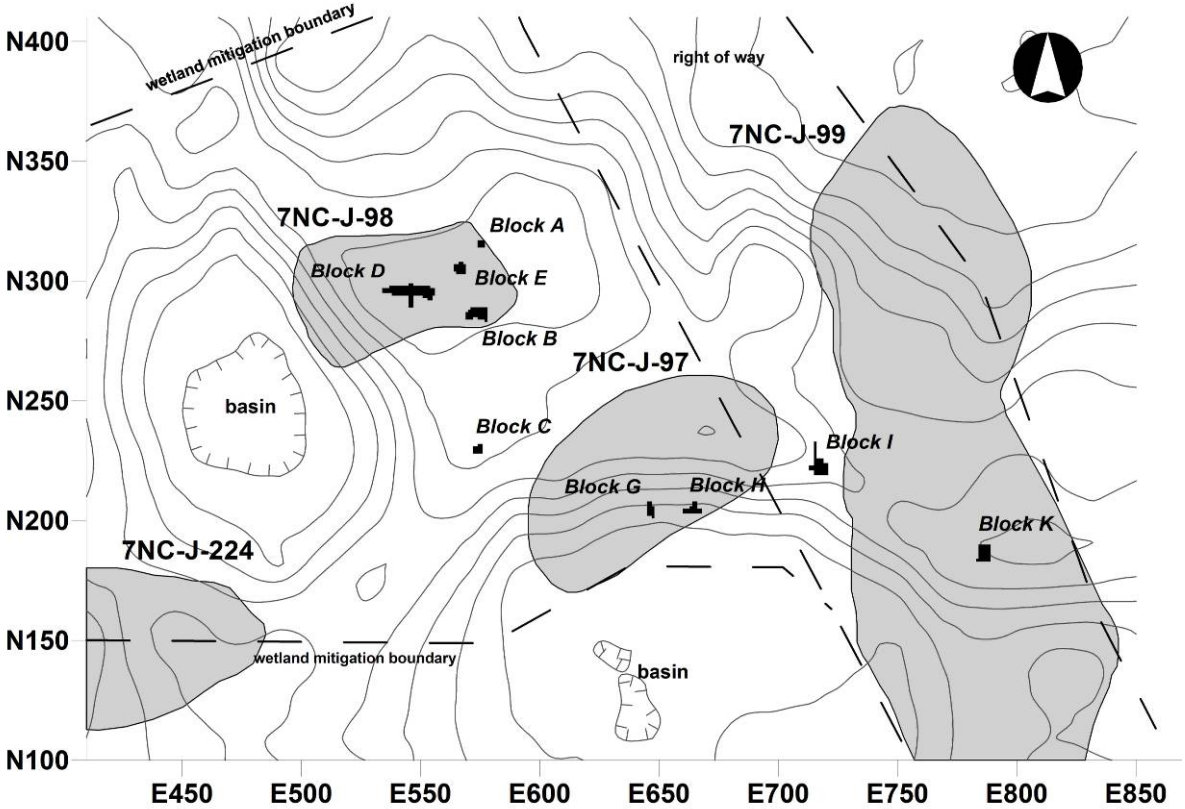

Figure 5-4 Locations of Data Recovery (Phase III) Block Excavations

Plate 5-6. Layout of Excavation Blocks.

Plate 5-7. Block Excavation: Block D on Western Crest.

