INTRODUCTION

The purpose of this report is to describe the results of final Phase II archaeological investigations at the Lewden Green (also spelled Greene) Site (7NC-E-9), which is located on the south bank of the Christina River in the town of Christiana, New Castle County, Delaware (Figure 1, Plate 1). The Lewden Green Site was encountered during a Phase I/II survey of the Route 7 project corridor (Catts et al. 1988). Changes in the Route 7 right-of-way (ROW) plans necessitated further intensive Phase II testing at the site, and this report describes the results of all archaeological testing at the site. Discussion of additional testing at the Lewden Green Site outside of the Delaware Department of Transportation (DelDOT) ROW by another firm working on a separate cultural resource management study (Lewis, Basalik, and Brown 1987) is also included in this report.

Archaeological investigations at the Lewden Green Site were funded by DelDOT and the Federal Highway Administration under Section 106 of the National Historic Preservation Act to evaluate the significance of the site and to study the effects of the proposed relocation of Delaware Route 7 on the site.

Phase I and II archaeological investigations were conducted by two separate organizations at different times. Much of the Phase I and II fieldwork, laboratory analysis and report preparation were undertaken by archaeologists working for the Delaware Department of Transportation, between November 1981 and November 1982. Additional Phase I and II testing, which was necessitated by ROW design changes and earlier problems with property access, was conducted by the University of Delaware

Center for Archaeological Research (UDCAR). This field work, under the supervision of Wade Catts, lasted from December 1985 to November 1986, and laboratory analysis was conducted between October of 1986 and February 1987. The results of both of the archaeological investigations are discussed together.

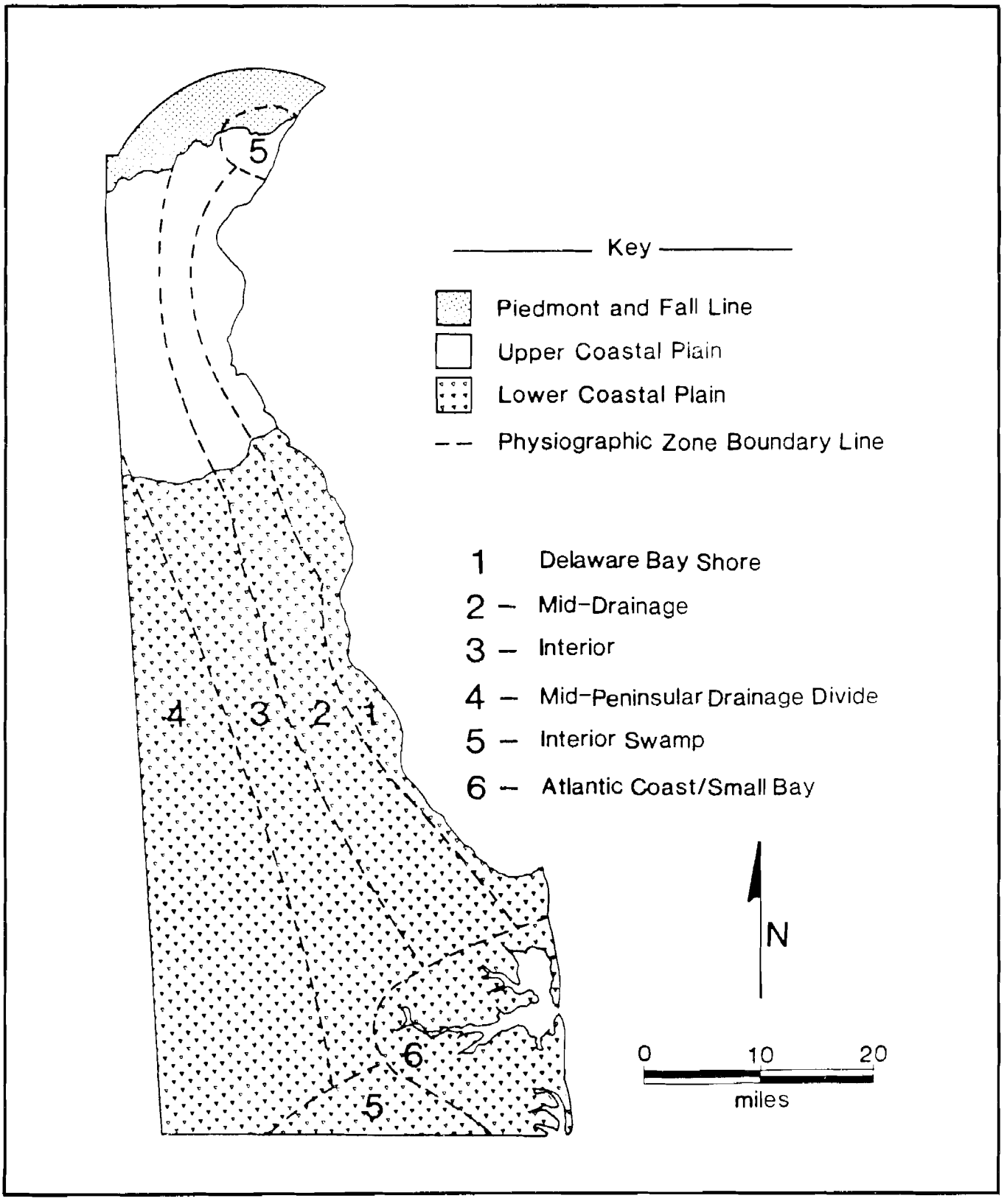
Overviews of the regional environmental setting for the site and the regional prehistory of northern Delaware are presented below along with discussions of the methodology, research goals, previous archaeological work and results of the archaeological testing.

