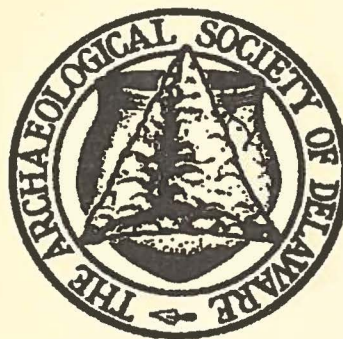


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**“SLOVENLINESS WILL NOT BE TOLERATED:”
GOVERNMENT REGULATION AND THE BOMBAY HOOK LIGHT STATION,
DUCK CREEK, KENT COUNTY, DELAWARE**

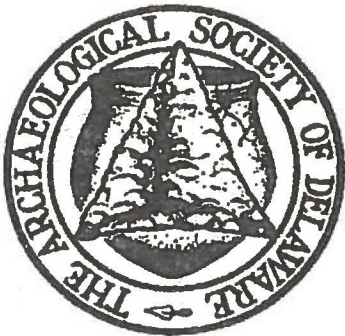
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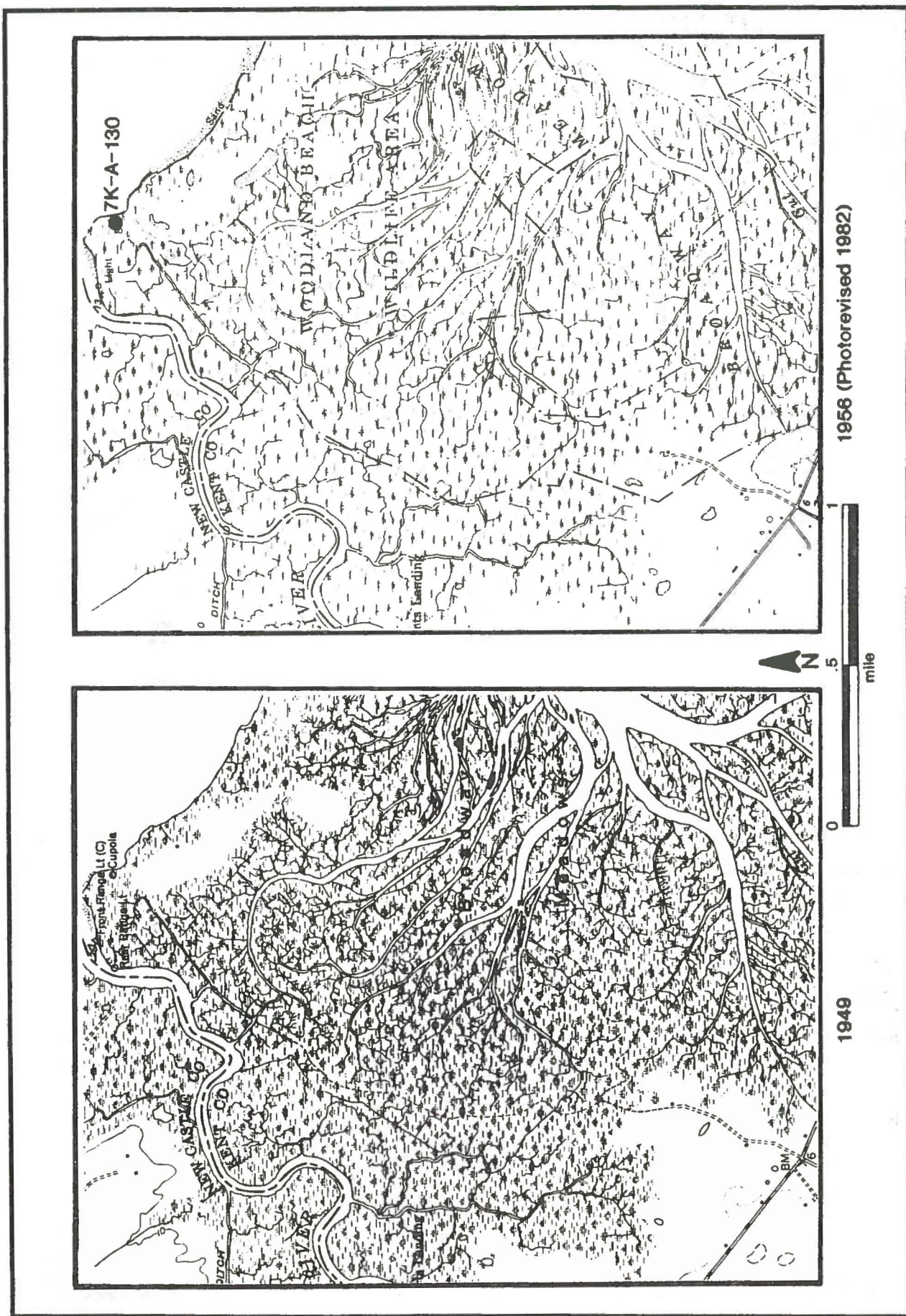


FIGURE 1. USGS Maps of Smyrna Quadrangle, Kent County, Delaware Site Location.

"Slovenliness will not be Tolerated:" Government Regulation and the Bombay Hook Light Station, Duck Creek, Kent County, Delaware

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INTRODUCTION

The Bombay Hook Light Station (7K-C-130) stood on the southern shore of the Smyrna River Thoroughfare outlet into Delaware Bay from 1831 until its demolition in the 1970s (Figure 1). Now an archaeological site located in the Woodland Beach Wildlife Preserve, Kent County, the Light Station had served ship and boat captains until 1912. Over its 81 year history as a lighthouse (Plates 1 and 2), only three keepers' and their families had lived at and operated the Light Station - Duncan Stewart and family (1831-1862), Joseph Benson and family (1862-1908), and William Salmons and family (1908-1912).

In 1991, the University of Delaware Center for Archaeological Research conducted an intensive archaeological survey and archival research into the Light Station's history. Funded by the Center for Archaeological Research and the Delaware Bureau of Archaeology and Historic Preservation with funds from the National Park Service's Bicentennial Lighthouse Fund, the project's purpose was to determine the site's eligibility for the National Register of Historic Places and to begin to evaluate Delaware's historic aids-to-navigation as historical archaeological resources.

This article highlights the process of evaluating the significance and archaeological research potential of the Light Station. The Station represents a site type virtually unique in Delaware, a pre-1850 lighthouse and keeper's house. The site is, however, well documented in the archival record and its integrity has been seriously compromised in many ways. This combination of factors complicated the evaluation process considerably. One of the few lighthouse and keeper's houses in the United States investigated by archaeologists, the Bombay Hook Light Station Site presents the opportunity to compare the life of the lighthouse keeper and his family with the lives of their neighboring farmers, farm tenants, farm laborers, watermen, and craftsmen. Moreover, the site offers the potential to investigate the impact of government regulation on the lives of the lighthouse keeping families, exemplified in the quote from the Directions and Instructions to Lighthouse Keepers, "Slovenliness will not be tolerated" (United States Light-house Establishment 1871). Although placing the lighthouse keeping families in the local community context will require more extensive archaeological research at the Light Station Site, the current research can begin to address the impact of government regulation. Specifically, the documented concern of the United States government with "appearances" at the lighthouses will be contrasted with the reality of conditions at the Bombay Hook Station by analyzing the evidence for landscaping and the use of space, and by comparing the nature and distribution of artifacts recovered from the Station's yards and features with those from two local nineteenth-century farmstead sites, the H. Wilson-Lewis Site (7K-C-375, K06414) and the Moore-Taylor Site (7K-C-380, K06432) (Gretler, et al. 1991). The research process and methods, findings, and recommendations are presented in the following sections.