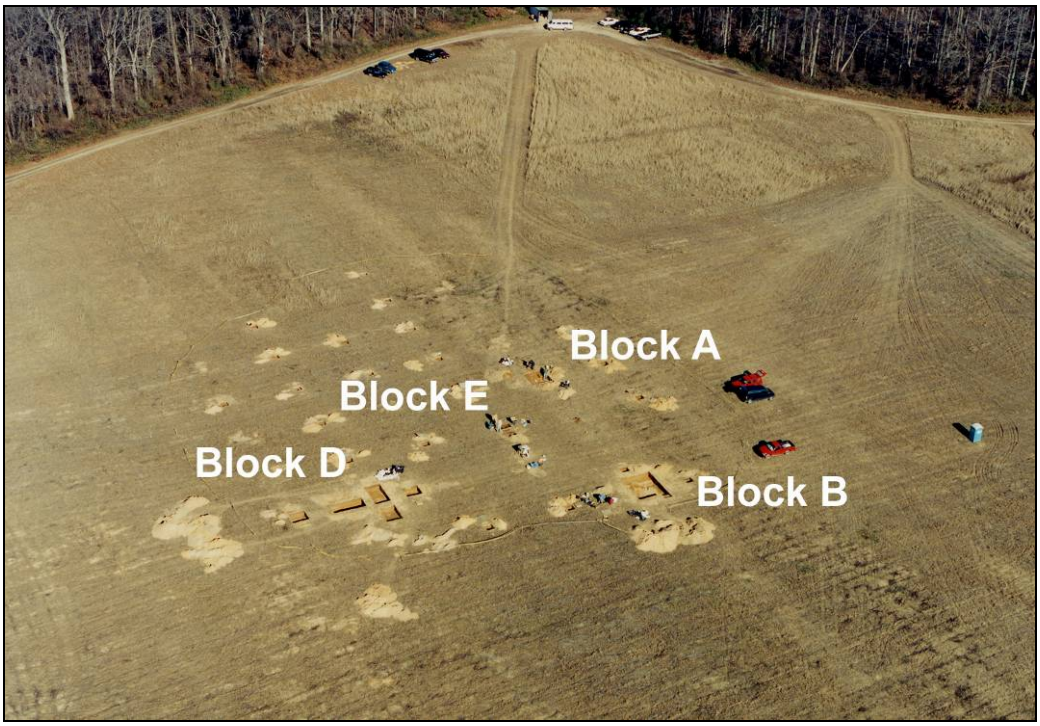

Plate 5-8. Aerial Photograph of Block Excavation on the Western Crest, Blocks A, B, D and E – view northeast.

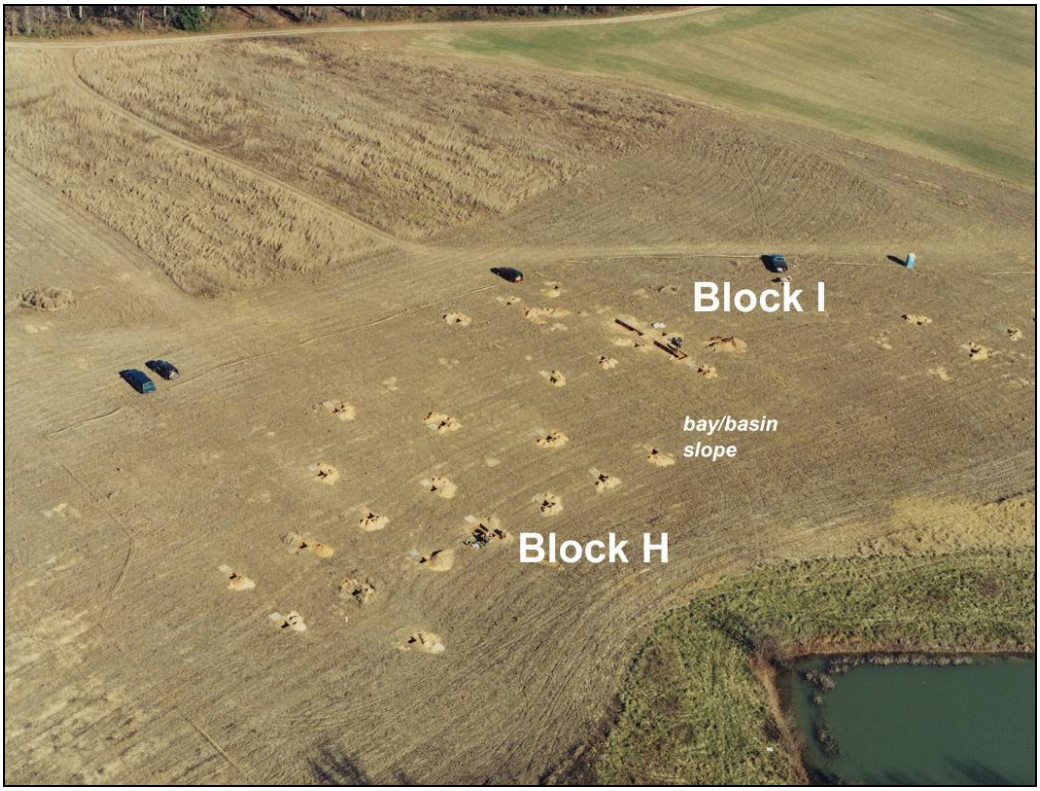

Plate 5-9. Aerial Photograph of Block Excavation on the Larger Bay/Basin Rim and Slope, Blocks H and I – view northeast.

Table 5-1. Phase II and III Excavations at the Frederick Lodge Site Complex: Transect, Grid, and Block Counts.