ENVIRONMENTAL SETTING

The Lewden Green Site is located within the High Coastal Plain of Delaware just to the south of the Fall Line adjacent to the middle reaches of the Christina River, a high order tributary of the Delaware River (Figure 2). The High Coastal Plain, which is located between the Fall Line and the Smyrna River, is characterized by a rolling topography and elevation differences which can range up to 16 meters (50 feet) from the headlands bordering high order streams to adjacent floodplain marshes. These differences are sufficient to cause varied distributions of plant and animal species (Braun 1967:246-247). Watercourses are deeply incised. Most streams are not completely tidal and the freshwater/saltwater mix allows for a wide range of resources. Soils include a variety of well-drained and poorly drained settings that are distributed in a mosaic pattern across the region.

FIGURE 2

Physiographic Zones



A variety of environmental settings can be found in the area around the site including open woodlands, grasslands, and a variety of swamps and marshes. The primary determinants of this local environmental variability are soil drainage and hydrology. The soils of the area are reflective of the underlying lithology and consist of slightly plastic silty and clayey soils derived from Pleistocene fluvial deposits (Matthews and Lavoie 1970). Slopes are generally on the order of two to five percent although they frequently range to 10 percent. In the upland areas, the pedogenic sequences may be markedly abbreviated as a result of erosion and deflation. Soils in the immediate vicinity of the Christina River are comprised of tidal marsh sediments on the north bank, and redeposited sandy alluvial soils on the south bank. Some wind-blown aeolian sediments may also exist in this area.

The Lewden Green Site is located adjacent to the Christina River which is fed by a number of low order intermittent and perennial streams and springs, including Eagle Run, a perennial tributary which empties into the Christina River from the northwest, just across the Christina River from the Lewden Green Site (Figure 3). The Christina River is tidal to Smalley's Pond, a distance of approximately 15.8 miles from its mouth near Wilmington, and has provided a focus for prehistoric settlement and historic period commerce and industry. The economic success of the town of Christiana has been dependent on the ability to keep the river open for efficient water-oriented transportation (Catts, Hodny, and Custer 1989). The present configuration of the Christina River is a result of this marine dependence because in

the 1820s the river was channelized just below the Route 7 bridge in an effort to compete with the construction of the Chesapeake and Delaware Canal. Figure 3 shows the location of the canal which removed the "Great Bend" of the Christina River. In fact, the body of water adjacent to the site is actually the canal, not the Christina River itself.

An additional important environmental feature of the surrounding area is Churchman's Marsh, which is located at the confluence of the Christina River and the White Clay Creek approximately two miles east of the project area (Figure 4). Churchman's Marsh is now a large tidal wetland covering almost 400 acres. Analysis of DelDOT's soils and drill cores from the construction of Interstate Route 95 (Custer 1982) indicates that rising interior water tables probably caused the initial formation of a freshwater swamp in this area around 8,000 years ago. As sea level rose during the last 8,000 years, the swamp became increasingly brackish and eventually became tidal. The initial swamp, and later tidal marsh, are especially productive environments for prehistoric groups, and the proximity of the marsh to the Fall Line ecotone, which is a transition zone between the Coastal Plain and the Piedmont, enhances its desirability as a habitation area for prehistoric groups. During historic times, the marsh was drained through a system of dikes and ditches and salt hay was grown in the marsh as part of horse farming ventures in the surrounding area (Figure 5). The dike system was destroyed by flooding in the 1930s and never repaired, and the marsh again flooded during high tides. However, the recent construction of I-95 interrupted tidal flow to the

southern half of the marsh and only the northern half retains its wetland characteristics.

The combination of varied hydrological settings and varied soils in the vicinity of the Lewden Green Site provided a variety of different environmental settings that could have been utilized by the site's inhabitants during the past 13,000 years of prehistoric occupation of the region. Table 1 lists the varied environments through time for the major drainage floodplains and the headlands and interior areas during the past 10,000 years based on local paleoenvironmental studies (Custer 1982, 1984; Custer and Watson 1987). Figure 6 shows a generalized cross-section of the study area and shows the locations of the floodplains, bluffs, and interior areas noted in Table 1.