PROJECT METHODOLOGY

Criteria for National Register Eligibility

The first step involved establishing the criteria for determining the National Register eligibility of the Bombay Hook Light Station. Developing explicit criteria against which to measure the results of the Light Station research proved invaluable in evaluating whether the Light Station's archaeological record can contribute significant information to an understanding of American history and culture [National Register criterion no. 4]. The resource types outlined below were identified as potentially comprising the significant archaeological record of light house and keeper's house

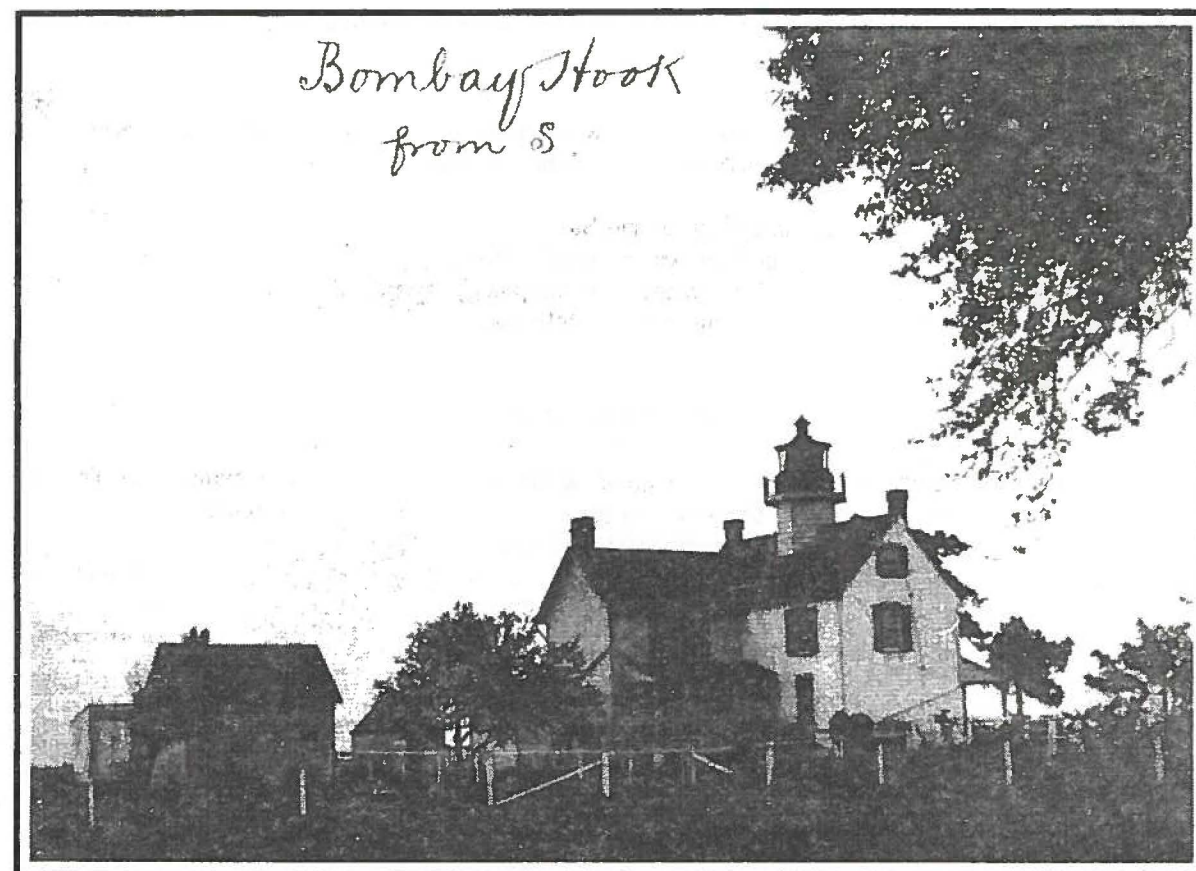


PLATE 1. South View of the Bombay Hook Light Station ca. 1897.

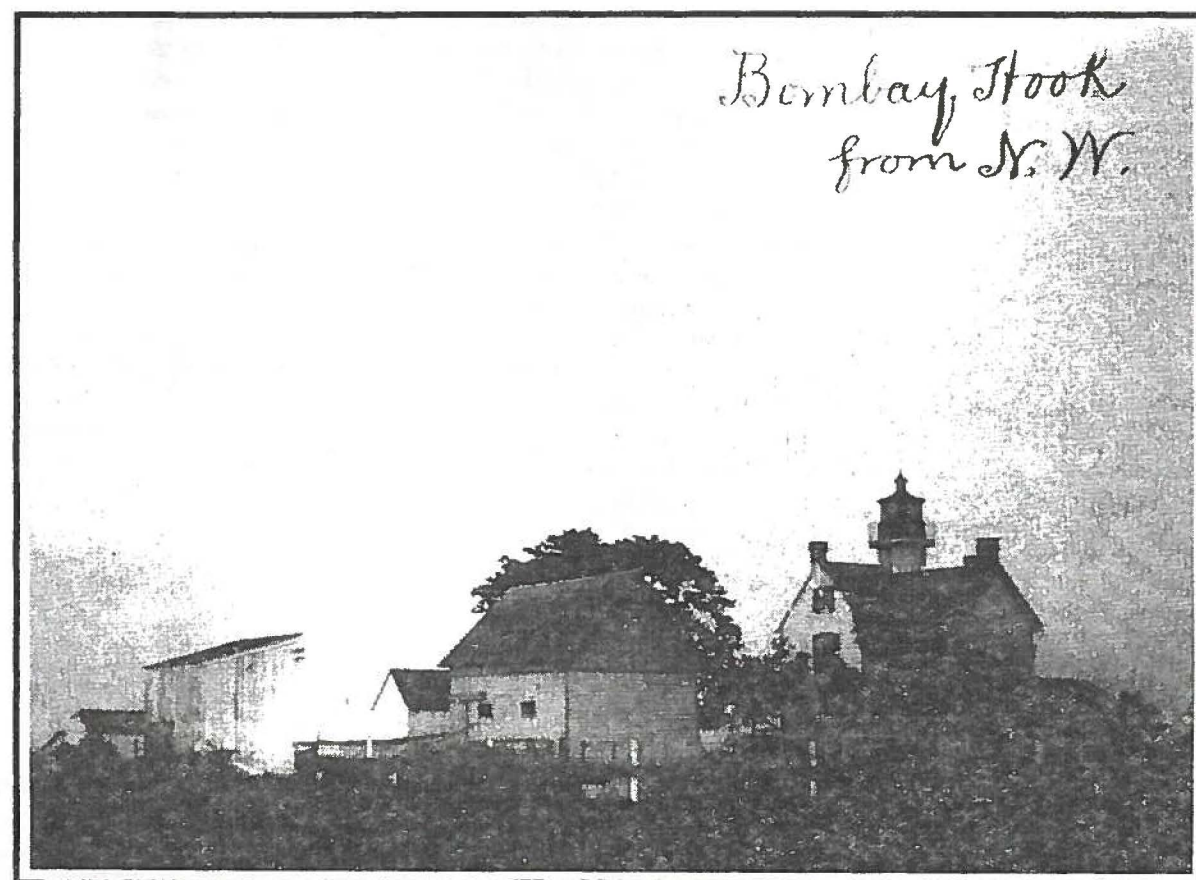


PLATE 2. Northwest View of the Bombay Hook Light Station ca. 1897.

sites. The Bombay Hook Light Station Site would exhibit integrity and thus be eligible for the National Register if any of the following survived substantially undisturbed and if the archaeological resources contribute supplementary, complementary and/or alternative information to that contained within historic documents.

- 1) Structures. Archaeological evidence of the location, construction history, and uses of the lighthouse, keeper's house, and auxiliary structures.
- 2) Physical Environment and Landscape. Archaeological evidence of the Light Station's physical environment and landscape and their evolution.
- 3) Activity Areas. Archaeological evidence of the location, extent and temporal duration of the various activities undertaken at the Light Station: domestic activities, home production of various goods, subsistence agriculture, hunting, fishing and gathering, lighthouse maintenance and repair activities, the provision of visitor services, status display activities, and trash disposal.
- 4) Domestic Economy Artifacts. The cultural artifacts associated with the domestic economy of the lighthouse keeper's family.
- 5) Lighthouse Artifacts. The cultural artifacts associated with the lighthouse's maintenance, repair and operation.
- 6) Visitor Service Artifacts. The cultural artifacts associated with the provision of visitor services by the lighthouse keeper.

Archival Research

The archival research was designed to serve two purposes:

- 1) to determine the nature and extent of the information contained within the extant historical documents;
- 2) to establish a base history of
 - a) the construction, renovation, and demolition of the structures and other landscape features at the Bombay Hook Light Station;
 - b) land use and alteration at the site;
 - c) the various activities undertaken by the keepers' families;
 - d) the lighthouse keepers and their families.