	Excavation Type		Count
Phase II	Transect Units		79
Phase III	Grid Units		72
	Block Units*		
		Block A	8
		Block B	41
		Block C	13
		Block D	94
		Block E	20
		Block G	16
		Block H	22
		Block I	48
		Block K	35
	subtotal block units		297
	Total		448

*does not include Phase II units within blocks

5.3 Laboratory Methods

5.3.1 Field Lab Procedures

Artifacts recovered during both phases of the archaeological investigation were inventoried at the CR Division Field Laboratory in Little Heaven, Delaware. Artifacts were classified by general category (prehistoric, historical) and specific type (biface, debitage, nails, brick), and were then tallied by horizontal and vertical provenience. The inventories produced in the Field Laboratory were entered into a preliminary database that was used to generate a series of artifact distribution maps. The distribution maps provided feedback that aided in directing the placement of test units and block excavations throughout the evaluation and data recovery investigations.

5.3.2 Lab Procedures

Comprehensive artifact processing, cataloging, and analysis was performed initially in Fairfax, Virginia, and later in Springfield, Virginia, after the CR Division moved from Parsons to Versar. Artifacts were processed to the standards of the Delaware State Museums Sampling and Curation Policy (DESHPO 1993a).

Artifacts were cleaned in plain water, and bagged by material and artifact type in 4-mil polyethylene zip-lock bags. Diagnostic artifacts were labeled with the Provenience/ Catalogue Control Number (99/48 for all Phase II/III Frederick Lodge artifacts) as well as the bag number, using acryloid B-72 sealant and black or white pigment ink. Catalog numbers and provenience information were written in indelible ink on the outside of the bags, and an acid-free tag with the same information was placed in the bags. In addition to provenience information, coding for database entry included the general group, raw material type, morphological type, segment, presence or absence of cortex, color, indication of heat exposure, size grade, and weight. Refit information and lot groupings also were recorded. Additional subfields were recorded for historical period artifacts. The full artifact inventory

is found in Appendix E. Artifacts are stored in acid-free trays within 20" x 20" x 3" corrugated polypropylene flat boxes. All photographic images are stored in archival slide and print sleeves, and contain photo logs. Field records are on acid-free paper.

In addition to the artifacts, samples were collected and the following outlines which samples will be curated. All unmodified lithic cobbles collected as part of the local gravel resources study will be discarded. All charcoal samples from test units will be retained. These consist of two samples (Bags 5038 and 5039), both from Feature 10 (Units N304 E536 and N305 E565, Stratum I).

Ten soil samples (eight 2-liter and two 1-liter) were analyzed for ethnobotanical remains (Appendix J), and the heavy and light fractions of the floated samples will be curated to allow for future study. A total of 44 soil samples underwent detailed analysis as part of the geoarchaeological studies that included geochemistry and sedimentology, and 16 soil samples were analyzed as part of the sand grain transformation study (Appendix I). Therefore, it is recommended that a limited number of the remaining soil samples be retained and that they be from the deeper basin features that contained cultural material. Due to the fact that ethnobotanical sampling was already performed, it is proposed that these be pint-sized (approximately 500 grams) samples. There was remaining soil from the deep basin Features 6 and 10, and therefore one sample from each will be retained. In addition, there may be value in retaining one non-feature sample that was taken as a control 70-80 cm below the datum from Unit N230 E575. One sample from each of these contexts will be retained, for a total of 3 curated pint-sized soil samples. These samples have been thoroughly air-dried and are stored in 4-mil polyethylene bags.

5.3.3 Analytical Methods: Lithic Technology

Once inventoried, the artifact assemblages were analyzed for information related to chronology, function, technology, and behavioral processes. Chronological definition of site components was based in large part on diagnostic point typology. Projectile point types and ascribed date ranges utilized in the component analysis were drawn from regional archaeological literature and research databases. A synopsis of the projectile point types and their temporal associations used in the analysis is included in this section.

Points

Points are chipped stone artifacts, usually bifacial in manufacturing technology and bi-laterally symmetrical in shape, that have a thinned, proximal end that functioned as a hafting element, and a distal end with blade edges that converge to an apex or point. Labels ranging from "projectile point" to "hafted biface" have been used in the archaeological literature to designate these kinds of artifacts. The simpler term *point* is used here, chosen since it does not imply an undemonstrated function, as in the former case, but is not as deliberately non-functional as the latter.

Where possible, points were assigned to conventional types based on regionally accepted styles. The purpose of typing the artifacts in this way was to provide an organizing frame of reference for studies of stratigraphy and artifact association. Chronologically diagnostic artifacts can be important analytical tools in that they can bring temporal perspective to site

analysis. They can be used as time markers, but they do not necessarily represent specific cultures. Some of the types in fact present challenges in terms of establishing time sequences because they are poorly defined formally; they have common or overlapping geographic distributions; they do not have clear time ranges associated with them; or they exhibit a combination of these conditions. Yet in the local archaeological record, these artifacts may often represent the only temporal data that are available.