TABLE 1

LOCAL PALEOENVIRONMENTS

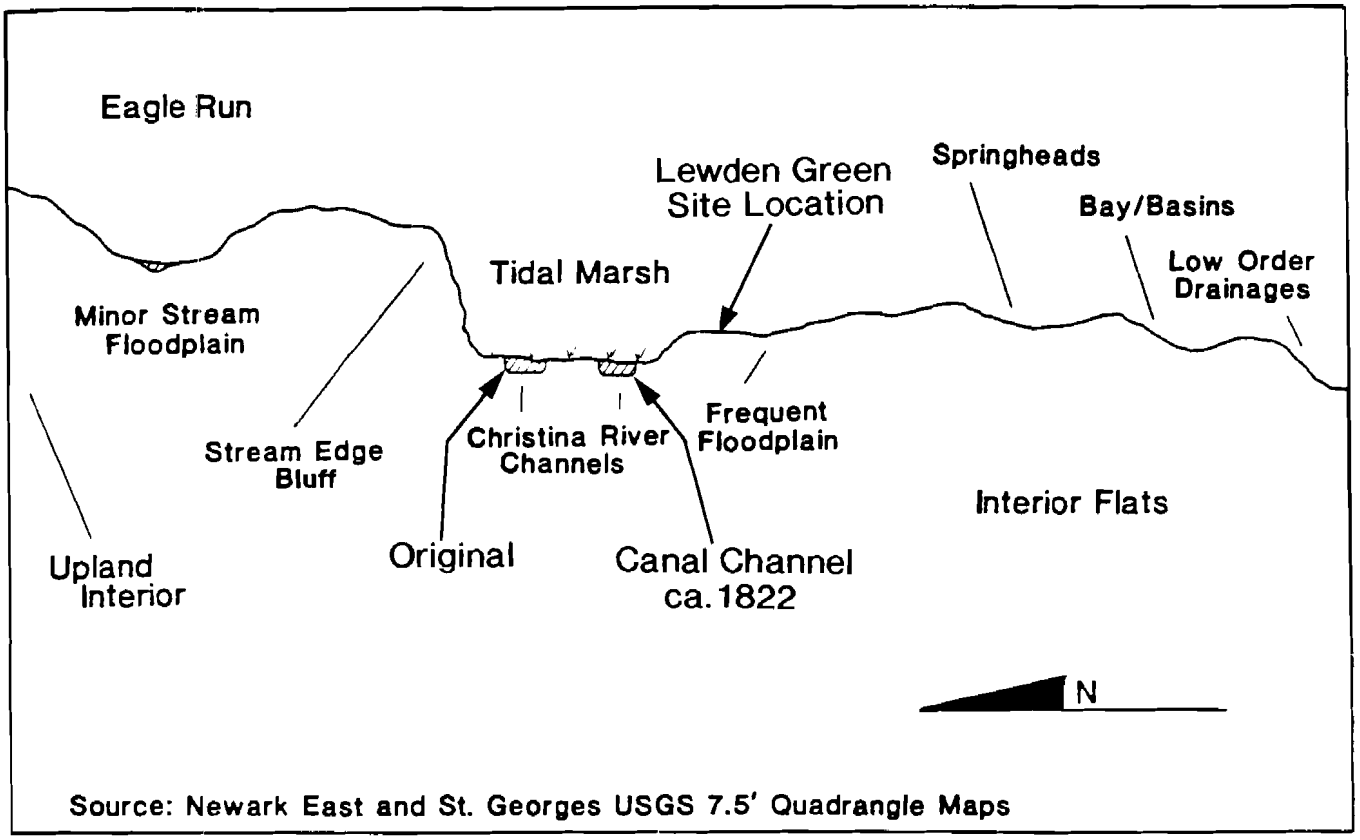
Date	Floodplain Margins	Bluffs and Interior
prior to 6500 B.C.	deciduous gallery forests	Scattered grasslands and boreal woodlands
6500-3000 B.C.	mixed oak/hemlock gallery forest	Hemlock/oak woodland
3000-800 B.C.	deciduous gallery forests	Open oak/hickory woodland with scattered grasslands
800 B.C.-recent	deciduous gallery forests	Mixed oak-chestnut woodland

Source: Custer 1982, 1984; Custer and Watson 1987

Lithic resources which would have been available to prehistoric inhabitants of the Lewden Green Site consisted of primary outcrops and secondary cobble resources (Custer and Galasso

FIGURE 6

Generalized Cross-Section of the Study Area



Source: Newark East and St. Georges USGS 7.5' Quadrangle Maps

1980). Aboriginal populations utilized locally available secondary resources of jasper, chert, quartz, quartzite, and chalcedony which had been laid down as bed deposits by the ancestral Susquehanna and Delaware Rivers. High quality primary resources were not immediately available in the Route 7 corridor, but could be found in nearby areas (Custer, Ward, and Watson 1986). "Newark jasper" and "Cecil black flint" are found in the Newark gabbro formation in the western portion of northern Delaware and southeastern Pennsylvania, especially in the vicinity of Iron Hill. "Broad Run chalcedony" is found in the chert outcrops of eastern Maryland, northern Delaware and southeastern Pennsylvania.