The United States government administers the nation's aids-to-navigation and a search of federal records housed at the National Archives in Washington, D. C. produced much information on the Light Station's physical history, including a set of photographs of the Bombay Hook Light Station, dated 1897 (Plates 1 and 2). Other sources in other repositories illuminated the social history of the Light Station Site - the keepers, their families, and their lives. United States Census Records (1840-1910), Duck Creek Hundred tax records (1831-1896), and probate records all yielded important information.

Archaeological Research

Archaeological testing at the Bombay Hook Light Station was designed to provide data on:

- 1) the boundaries of the site;
- 2) the nature and temporal range of the archaeological resources;
- 3) the integrity of the archaeological resources;
- 4) the information potential, and hence significance, of the archaeological resources.

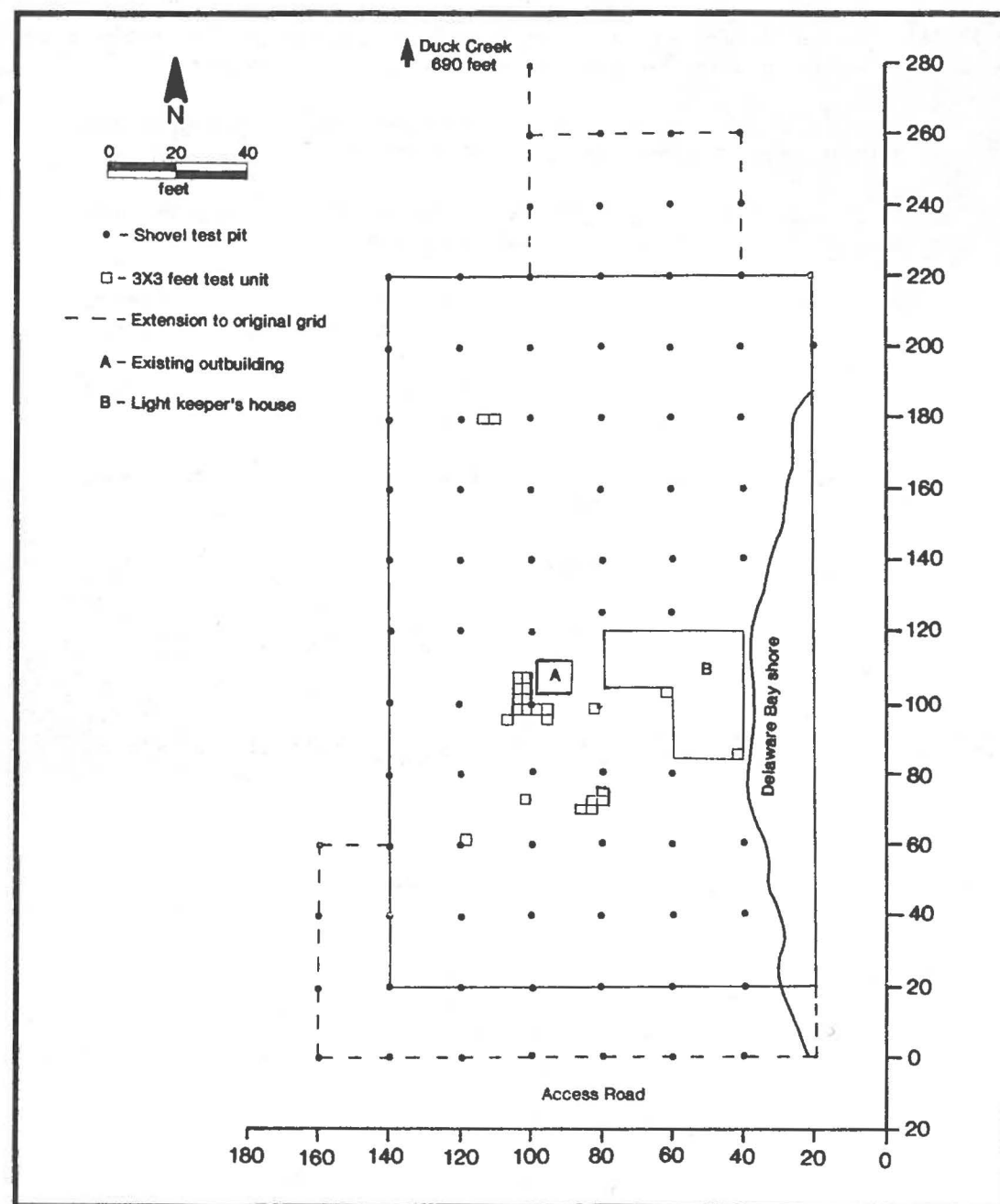


FIGURE 2. Archaeological Base Map, Bombay Hook Light Station and Keeper's House Site.

In order to discern the site limits, the team laid out a grid, aligned along the lighthouse's foundation walls (Figure 2), over the "island" of fast land on which the lighthouse stands. The Delaware Bay bounds this "island" to the east and marshlands surround it on the other three sides. This grid also encompasses the core of the lighthouse compound as illustrated in a 1899 survey plan (Figure 3).

Eighty-two shovel test pits (STPs) were excavated at 20-foot intervals within this grid area (Figure 2). These tests were expected to yield information on the site's stratigraphy (and its integrity). Moreover, artifact distributions would assist in identifying the site's boundaries and activity areas, and in deciding on the placement of other test units.

The second phase of the intensive survey consisted of excavating a sample of 3- x 3-foot test units in areas of high artifact concentrations (as exhibited in the STPs), in and around the lighthouse keeper's house structure itself, and in areas with high surface concentrations of artifacts or exhibiting other surface anomalies. A total of 24 test units was ultimately excavated (Figure 2).