For artifacts that were sufficiently complete, a standardized series of attribute data were recorded. These data included dimensional measurements, such as length, width, thickness, and several angle measurements, along with a suite of nominal variables related to shape, raw material, knapping characteristics, and edge wear. Statistics presented in the text include the range of each measurement and, where appropriate, indices of central tendency, including the mean, standard deviation. The metrical data, as presented, should be considered with some caution, since damage, reuse, and rejuvenation can alter the shape of a tool from its original form, as a number or researchers have noted (Frison 1968; Flenniken and Raymond 1986; Towner and Warburton 1990; Dibble 1995). Thus, the archaeological form of a tool as recorded in its dimensional measurements usually represents the form of the artifact following its last use, or as often, the last attempt at retooling, and does not necessarily reflect its original design.

Detailed information regarding the major point types noted in the report text are included in the Point Descriptions in Appendix F. The data include comparative analyses, as appropriate, using published metrical data from large type collections. Where possible, the statistics have been derived from original reports of the type sites for each point type. Since this form of data can be relatively limited in availability, the entries have in some cases been supplemented by data from other large, published collections. Collections from Delaware are used when possible, although most of the data are derived from sites to the north, in the Delaware River Valley. Brief descriptions of the types are included here as an introduction.

Bifurcates

Bifurcate points are thin, stemmed points, bearing generally triangular blades with edges that are commonly serrated. Along with serration, the distinctive feature of the group is a deeply notched base, referred to as bifurcated (from the Latin for two-pronged or forked). Flaking is usually patterned, and bases and hafting elements are often ground. Several sub-types have been identified, including St. Albans, McCorkle, Kanawha, and LeCroy. Among the bifurcate points recovered at the Frederick Lodge Site Complex, LeCroy was the only sub-type that was confidently identified. In her type definition at the St. Albans site, Broyles (1971:69) differentiated the LeCroy type from other bifurcates on the basis of their small size; thin and triangular blade; and pronounced shoulders that usually occur at right angles to the stem. Collectively, bifurcates appear to have a long date range, spanning the traditional break between the Early and Middle Archaic periods (Dent 1995:157).

Morrow Mountain

First described by Coe (1964) in the North Carolina Piedmont, Morrow Mountain points have triangular blades and a contracting stem. Coe's original analysis identified two sub-types on the basis of stem form: Morrow Mountain I points, exhibiting short, almost

vestigial stems; and Morrow Mountain II points, with longer, often lobate contracting stems. As a group, Morrow Mountain points have been shown to have an extremely broad geographic range which extends from Alabama (Griffin 1974) to New York, and perhaps northward through New England, where morphologically similar points have been described (Dent 1995). They tend to post-date the occurrence of bifurcates, being more typical of the latter half of the Middle Archaic (Blanton and Sassaman 1989:57).

Lackawaxen

Lackawaxen subsumes a series of long-bladed, stemmed points with a variety of hafting element configurations, including straight-stemmed, expanding-stemmed, and contracting-stemmed forms (Kinsey 1972). Blades may range from narrow-to-wide, while blade edges were usually straight-to-slightly convex. The bases of the straight-stemmed variety are straight-to-rounded; the bases of the expanding-stemmed variety are straight-to-convex; the bases of the contracting-stemmed variety are typically round. The points are characteristic of the Late Archaic period, but have been reported in contexts associated with the early part of the Early Woodland (Kinsey 1972; Wall et al. 1996:82).

Bare Island

This group consists of narrow-bladed, straight-stemmed points of medium length. Common characteristics include a short and relatively wide, straight-sided stem, pronounced shoulders, and a straight or slightly convex base. Blade edges vary from slightly convex to straight. Asymmetrical shoulders have also been noted as a common characteristic (Hranicky 1988). The predominant raw material used for Bare Island points was quartz.

Fishtail

Fishtail points exhibit a relatively long and slender blade with finely shaped, convex edges. Shoulders are weak, and the stem expands to prominent or even sharp barbs. The base is often slightly concave. Ritchie (1959) first described Fishtails as characteristic of the Late Archaic and Early Woodland in eastern and southern New York. The distribution of the type extends southward, where Kinsey (1972) reported finds from several sites along the Upper and Middle Delaware Valley. The Fishtail type and related variants also have a wide distribution across the Middle Atlantic region (Dent 1995:180). Two sub-forms of the Fishtail type have been recognized: Ritchie's original, referred to as the Orient Fishtail; and the Dry Brook Fishtail, with a roughly similar geographic distribution and time span (Kinsey 1972:430-1). The main morphological distinction between the variants appears to be a slightly wider and more prominent shoulder associated with the Dry Brook type.