In sum, the Lewden Green Site is located in an especially rich environmental setting. On a large scale, the site is located near the Fall Line, a major ecotone transition zone between the Piedmont Uplands and the High Coastal Plain. On a small scale, the local floodplains, uplands, and wetlands in the vicinity of the site provided a wide range of micro-environments which could be exploited by the site's prehistoric inhabitants (Custer and De Santis 1986:21).

REGIONAL PREHISTORY

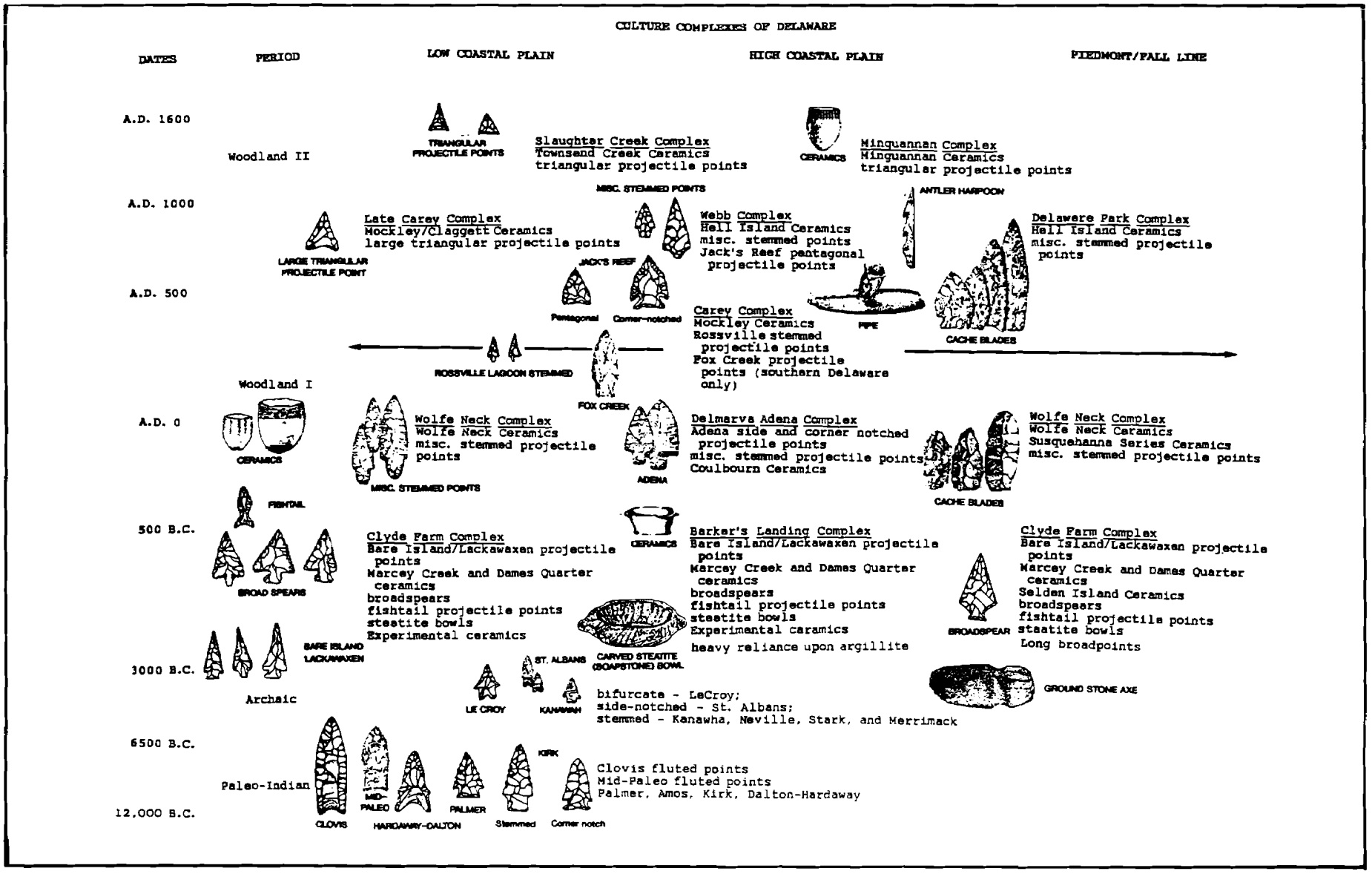
The prehistoric archaeological record of northern New Castle County area can be divided into four blocks of time: the Paleo-Indian Period (ca. 12,000 B.C. - 6500 B.C.), the Archaic Period (6500 B.C. - 3000 B.C.), the Woodland I Period (3000 B.C. - A.D. 1000), and the Woodland II Period (A.D. 1000 - A.D. 1650). A fifth time period, the Contact Period, may also be considered and includes the time period from A.D. 1650 to A.D. 1750, the approximate date of the final Indian habitation of northern Delaware in anything resembling their pre-European Contact form (Figure 7). Each of these periods is described below and the descriptions are summarized from Custer (1984) and Custer and De Santis (1986).