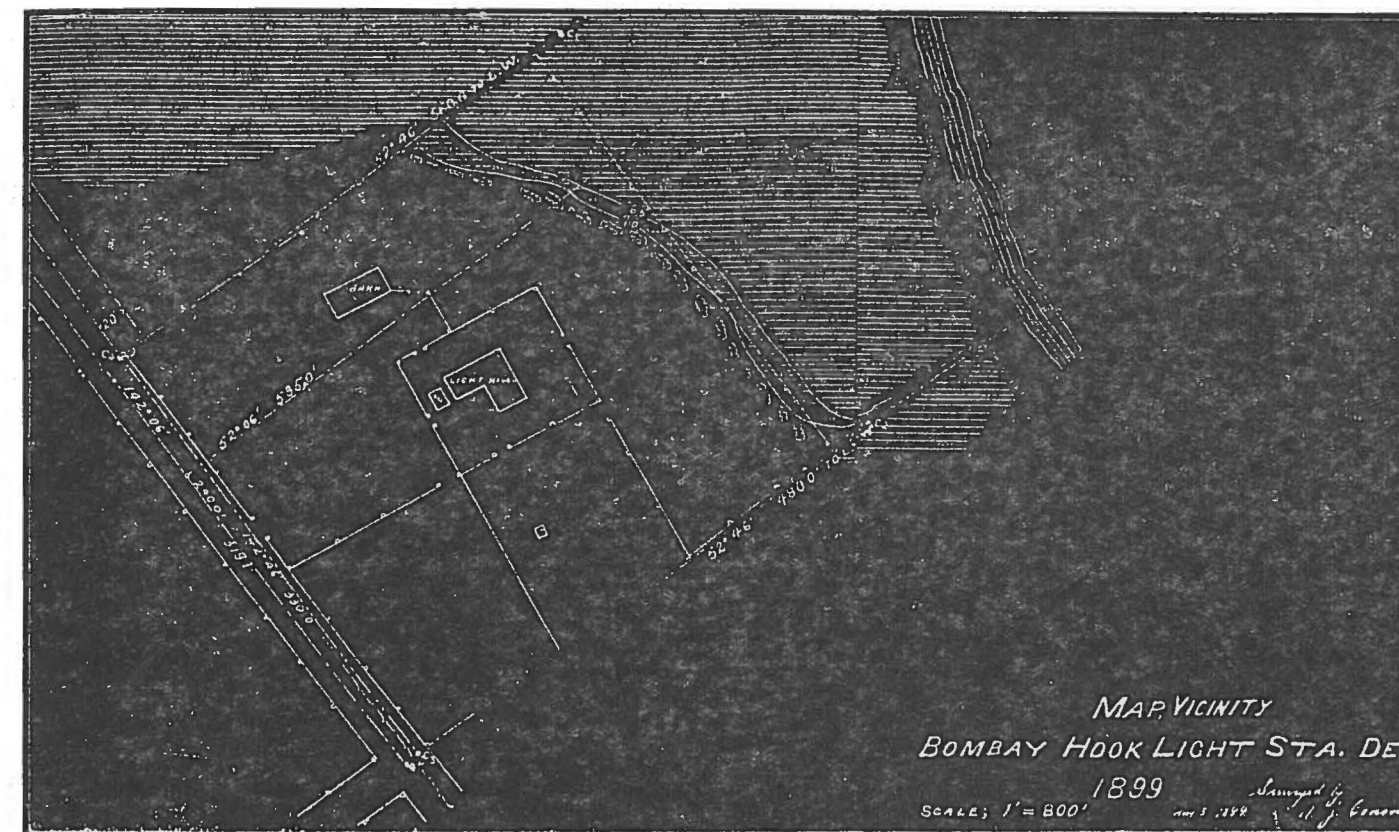


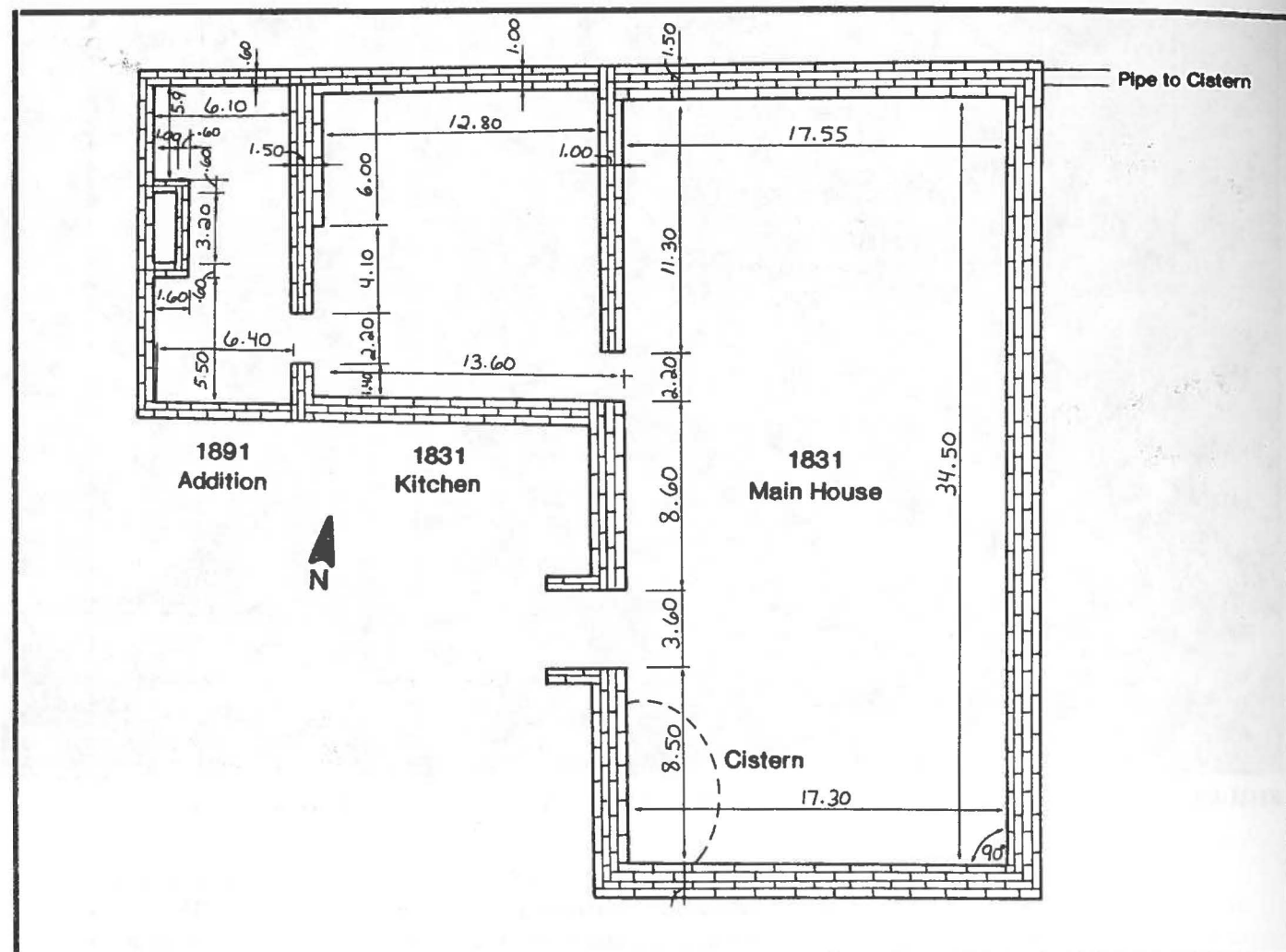
FIGURE 3. Map, Vicinity of Bombay Hook Light Station, 1899 - National Archives, Washington D.C.

All STPs and test units were excavated by hand following natural strata, and when these strata exceeded 0.4 feet in thickness, in arbitrary 0.4-foot thick strata. All soils were dry-screened through 1/4-inch hardware mesh. The excavations were recorded on field forms, through black and white (print) and color (slide) photographs, and in sketch and measured plan and profile drawings. Artifacts were collected by provenience; collection was 100% with the exception of architectural materials such as brick, mortar, plaster, and wood. Brick was weighed and discarded in the field, except for a series of randomly selected samples. The presence of the other building materials was noted, and diagnostic samples collected. All artifacts were cataloged by provenience and processed in accordance with the standard processing procedures of the Delaware State Museums.

Research Results

This summary of the historical archaeological research at the Bombay Hook Light Station Site is organized into six sections, thus addressing each of the six potentially significant resource categories noted earlier. Each section summarizes the historical documentation and archaeological resources discovered relating to that resource category and discusses their integrity. (For a more comprehensive presentation of the research findings, see De Cunzio and Silber 1992). A conclusion section then presents the comparative analysis and interpretations of the impact of government regulation on the lighthouse keeping families, along with the conclusions regarding the site's significance and research potential as measured against the established criteria.

The Lighthouse and Keeper's House Structure and Outbuildings. The site's physical history is comparatively well documented. An 1831 construction contract (U. S. Lighthouse Board 1831) describes the lighthouse/keeper's house in detail, while inspection reports of 1838 (Porter 1838), 1851 (Fifth Auditor of the Treasury 1851), c. 1878 (U. S. Lighthouse c.1878), 1896 (Bixby 1896) and 1907 (Dept. of Commerce and Labor 1907), maintenance and repair records from 1831-1912, a survey map of 1899 (U. S. Lighthouse Board 1899) (Figure 3), and photographs from 1897 (U. S. Lighthouse Board 1897) (Plates 1 and 2) and 1909 (Caley 1978:138) record changes and the Station's appearance at several points. No graphic representations of the Station have yet been uncovered pre-dating 1897, however; the



maintenance and repair records are sketchy; and even the inspection reports do not exhaustively describe the structures. Outbuildings pictured in the late nineteenth and early twentieth century photographs, for example, are not referenced in any other documents.

The archaeological survey located the cellar and foundation walls of the Light Station's main block and the kitchen ell's foundation walls and builder's trench (Figure 4). Much of the superstructure, as it stood in the 1970s, remains in and around the building's foundations in the form of demolition rubble.

The survey may also have located the original privy; a concrete pad sealing the shaft and a post hole possibly associated with the structure were discovered west of the lighthouse (Figures 5, 6). No in situ architectural remains of the Light Station's other outbuildings (Plates 1 and 2) were identified. The limited testing, however, may easily have missed structural post holes, especially on the barn- and work-yard terrace. The preservation of the barnyard well and the stratigraphy evident on the terrace suggest the potential for such structural features to exist.

Artifactual remains of the Light Station's structures abound; in fact they comprise by far the most numerous class of artifacts recovered during the survey. They include brick and mortar, plaster (some with intact finishes), wooden members, nails, copper rivets from the lantern tower, spikes, window glass, hardware, even a paneled door. Most represent the Station at the time of its burning and subsequent demolition in the 1970s, however, the remains of earlier renovations and repairs were also identified.