Piscataway

Piscataway points are lozenge-shaped, with triangular, straight-sided blades, rounded-to-prominent shoulders, and short stems that contract to a rounded base. Although similar in shape to the Rossville type (Ritchie 1971), Piscataway points tend to exhibit narrower blades, less pronounced shoulders and less prominent stems. The Piscataway type was originally described by Stevenson and Ferguson (1963) at the Accokeek Site, located near the fall line on the Potomac River. In addition, a number of important sites in northern and southern

Virginia closely link Piscataway points with Early Woodland period Accokeek ceramics (Johnson 1985; Mouer 1990; McLearen 1991).

Woodland I Stemmed

These are small points, usually exhibiting symmetrical blade outlines, straight-to-slightly convex blade edges, and prominent shoulders. Stems are generally straight sided, but a contracting-stemmed variety is recognized, as are narrow-bladed and wide-bladed varieties. Most have convex bases. Remnant pebble cortex is common on the base, indicating the source of the raw material in secondary deposits of stream or outwash gravels and leading to a colloquial name for the artifacts, "pebble points." While the precise chronological status of these points is as yet uncertain, the type name used for identification implies the fact that the points are generally found in Early-to-Middle Woodland components. The name is a hold-over from previous research in which the points were introduced as a particular form recognized on many, if not most, sites in Delaware (Petraglia et al. 2005). The label was originally meant as a preliminary or working term, adopted from the regional Delmarva chronology and introduced by Custer in the mid-1980s. But no alternative term has been developed, and the initial name has persisted (e.g., Hranicky 2002).

Triangle

Generally characteristic of the Late Woodland period, triangular points are typically small, straight-sided, and have straight-to-concave bases. Overall shapes range from isosceles to equilateral triangles. Size, blade shape, and basal concavity are among the data that have been used to distinguish certain sub-types of triangle, such as Levanna and Madison, which are considered to have been early and late types, respectively (Ritchie 1971). Wall et al. (1996) have reported evidence of triangle points in deep, Archaic period deposits at the Area D site (28ME1-D) in the Trenton Complex at Abbot Farm, but how widespread such a tradition may have been at that time is unclear.

Other Chipped Stone Tools

The remaining chipped stone tools were categorized during the cataloging process based on form and manufacturing characteristics.

Bifaces

Bifacial artifacts were defined by the presence of patterned flake removals from opposing surfaces along at least one edge, usually creating a symmetrical shape. All complete bifaces were measured for length, width, thickness, and weight.

Bifaces were subdivided into two categories during the cataloging process: *early stage* and *late stage*. These subdivisions were based on several attributes related to the overall appearance of the artifacts, including the degree of shaping that had been undertaken, relative thickness, and the sinuosity of edge profiles. The characteristics are related to the perceived level of completion of the biface, and while their recognition can be subjective, they provide a general basis for comparison against examples from experimental and theoretical models (e.g., Muto 1971; Collins 1975; Callahan 1979; Johnson 1981). Early stage bifaces result from the initial efforts at producing a bifacial edge on a cobble, pebble, or flake blank.

Typically, early stage bifaces exhibit comparatively random flaking produced by hard hammer percussion. Flake scars are often wide and deep. The amount of flaking may vary from minimal to extensive, but with little overall shaping of the artifact evident and the resulting bifacial edge remaining sinuous in profile. Early stage bifaces are relatively thick in cross section and often retain remnant cortex. By contract, late stage bifaces typically display greater width:thickness ratios than early stage bifaces, indicating that purposeful thinning has been undertaken. Late stage bifaces also exhibit a greater degree of shaping and straighter edges in profile, suggesting more designed and patterned flaking. Edge modification may be present in the form of platform preparation, implying the use of controlled flaking techniques.

Unifaces

Unifacial artifacts were defined by the presence of unifacial flake removals that had shaped at least one edge of the piece. Complete unifaces were measured for length, width, thickness, and weight. The edge angle of the bit, or working edge, was measured at the approximate center of the bit using a goniometer.

Retouched Flakes

Retouched flake tools were characterized in the analysis by the presence of intentional marginal flaking, with flake scars at least 3 mm in length oriented perpendicular to the flake edge that had resulted in minimal shaping along the flake perimeter. The focus of the flaking on retouched flake tools was edge modification rather than formal shaping.

Utilized Flakes

Utilized flake tools were identified by the presence of usewear along the edges of the artifact, without evidence of intentional edge modification. Usewear was indicated by the presence of various types of edge degradation or modification, such as microflaking, rounding, or blunting.