Paleo-Indian Period (12,000 B.C. - 6500 B.C.)

The Paleo-Indian Period encompasses the time period of the final disappearance of Pleistocene glacial conditions from Eastern North America and the establishment of more modern Holocene environments. The distinctive feature of the Paleo-Indian Period is an adaptation to the cold, and alternately wet

FIGURE 7

Prehistoric Chronological Chart



and dry, conditions at the end of the Pleistocene and the beginning of the Holocene. This adaptation was primarily based on hunting and gathering, with hunting providing a large portion of the diet. Hunted animals may have included now extinct megafauna and moose. A mosaic of deciduous, boreal, and grassland environments would have provided a large number of productive habitats for these game animals throughout Delaware, and watering areas would have been particularly good hunting settings.

Tool kits of the people who lived at this time were oriented toward the procurement and processing of hunted animal resources. A preference for high quality lithic materials has been noted in the stone tool kits and careful resharpening and maintenance of tools was common. A lifestyle of movement among the game attractive environments has been hypothesized with the social organizations being based upon single and multiple family bands. Throughout the 5500 year time span of the period, the basic settlement structure remained relatively constant with some modifications being seen as Holocene environments appeared at the end of the Paleo-Indian Period.

Numerous Paleo-Indian sites are noted for northern Delaware including hunting and processing sites near Hockessin and adjacent to the Wilmington Medical Center, possible quarry sites near Iron Hill, and isolated point finds.

Management plans for prehistoric cultural resources in Delaware (Custer 1986; Custer and De Santis 1986) indicate that the Lewden Green Site is within a Study Unit where only occasional hunting/gathering procurement sites are expected.

While most of the study area features an environment of closed boreal forest vegetation, floodplains of some of the larger drainages, the Delaware River shore, and scattered poorly drained springheads and streams would have been attractive hunting locations during this period (Custer and De Santis 1986).

Archaic Period (6500 B.C. - 3000 B.C.)

The Archaic Period is characterized by a series of adaptations to the newly emerged full Holocene environments. These environments differed from earlier ones and were dominated by mesic forests of oak and hemlock. A reduction in open grasslands in the face of warm and wet conditions caused the extinction of many of the grazing animals hunted during Paleo-Indian times; however, browsing species such as deer flourished. Sea level rise was also associated with the beginning of the Holocene Period in northern Delaware. The major effect of the sea level rise was to raise the local water table, which helped to create a number of large swamps, such as Churchman's Marsh. Adaptations changed from the hunting focus of the Paleo-Indians to a more generalized foraging pattern in which plant food resources would have played a more important role. Large swamp settings such as Churchman's Marsh supported large base camps as indicated by the remains at the Clyde Farm Site. A number of small procurement sites in favorable hunting and gathering locales are also known in northern Delaware.

Tool kits were more generalized than earlier Paleo-Indian tool kits and showed a wider array of plant processing tools such as grinding stones, mortars, and pestles. A mobile lifestyle was

probably common with a wide range of resources and settings utilized on a seasonal basis. A shifting band-level organization which saw the waxing and waning of group size in relation to resource availability is evident.

The Lewden Green Site is located within a Study Unit which, during the Archaic Period, had low potential for procurement sites except along flowing surface watercourses and near the small poorly-drained swamps that would have been found in the area (Custer and De Santis 1986).

Woodland I Period (3000 B.C. - A.D. 1000)

The Woodland I Period can be correlated with a dramatic change in local climates and environments that seems to have been a part of events occurring throughout the Middle Atlantic region. A pronounced warm and dry period set in and lasted from ca. 3000 B.C. to 1000 B.C. Mesic forests were replaced by xeric forests of oak and hickory, and grasslands again became common. Some interior streams dried up, but the overall effect of the environmental changes was an alteration of the environment, not a degradation. Continued sea level rise also made many areas of the Delaware River and Bay shore the sites of large brackish water marshes which were especially high in productivity. The major changes in environment and resource distributions caused a radical shift in adaptations for prehistoric groups. Important areas for settlements included the major river floodplains and estuarine swamp/marsh areas. Large base camps with fairly large numbers of people are evident in many areas of northern New Castle County such as the Delaware Park Site, the Clyde Farm Site, the Crane Hook Site, and the Naamans Creek Site. These

sites supported many more people than previous base camp sites and may have been occupied on nearly a year-round basis. The overall tendency was toward a more sedentary lifestyle.