Demolition of the lighthouse and extant outbuildings compromised but did not destroy their archaeological integrity. Bulldozing of the structures and grading in the 1970s redistributed architectural artifacts across the site and disturbed the uppermost occupation surface. The archaeological survey suggests that architectural artifacts can be identified

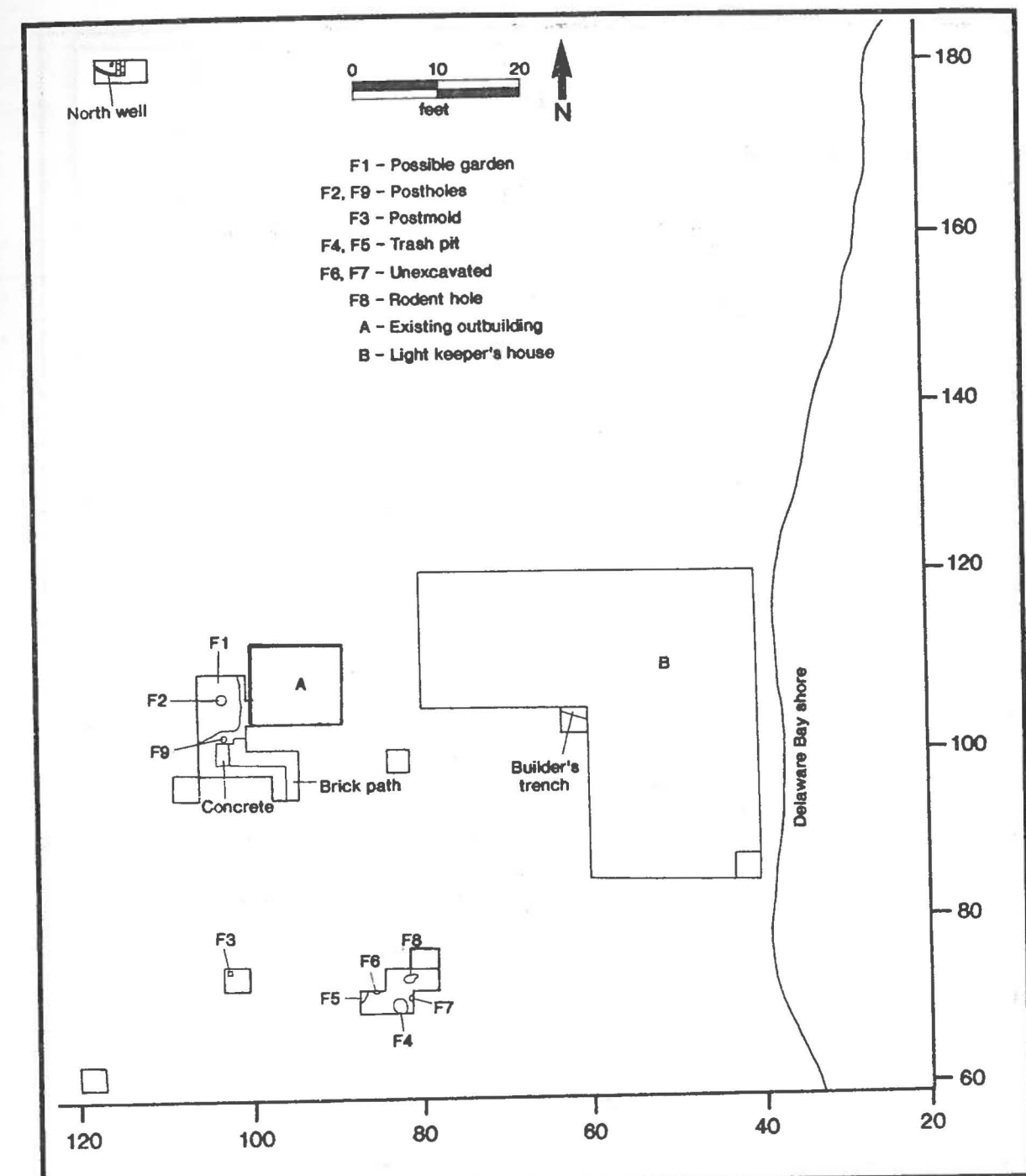


FIGURE 5. Bombay Hook Light Station Site, Site Plan, Showing Extent of Excavations and Identified Features.

by their provenience as originating in either the main house and domestic complex, or in the structures of the barn- and work-yard terrace. Demolition appears to have pushed the former primarily to the south and west, and the latter to the north.

Physical Environment and Landscape. Evidence of the physical environment and cultural landscape history also survive at the Bombay Hook Light Station Site. The components of the environment, though altered through time, remain nevertheless, the Delaware Bay, the Duck Creek (Smyrna River) Thoroughfare, the upland, and the marshes. Moreover, particular elements of the site's landscape survive, such as, trees, shrubs, daffodils and hastas. Finally, the archaeological testing revealed evidence of brickpaths, fencelines (in the form of post holes and post molds), trees, shrubs and other plantings (garden soils and possible planting holes - Features 6-7) (Figures 5 and 6). Additional excavation will likely yield further information on the Light Station's environment and landscape, especially if traditional field techniques are supplemented with soil chemical, macrobotanical, pollen and phytolith analyses.

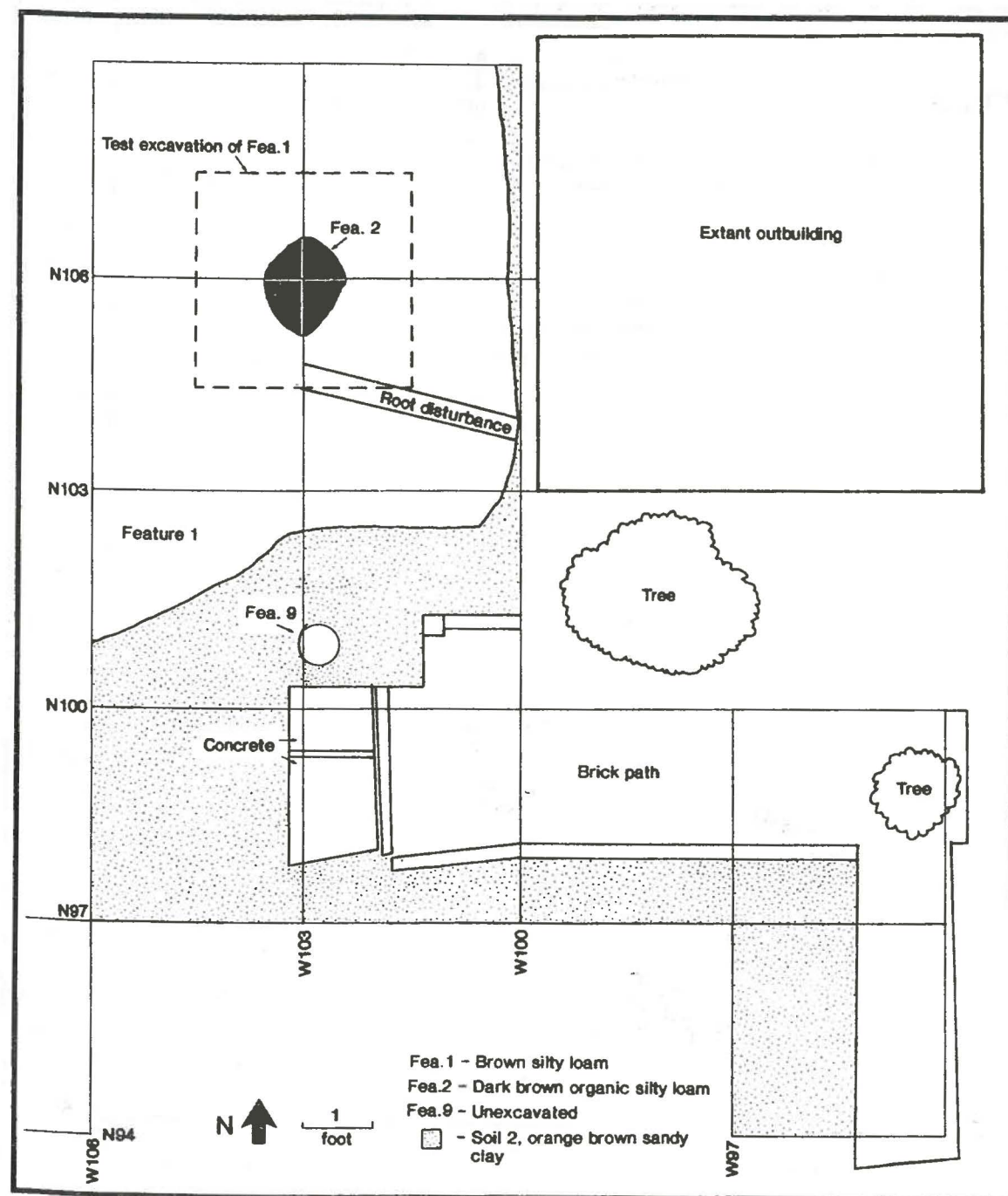


FIGURE 6. Bombay Hook Light Station and Keeper's House, Plan of Features in Block Excavation West of Kitchen Ell.