Cores

Cores represent one of the basic residues of lithic reduction. They can range in size and complexity from pebbles or cobbles with only a single flake removal (often referred to as a tested cobble), to an exhausted cobble core that has been rounded and is no longer workable. In most cases, cores that occur archaeologically are artifacts that were rejected because additional flake removal was impractical, either because of poor material quality or because the size or shape of the core made further flaking difficult. By general implication, cores are usually assumed to have been used for flake production. While it is recognized that some cores were worked into bifacial tools, it can be challenging to discern intent in the early stages of reduction when few flakes have been removed. And so in this analysis, all cores have been described together regardless of the final goal of the reduction process.

Cores were separated into two categories, bipolar and multi-directional, based on flake removal patterning. Bipolar cores were identified by a distinctive arrangement of opposing striking platforms. In bipolar reduction, the core was placed on a hard surface or anvil, such as a dense stone, and was struck from above. The blow typically produced crushed platforms

on opposite sides of the artifact, and flakes that were either flat and sheared or distinctly convex in shape. Multidirectional cores are defined as cores with unpatterned flake removals, either multiple flake scars or single flake removals, and no evidence of anvil-based percussion. Note that given the small size of the collection, tested cobbles exhibiting unpatterned flake removals were included in this category.

Flaking Debris

Flaking debris was separated into two basic categories: flakes and chips. Flakes were defined by the presence of identifiable attributes such as bulbs of percussion, striking platforms, dorsal flake scars, and feather, snap, or hinge terminations. Chips, sometimes referred to as shatter, represented small-to-medium sized, angular pieces of lithic material with no identifiable flake attributes.

Flaking debris usually represents the majority of the artifactual material recovered from a prehistoric archaeological site in the Middle Atlantic region, and the Frederick Lodge Site Complex was no exception. Efficient analysis of such a large number of artifacts can be challenging. A useful approach to the task involves the analysis of flake size based on interval data (Henry et al. 1976; Stahle and Dunn 1984; Shott 1994). The process used in the current study is ultimately based on techniques of a form of flake aggregate analysis referred to as mass analysis, as documented by Ahler (1986, 1989). Mass analysis entails grading flake debris according to standard size intervals and retrieving various quantitative data, including count, weight, and the amount of remnant cortex, from each size-grade. These data are then subjected to a variety of specific multivariate statistical manipulations that can be used to aid in characterizing the type or types of reduction technology represented in the assemblage.

Mass analysis does have widely acknowledged limitations in terms of its analytical potential (Andrefsky 2007; Bradbury and Carr 2009; Kooyman 2000:63-64). The procedure is based on the observation that lithic tool manufacture is a process of reduction and that in general, earlier stages of manufacture result in larger debris with more cortex than do later stages. The analysis identifies the stages through the recognition of certain specific attribute ratios. Results may be muddied by several factors though, the most critical of which is the presence of mixed assemblages; the process provides the best results for single activity assemblages. And since the analytical process looks at gross attributes expressed in size, weight, and cortex ratios, it tends to it gloss over other forms of variation such as shape or platform type. Most assessments of mass analysis thus recommend that it be used in concert with other analyses (Bradbury and Carr 2009:2795; Odell 2004:132).

Although based on mass analysis, the flake aggregate technique used in the Frederick Lodge investigation was not mass analysis as formally defined. Size intervals were different (using a table-top template for more consistent grading), and statistical calculations were not as rigorous and did not include multivariate statistics. Nonetheless, the analysis provided a general characterization of the flakes in the collection, although detailed interpretation could not be made and would be meaningless in the absence of good depositional contexts

Size grading for the Frederick Lodge assemblages was conducted using the following interval scale:

- *size-grade 1*: < 1 cm
- *size-grade 2*: ≥ 1 cm and < 2 cm
- *size-grade 3*: ≥ 2 cm and < 3 cm
- *size-grade 4*: ≥ 3 cm and < 4 cm
- *size-grade 5*: ≥ 4 cm and < 5 cm
- *size-grade 6*: ≥ 5 cm

More detailed analysis of an assemblage of flakes from a portion of the Middle Archaic component was conducted using attributes based on Phagan's (1976) approach to flaking dynamics (Table 5-2). In this system, ten platform shapes are employed to characterize the continuum of platform preparation and implied reduction stages (Phagan 1976). The four rectilinear platform shapes—rectangular, diamond, triangular, and square—are presumed indicative of little or no preparation, and thus suggest initial core shaping (Phagan 1976: 46). Other platform shapes associated with core shaping include crescent and gull wing. Lenticular and round platforms are linked in the analysis to increased platform preparation and platform isolation, and thus to more controlled flaking typical of late stage biface reduction (Phagan 1976:46). Semicircular platforms indicate an "excessively strong platform" usually along the margins of a biface or thin core.