The overall tool kits show some minor variations as well as some major additions from previous Archaic tool kits. Plant processing tools became increasingly common and seem to indicate an intensive harvesting of wild plant foods that may have approached the efficiency of horticulture by the end of the Woodland I Period. Chipped stone tools changed little from the preceding Archaic Period; however, more broad-bladed knife-like processing tools became prevalent. Also, the presence of a number of non-local lithic raw materials indicates that trade and exchange systems with other groups were beginning to develop. The addition of stone, and then ceramic, containers is also seen. These items allowed more efficient cooking of certain types of food and may also have functioned as storage for surplus food resources. Storage pits and house features during this period are also known from the Delaware Park Site and the Clyde Farm Site. Social organizations also seem to have undergone radical changes during this period. With the onset of relatively sedentary lifestyles and intensified food production, which might have produced occasional surpluses, incipient ranked societies may have begun to develop, as indicated by the presence of extensive trade and exchange and some caching of special artifact forms. By the end of the Woodland I Period, a relatively sedentary lifestyle existed in northern Delaware.

The Lewden Green Site is located within a Study Unit which, during the Woodland I Period, consisted of all the floodplain areas of the major drainages within present-day northern New Castle County (Custer and De Santis 1986:49). This location would have high site potential because it represents a dependable surface water setting in the face of the warm and dry conditions of the mid-Holocene. The Study Unit within which the Lewden Green Site is located has the potential to yield either base camps or procurements sites (Custer and De Santis 1986).

Woodland II Period (A.D. 1000 - A.D. 1650)

In many areas of the Middle Atlantic, the Woodland II Period is marked by the appearance of agricultural food production systems; however, settlements of the Woodland I Period, especially the large base camps, were also occupied during the Woodland II Period and very few changes in basic lifestyles and artifact assemblages are evident. Intensive plant utilization and hunting remained the major subsistence activities up to European Contact. Similarly, no major changes are seen in social organization for the Woodland II Period of northern Delaware.

The Management Study Unit for the Woodland II Period, which includes the Lewden Green Site, remains the same as those of the Woodland I, supporting the observation that many of the Woodland I base camp locations continued to be occupied in the subsequent period with little change in artifact assemblages (Custer and DeSantis 1986.

Contact Period (A.D. 1650 - A.D. 1750)

The Contact Period is an enigmatic period of the archaeological record of northern Delaware which began with the

arrival of the first substantial numbers of Europeans in Delaware. The time period is enigmatic because few Native American archaeological sites that clearly date to this period have yet been discovered in Delaware, although numerous Contact Period sites are evident in southeastern Pennsylvania. It seems clear that Native American groups of Delaware did not participate in much interaction with Europeans and were under the virtual domination of the Susquehannock Indians of southern Lancaster County, Pennsylvania. The Contact Period ended with the virtual extinction of Native American lifeways in the Middle Atlantic area except for a few remnant groups.