The principal force compromising the archaeological integrity of the site's physical environment and cultural landscape has been erosion. Erosion and the extension of the marshes since a storm breached nineteenth century drainage dikes have also destroyed and rendered inaccessible large portions of the original Light Station property. Approximately 740 feet of marsh and upland fronting the lighthouse has eroded into Delaware Bay since 1831 (including 130 feet of fast land since 1899 alone) (compare Figures 2 and 3). In addition, access road construction has disturbed the southern 65-70 feet of the remaining property and, beyond the road, the land lies in marsh (Figure 7). This area was filled and graded in 1900 to provide additional land for gardening, possibly to compensate for land lost to the bay. Finally, the westernmost 75-100 feet of the Station's property, originally upland and fenced as late as 1899, now also lie in marsh.

Activity Areas. Activities such as gardening, animal husbandry, food processing, trash disposal, and providing drainage, water and sewage disposal appear infrequently in the records. Gardens are mentioned, but only in 1900 is even the general location noted, and no information is provided on cultivation practices or agricultural products. Similarly,

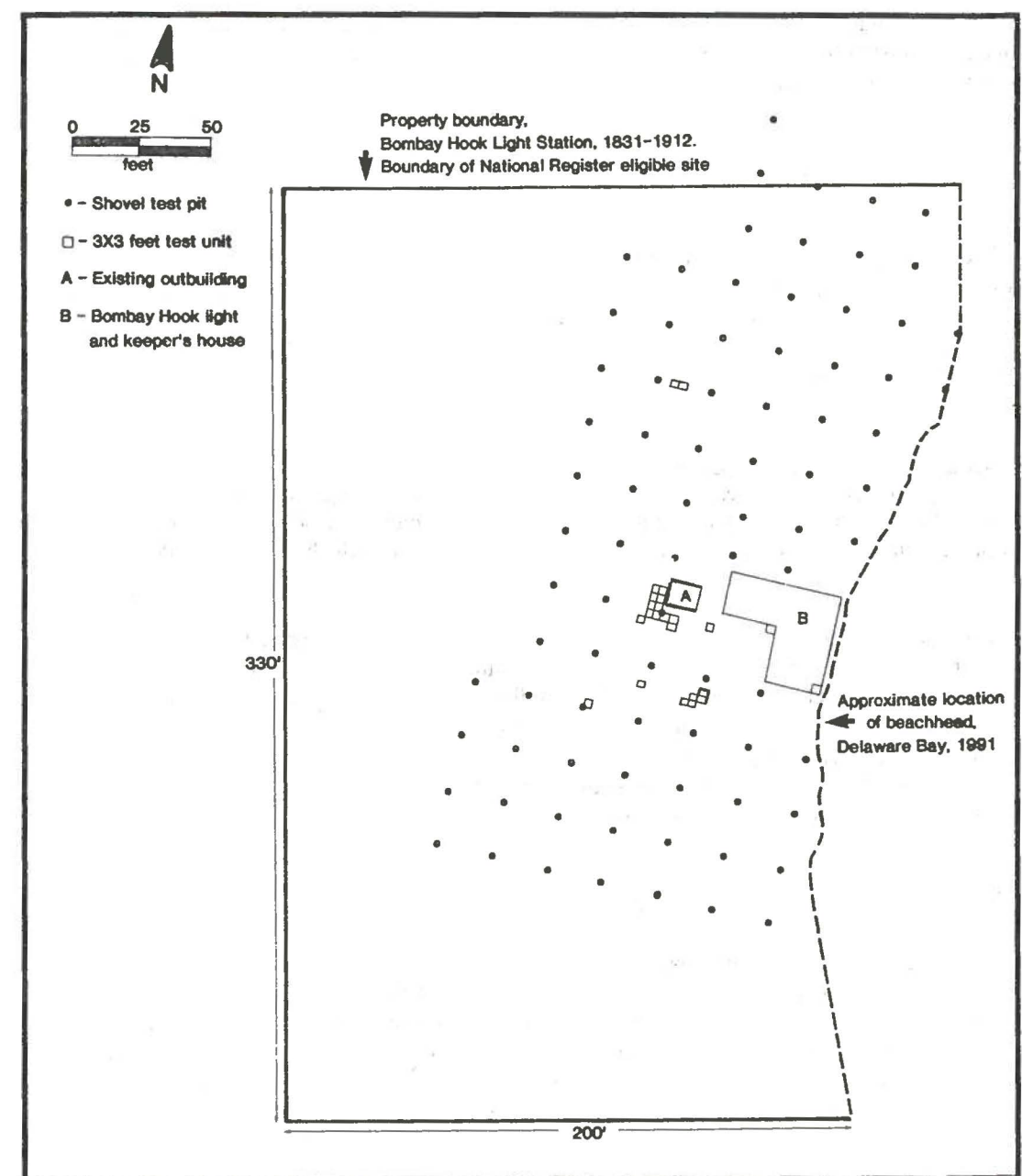


FIGURE 7. Plan of the Bombay Hook Light Station Archaeological Site Showing National Register Boundaries and Test Excavations.

the records identify the Stewarts' ownership of a cow and the Bensons' ownership of cows and later a horse, but nothing more is documented aside from the location of the stable and carriage house. Construction and repair of the cisterns, wells and privy are discussed, but the only detailed description of these features dates to within five years of the Light Station's "discontinuation" (Dept. of Commerce and Labor 1907). Food processing and trash disposal received no mention in any of the records consulted.

Gardens and Animal Pens. Stratigraphic evidence of the lighthouse keepers' gardening activities survive. One probable garden, not an original feature of the Light Station, was discovered west of the domestic complex (Feature 1) (Figure 6). An exceptionally well-developed, organically enriched A-horizon south and southwest of the lighthouse (especially in the vicinity of the tests at N69-N76.5 and W79-W88) (Figure 2) and the presence of non-native species (daffodils and hastas in particular) in this area suggest a second garden location. Artifacts potentially dating to the Stewart occupation were recovered from this deposit.

CONCLUSIONS

Comparative Analysis: The Impact of Government Regulation

The Stewart, Benson, and Salmons families differed from their neighboring farming, maritime, and crafts families in at least one important respect; the lighthouse keeper's employer, the United States government, strove to closely control these families' lives, albeit from a distance. This control was to extend even to their house and yard-keeping practices. "Slovenliness will not be tolerated..." the *Directions and Instructions* (1871) proclaimed. The *Directions and Instructions*, however, outline only the ideal, the government's requirements; they do not reveal the extent to which the keepers and their families allowed the government to dominate their lives and control their daily activities. The limited archaeological testing at the Bombay Hook Light Station property can shed light on this question, at least as it relates to the keepers' families' yard-keeping practices.

Shovel test pit, 3- x 3-foot test unit, and feature excavations at the Bombay Hook Light Station recovered a total of 5528 artifacts. Over one third of these artifacts were identified as architectural artifacts; many of which entered the archaeological record during the lighthouse's demolition in the 1970s. Artifact distributions of the Light Station (Figure 8) were as follows:

Ceramic	8.70%
Non-architectural glass	22.0%
Architectural	37.7%
Metal	23.1%
Miscellaneous	8.5%
Total	100.0%

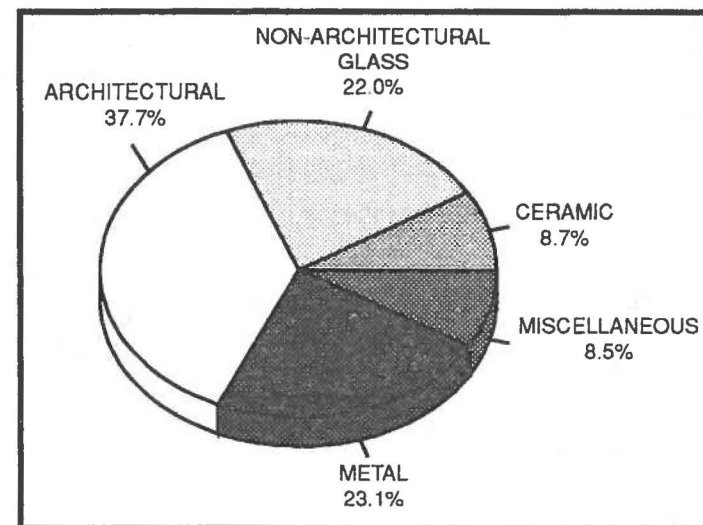


FIGURE 8. Distribution of Artifact Types, Bombay Hook Light Station and Keeper's House, (7K-C-130).