Six platform surface categories are similarly thought to represent varying degrees of platform preparation. Two of the categories—cortex and single flake surfaces—are linked to minimal platform preparation, and thus with initial core reduction. Four additional categories—2-3 flake scars, faceted, crushed/hinged and ground—are thought to indicate a greater levels of preparation and concern with control of fracturing properties (Phagan 1976:47). Although not exclusive, these latter platform surfaces are thought to be associated with biface reduction (Phagan 1976:49).

Table 5-2. Attributes Recorded on Flakes from Middle Archaic Assemblage.

Attribute	Type or Measurement	
Condition	W – whole P – proximal	
Length	mm (measured parallel from platform)	
Width	mm (measured perpendicular from platform)	
Thickness	mm	
Platform width	mm	
Percent of Cortex	mm	
Flake scars (dorsal surface)	Count	
Platform Shape	RECT – rectangular DIAM – diamond TRI – triangular SQU – square LENT – lenticular	RND – round CRES – crescent GUWG – gull wing SEMI – semi-circular
Platform Surface	CORT – cortex 1FSCAR – one flake scar 2-3FSCAR – two to three flake scars	

	FACET – faceted CRHNG – crushed/hinged GROUND – ground or smoothed
Platform Angle	In degrees
Ventral Lipping	Yes or No
Usewear on platform or dorsal surface	Yes or No

Six platform surface categories are similarly thought to represent varying degrees of platform preparation. Two of the categories—cortex and single flake surfaces—are linked to minimal platform preparation, and thus with initial core reduction. Four additional categories—2-3 flake scars, faceted, crushed/hinged and ground—are thought to indicate a greater levels of preparation and concern with control of fracturing properties (Phagan 1976:47). Although not exclusive, these latter platform surfaces are thought to be associated with biface reduction (Phagan 1976:49).

Lipping along the ventral edge of a flake platform may be indicative of use of a soft hammer percussor, employed to produce thinner, narrower, and flatter flakes (Phagan 1976:30). This variable was recorded as an additional indicator of late stage reduction debris.

Usewear and Edge Angles

Usewear patterns and tool edge angles are considered measurable attributes that can be basic indicators of tool use (Crabtree 1974; Wilmsen 1974; Hayden 1979; Carmichael 1985). In general terms, experimental studies have indicated that unifacial microflaking (serial flake removals measuring less than 3 mm in length) can be characteristic of activities involving a scraping motion, while bifacial microflaking typically suggests a cutting motion. When these patterns are accompanied by edge rounding or blunting, the scraping or cutting of soft materials, such as hides, fibers, or other vegetal material, may be implied. Experimental data have also suggested that the angle of a unifacial bit may correspond with the type of activity that was intended: 26-35 degrees, light cutting or scraping; 46-55 degrees, medium work; 66 to 75 degrees, heavy work.

Accordingly, usewear and edge angle analyses were conducted for selected artifacts from the Frederick Lodge Site Complex. Usewear analysis was carried out with a 10x hand lens in bright light. Evidence of both usewear and retouch were recorded along each working tool edge. Retouch, as defined above, may result from trimming during initial manufacture, intentional edge modification (i.e., flake tools), tool shaping, or resharpening episodes. Usewear was indicated by the presence of various types of edge degradation or modification, such as microflake removal, polish, rounding, or blunting. And, as noted, edge angles were measured at the approximate center of each tool edge or bit using a goniometer.

Fractures

Since many of the bifaces recovered from an archaeological site are production failures, archaeologists studying stone tool manufacturing technology have identified a series of characteristic fractures on the tool forms through comparison with experimental tool assemblages. In many cases, recognizing the type of fracture can help determine the

manufacturing techniques involved in the specific production episode. The following list is not definitive, but includes those fracture patterns recognized in the Frederick Lodge artifact assemblages.

> *transverse snap* – lateral fracture extend directly across the artifact at right angles to the long axis and may be the result of either a direct or indirect blow (Johnson 1981:47); the latter is referred to as end shock, resulting from tension failure in areas weakened by repeated blows. (Crabtree 1972:60)
>
> *oblique snap* – similar to a transverse snap break but at an acute angle to the long axis and more likely the result of a direct blow. (Johnson 1981:47)
>
> *perverse* snap – an irregular, twisting break traveling across the face of the tool often at an oblique angle to the long axis: "Natural flaws, excessive force and mass to be removed add to the possibility of perverse fracture." (Crabtree 1972:82)

Cobble Tools/Groundstone

Cobble tools were used for a variety of tasks including battering, abrading, grinding, and pecking. These tools typically consisted of unmodified, rounded cobbles procured locally from stream beds or other exposed gravel deposits. In the current analysis, two functional categories were recognized: hammerstones and anvils. Some cobble tools contained multiple usewear patterns and were categorized based on most frequent use type in evidence.