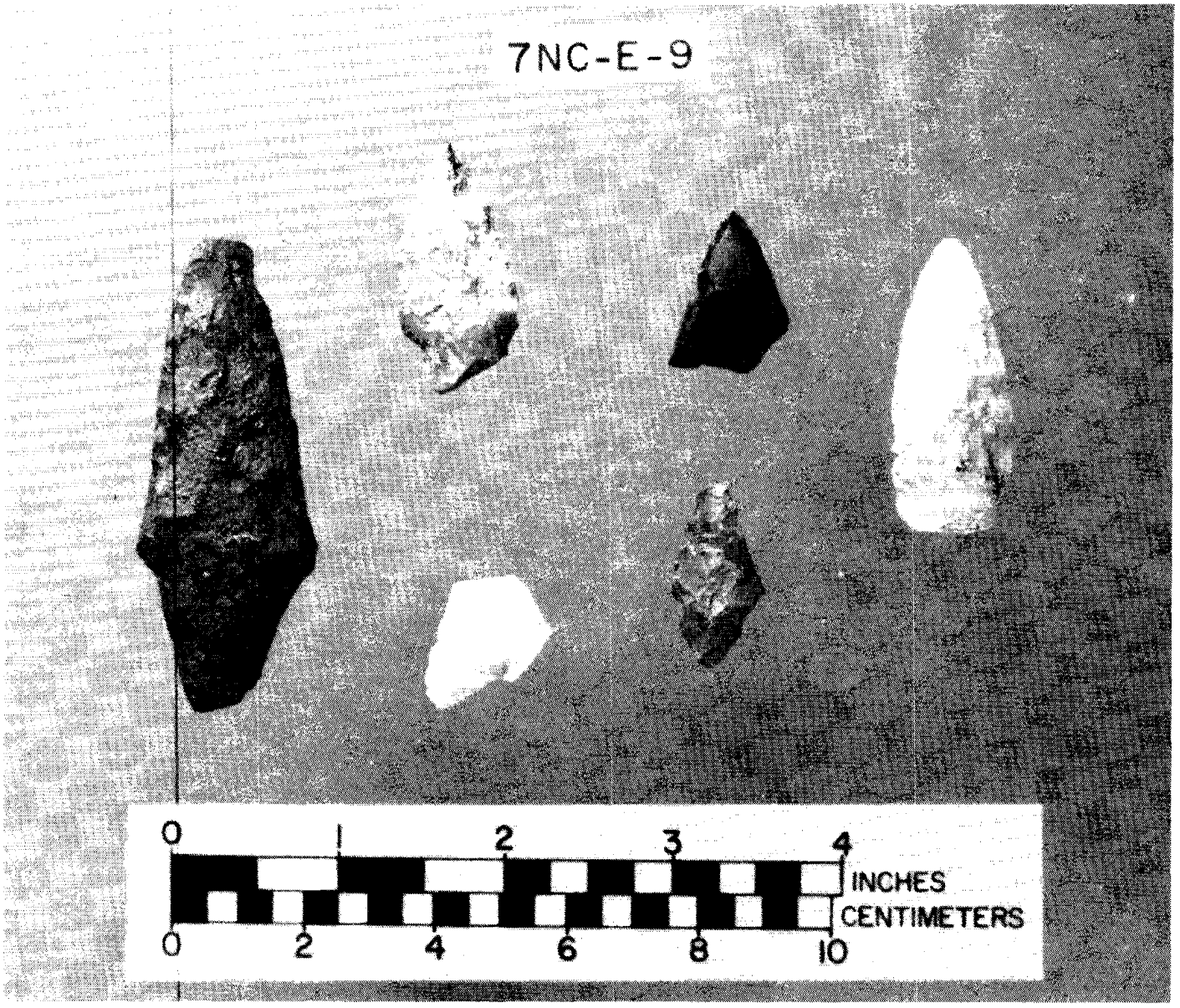
PREVIOUS INVESTIGATIONS

The Lewden Green Site, 7NC-E-9, was originally identified by H. Geiger Omwake and Douglas Ubelaker in December of 1977. Ceramics were collected from the site including one Wolfe Neck cord-marked sherd and two Hell Island cord-marked types. These ceramics date to the Delaware Park and Wolfe Neck complexes of the Woodland I Period (ca. 500 B.C. - A.D. 1000).

During the survey of the Route 7 South Corridor (Catts et al. 1988), initial testing of the site was undertaken. Phase I testing conducted by DelDOT archaeologists consisted of a surface survey and subsurface testing consisting of nine 75cm x 75cm test units (Nos. 35-38 and 40-44 - Figure 8). This testing was conducted in March of 1982, and produced small numbers of both historic and prehistoric artifacts (Figure 9). Most of these artifacts were found in the plowzone; however, soil profiles initially seemed to indicate various episodes of periodic erosion

FIGURE 9

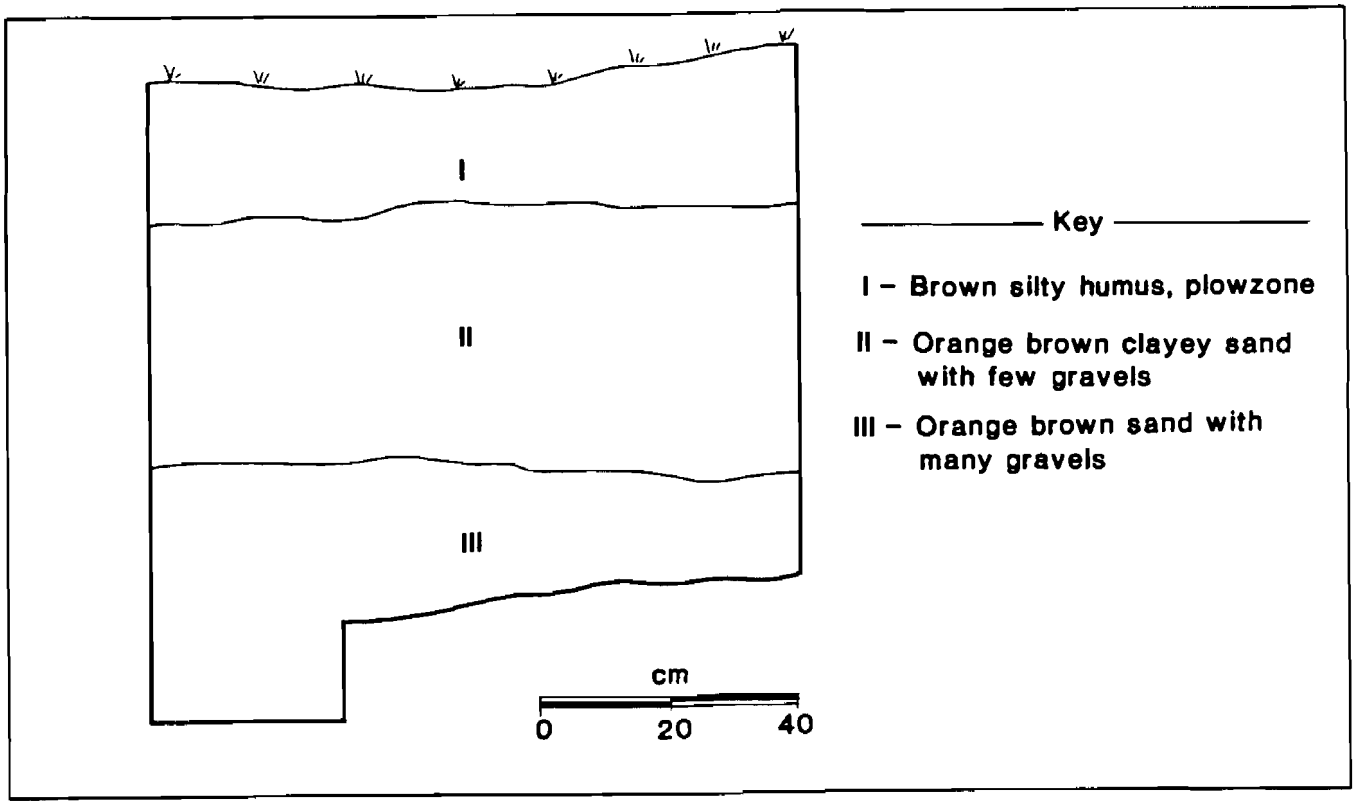
Lithics Recovered from 7NC-E-9, Lewden Green Park, Phase I Testing