Fourteen shovel test pits yielded no cultural material. Approximately 84.53% of the artifacts were recovered from Soil I/la horizons of the remaining 68 shovel test pits and 24 3- x 3-foot test units (Figure 2). The remaining 15.47% of the artifact assemblage originated from subsurface feature soils.

Non-architectural artifacts (ceramic, non-architectural glass, metal, and miscellaneous artifacts) recovered from shovel test pit excavations totaled approximately 12% (an average of 7.6 artifacts per STP) of all non-architectural artifacts recovered from all Light Station excavations. The 131 ceramic sherds from shovel test pit excavations were only 11% of all artifacts recovered from these excavations and only 3.04% of the total non-architectural artifact assemblage recovered from all excavations at the site. Plotted distributions of artifacts from Soil I/la horizons reflected absences of normal distributions of non-architectural artifacts such as ceramic and glass across the site. As was expected, higher artifact concentration areas predominated in the rear and south side of the kitchen ell no more than 80 feet into the southwest yard.

Recovered ceramic types are consistent with nineteenth century occupation of the Light Station. Almost two-thirds, or 64.3%, of the sherds date to the mid to late nineteenth century. These sherds included whitewares, ironstones, yellowwares, Bennington-wares and bone chinass. Even the earlier pearlwares and creamwares are consistent with an occupation beginning in 1831. Tableware forms appear to predominate in the sample; however, the small size of the sherds themselves hinder definitive analysis.

The 208 bottle and table glass sherds from shovel test pit excavations, span from the Benson occupation to the present. Fragment size is consistently small and most sherds are non-diagnostic. Examples from the lighthouse keepers' era include canning jar and milk glass liner fragments and bottle neck/lip sherds with hand-tooled finishes. The few table glass sherds represent undecorated pressed drinking glasses.

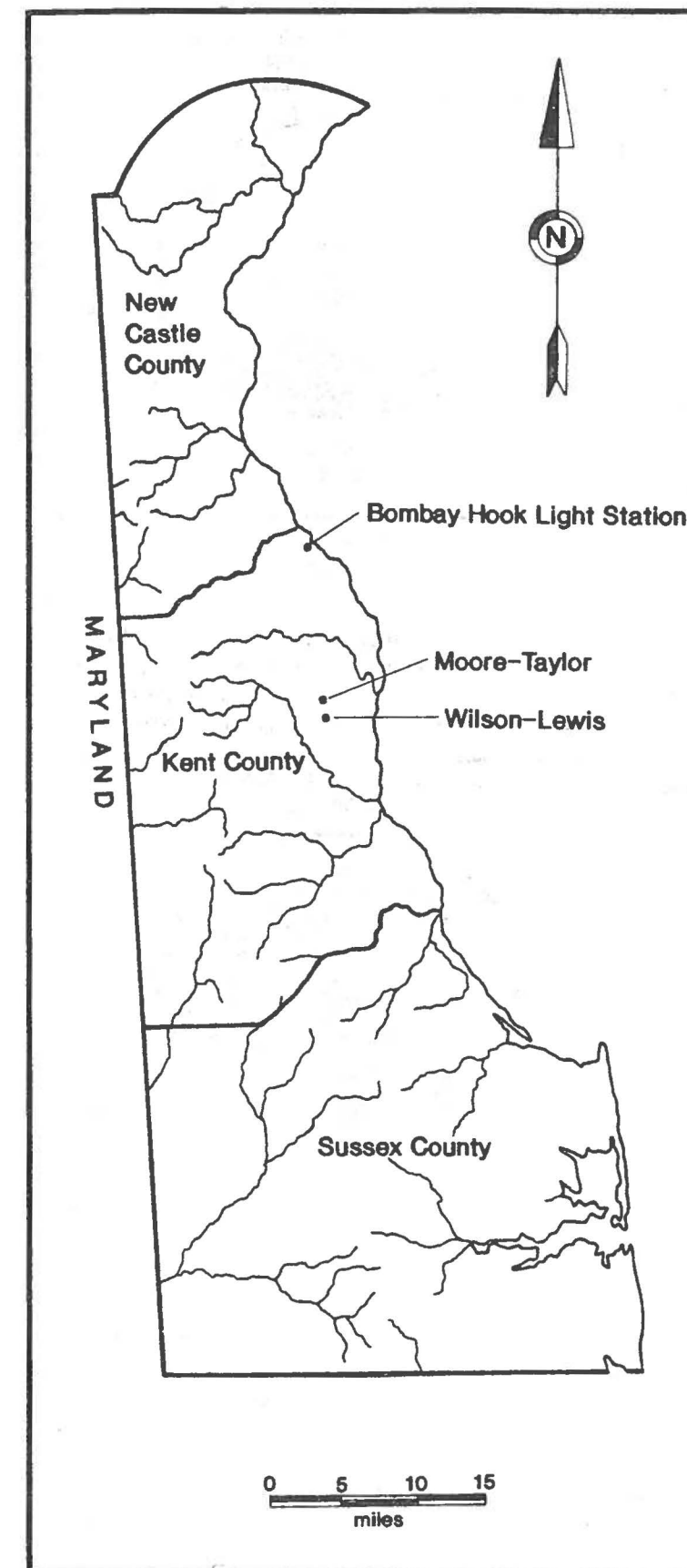


FIGURE 9. Locations of the Bombay Hook Light Station, Wilson-Lewis, and Moore-Taylor Sites.

The archival record strongly suggests that light keepers and their families lived under the shadow of their absentee employer, the US government. Consequently, the irregular densities of artifacts and dearth of material culture in Soil I/la horizons in the project area, especially ceramics and non-window glass, strongly indicated the absence of sheet midden refuse deposition. The lack of such features suggests that perhaps the Stewarts, Bensons, and Salmons industriously obeyed the United States government edict that "Slovenliness.. (would) not be tolerated" at lighthouse sites, and conscientiously kept their house yard virtually free of household trash. To discern any manifestations and implications of US government regulations on the lifestyles of the lighthouse keepers' families in the archaeological record, distributions of the artifact assemblage of the Light Station were compared to artifact assemblages of two other local nineteenth century farm sites, the Wilson-Lewis Site (7K-C-375) and the Moore-Taylor Site (7K-C-380) (Figure 9) (Gretler, et. al 1991).

Several reasons prompted selection of these two sites for comparison with the Bombay Hook Light Station Site. First, Phase I and II field methods conducted at the Moore-Taylor Site and the Wilson-Lewis Site to determine site limits and feature limits were similar to those methods conducted at the Light Station. Second, in addition to the recovery of similar material culture, similar types of features were discovered and tested at all three sites. Third, historical documentation and mean ceramic dates indicated contemporaneous occupation of the three sites, at least between 1838 and 1854. Lastly, and most importantly, unlike the occupants of the Bombay Hook Light Station, the local farmers and farm tenants of Moore-Taylor and Wilson-Lewis sites made decisions regarding the use and maintenance of their farmsteads unencumbered by federal government edicts. It is a manifestation of this difference which this analysis hoped to identify in the archaeological record.

Located northeast of Dover (Figure 9), farmers and their tenants occupied the H. Wilson Lewis Site for most of the nineteenth century (MCD 1843.1, 1850.1 excluding redware) (Gretler, et. al 1991). Phase I and II surveys at this site excavated a total of 45 shovel test pits, 31 3- x 3-foot test units and two intact subsurface

features. These excavations produced a total of 2241 artifacts. The distribution of artifacts (Figure 10) from the Wilson-Lewis Site were as follows:

Ceramic	27.28%
Non-architectural glass	24.02%
Architectural	37.66%
Metal	9.32%
Miscellaneous	1.72%
Total	100.00%

Only one nail fragment, or .04% of the total artifact assemblage, originated from the two features uncovered during Phase I and Phase II field investigations. Both of these features were identified as historic fence post holes. Hence, 99.96% of the total artifact assemblage of Wilson-Lewis Site was recovered from plow zone contexts, perhaps a result of disturbed sheet refuse middens or shallow features.