5.3.4 Thermally Altered Stone

Thermally altered stone is increasingly recognized as an important source of archaeological information, and as such quantification and systematic characterization of this artifact type was undertaken at the Frederick Lodge Site Complex. The term *thermally altered stone* is employed in this study rather than the more commonly used term *fire-cracked rock*: it is considered a more inclusive expression that encompasses 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, though, include items that were heat treated as part of lithic reduction practices.

In addition to recording material type and fragment weight for thermally altered stone fragments, a comprehensive refit study was conducted for artifacts from two locations: Block B and Block D. The purpose of the refit study was to provide detailed information about feature function, feature formation, and site structure.

In preparation for the study, artifacts were labeled with bag numbers to maintain provenience information. During this labeling process, a number of refits were found, generally from the same vertical and horizontal provenience. These initial refits were marked along the mended edge. The artifacts were then sorted by unit, stratum, and level so that spatial juxtapositions of potentially conjoinable pieces could be viewed. All of the stone fragments within the sample area were examined and refitted by a single person to provide consistency. Details of the methods used in the study, as well as the results and interpretations of the investigation are included in Appendix G.

As part of the data recovery investigations, a study of locally available lithic resources was implemented. This study followed methodologies established as part of data recovery investigations at the Hickory Bluff site (Petraglia et al. 2005). Similar to the Hickory Bluff Raw Material Study, sampling for this study was focused on the Pleistocene deposited pebbles and cobbles of the Columbia Formation. The current study was initiated to systematically analyze the lithologic and size characteristics of locally available raw materials. A descriptive framework enabled the comparison of the recovered lithic artifact assemblages to the locally available raw materials allowing for interpretations of prehistoric lithic resource procurement. Samples for the current study were collected from exposed pre-Holocene Columbia Formation deposits within the Sandom Branch and Blackbird Creek watersheds, north of Frederick Lodge, as well as from deposits exposed during data recovery excavations at the sites.

5.3.5 Viewshed Analyses

A viewshed analysis was conducted to examine aspects of human interaction with the landscape that might not be readily evident with conventional archaeological approaches. The analysis, typically computer based, compares relative elevation and aspect (the compass orientation of a slope) between a specific point and surrounding areas, giving an indication of the terrain visible from that point (Lake et al. 1998; Wheatley 1995; Tripcevich 2002). The results of viewshed analyses can help approach an interpretation of past landscape use, providing a means of visualizing the world as it was experienced by the people living within it.

Viewshed analyses have been used to aid an understanding certain features of past cognition—how people saw and understood the world around them. In an early study of barrow sites in England, for example, Lock and Harris (1996) used viewshed analysis to demonstrate that long barrows in the Danebury region of England were not mutually visible, supporting a theory that the barrows had been used as territorial markers. In an alternate finding, Wheatley (1995) demonstrated that long barrows of the Stonehenge group (Avebury and Salisbury Plain) tend to occur in locations from which high numbers of other barrows were visible. Maschner (1996) analyzed village locations on the Northwest Coast, demonstrating that villages around A.D. 500 moved to landscapes with views encompassing approximately three times the visibility of the previous locations. This was interpreted as reflecting a perceived need for increased defense. In a more recent study, Jones (2006:525) came to a similar conclusion regarding Onondaga Iroquois settlement: site location was interpreted as a measure of defensibility, and was: “a major factor governing settlement location during the Late Woodland and early Historic periods in the Northeast because of the high frequency of warfare..” The viewshed analysis supported a conclusion that village locations were chosen primarily on the basis of agricultural needs, “but not at the expense of…defensibility” (Jones 2006:537).

Kvamme (1990:7) proposed some ground rules for conducting and then interpreting a viewshed analysis. The viewshed operation is based on the premise that: a digital elevation model (DEM) represents the terrain accurately, the paleoenvironment can be modeled with relative confidence; the object of observation stands out sufficiently to be visible; and, finally, the measured landscape attributes were relevant and significant to the prehistoric

inhabitants. The latter is the conceptual leap that must be bridged by the archaeologist's interpretations. Some have argued that the analytical process over-represents ecological data and simplifies complex socio-cultural variables that may also be involved in landscape use (Kvamme 1997; Tilley 1994; Wheatley and Gillings 2000). However, viewshed analysis is perhaps more accurately described as a middle-ground that draws on geographically measurable attributes to reflect the experiences of individuals and the ways they made their settlement choices (Wheatley 1995).

5.3.6 Other Analyses

Special analyses and procedures, including geoarchaeological investigations, paleobotanical studies, and AMS dating, were performed by outside laboratories. Summaries of results and interpretations of these studies are presented in the appropriate sections in the main body of the report, while complete texts of the reports submitted, including methods and results, are presented in Appendix H, Appendix I, and Appendix J.