LEFT: Ironstone contracting stemmed point.
CENTER TOP (Left to Right): Jasper distal stemmed point section; Chert bifacially worked flake tool.
CENTER BOTTOM (Left to Right): Chert indented base triangular projectile point fragment; Jasper stemmed projectile point tool.
RIGHT: Quartz distal projectile point/knife section.

FIGURE 10

Representative Profile - Phase I Testing - Lewden Green Site



and deposition (Figure 10).

Phase II testing, consisting of an additional 66 75cm x 75cm test units and 58 shovel test pits, were undertaken by DelDOT archaeologists during July and August of 1982 (Figure 11). More prehistoric artifacts were recovered during these excavations and most came from disturbed plowzone contexts. During the course of this Phase II testing, the ROW of the proposed Route 7 alignment was moved to the west of its original location (Figure 12). Additional Phase II testing was required and undertaken by archaeologists from the University of Delaware Center for Archaeological Research. This report described the results of all Phase II testing at the site.

While Phase II testing was being undertaken within the DelDOT ROW, additional archaeological testing was undertaken in a portion of the Lewden Green Site that was being affected by the construction of a sewer line (Figure 13) (Lewis, Basalik, and Brown 1987). Where possible, data from these site excavations were utilized to enhance the analysis of data from the DelDOT ROW.

RESEARCH DESIGN AND RESEARCH METHODS

The main goals of Phase II testing at the Lewden Green Site were to determine its limits and assess the integrity and significance of any archaeological materials found within the proposed ROW. Specifically, the Phase II excavations sought to determine if any archaeological remains were present in in situ conditions in sub-plowzone contexts, including buried landscapes or prehistoric subsurface features.

Because the site is located adjacent to the present course of the Christina River, and because initial examination of the site stratigraphy (Lewis, Basalik, and Brown 1987:43) suggested that landscapes less than 10,000 years old could have been buried at the site by either alluvial or colluvial processes, a series of 98 1m x 1m test units were excavated at regular 10m intervals across the site, in addition to the 66 75cm x 75cm units previously excavated by the DelDOT archaeologists (Figure 14, Plate 2). All of these units were excavated to depths where they encountered Pleistocene-age gravels or micaceous sand deposits in order to test for the presence of buried landscapes. All soils were screened through 1/4-inch mesh and subsoil surfaces examined

PLATE 2

Phase II Testing

for the presence of cultural features.

All artifacts were washed and marked using the standard accession system developed by the staff of the Island Field Museum. Lithic artifacts were analyzed for blood residues following protocols developed by UDCAR (Custer, Ilgenfritz and

Doms 1988) and sorted by raw materials and functional categories including projectile point/knives, bifaces, retouched flake tools, ground stone tools, and debitage. Presence or absence of cortex was noted to study cobble utilization, and bifaces were sorted into discards and rejects following the work of Callahan (1979) to study tool manufacturing activities. Ceramics were sorted by the major varieties noted for Delaware (Custer 1984). Surface treatments, design motifs (if present), and paste attributes were also noted. Where textile or cordage impressions were present on ceramic sherds, clay impressions were made to study cordage and textile technologies.

RESULTS AND INTERPRETATIONS

SITE STRATIGRAPHY

As was noted in the discussion of the research design and field methods, there was some question as to whether buried landscapes, which could have been living surfaces for prehistoric groups, were present at the site. Initial inspection of profiles of the DelDOT Phase II test units by a consulting pedologist seemed to indicate that such landscapes could be present (Cunningham 1984; Catts et al. 1988:126). The same consultant looked at site profiles from the sewer line excavations and concluded that the soils in the sewer line ROW consisted primarily of a recent plowzone 30-35cm thick underlain by clay loams with gravels that contained no artifacts and were probably of early Holocene/Late Pleistocene age, more than 10,000 years old (Lewis, Basalik, and Brown 1987:43-44; Geo-Sci Consultants, Inc. Report of Investigation Form 7/9/85). However, the sewer