Farming families also owned and occupied the Moore-Taylor Site (Grettlar, et. al 1991). Located between Leipsic and Dover (Figure 9), this site dates from the middle of the nineteenth century through the mid-twentieth century (MCD 1841.5, 1838 excluding redware). During Phase I and II surveys, the University of Delaware Center for Archaeological Research excavated 40 shovel test pits, 60 3- x 3-foot test units and 13 intact subsurface features. The artifact total of Phase I and II survey at Moore-Taylor Site was 5992 artifacts (Grettlar, et. al 1991). These artifacts were distributed as follows (Figure 11):

Ceramic	35.20%
Non-architectural glass	27.30%
Architectural	22.00%
Metal	13.00%
Miscellaneous	2.50%
Total	100.0%

The 13 features excavated at Moore-Taylor produced 86 artifacts; 1.4% of the total material culture assemblage. Plow zone contexts at this site yielded 98.6% of all artifacts recovered. Comparison of the artifact distributions of all three sites are presented in Figure 12.

Comparison of artifact percentages of plow zone contexts to artifact percentages of feature contexts showed that, of the three sites, excavations at the Light Station Site recovered the lowest percentage of artifacts from plow zone like contexts. However, of the three sites, the Light Station Site assemblage also consisted of the highest percentage of artifacts recovered from subsurface features. These distributions are presented for comparison in Table 2 and in Figure 13.

The lack of artifacts recovered from soils most likely to contain remnants of sheet midden refuse deposits (i.e. plow zone or surface soils) and the high percentage of artifacts recovered from subsurface features at the Light Station appeared to support our primary interpretation of the archival data regarding Bombay Hook Light Station keepers' habits of trash disposal, cleanliness and order.

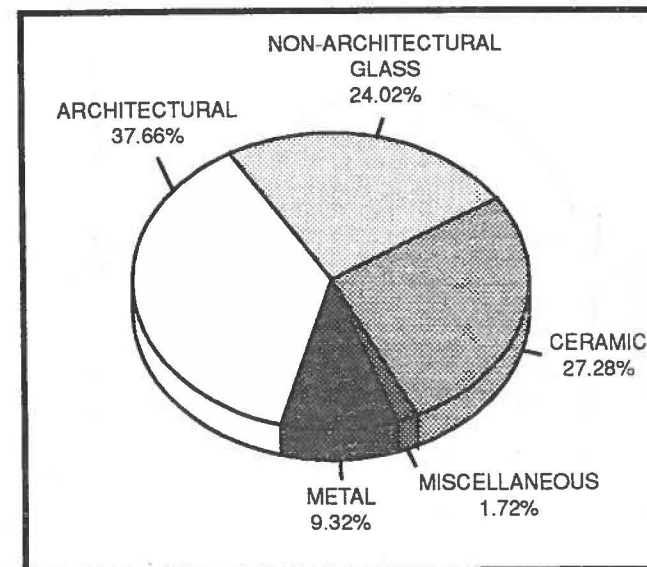


FIGURE 10. Distribution of Artifact Types, Wilson-Lewis Site (7K-C-375).

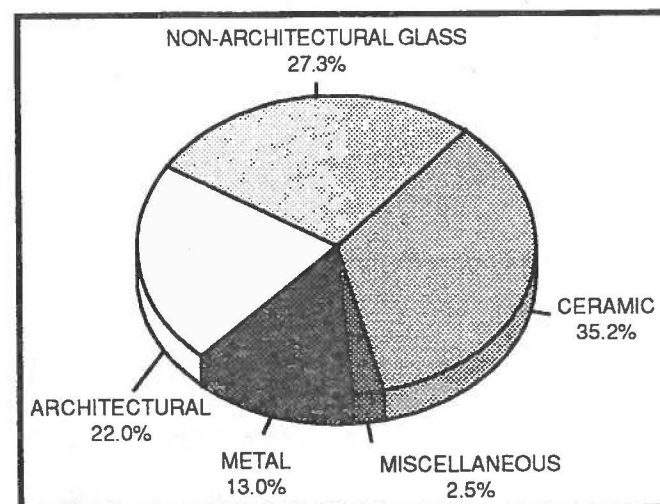


FIGURE 11. Distribution of Artifact Types, Moore-Taylor Site (7K-C-380).

TABLE 2
ARTIFACT DISTRIBUTIONS,
PLOWZONE AND FEATURE SOILS

Site	Plowzone Horizon	Feature Soil	Total
Wilson-Lewis	99.96%	.40%	100%
Moore-Taylor	98.60%	1.40%	100%
Light Station	84.53%	15.47%	100%

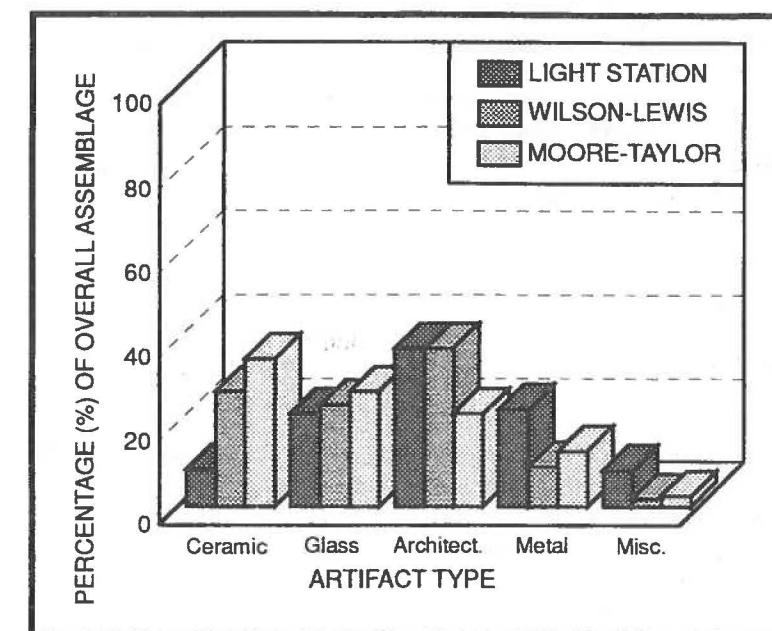


FIGURE 12. Comparison of Artifact Distributions within Total Artifact Assemblages.

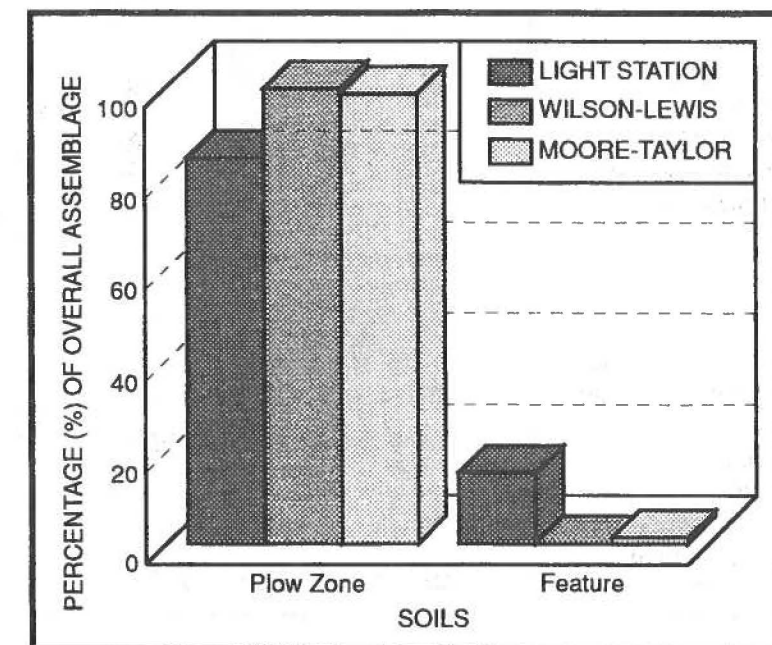


FIGURE 13. Comparison of Proportion of Artifacts Recovered from Plow Zone and Subsurface Feature Soils.

TABLE 3 PERCENTAGES OF ARTIFACTS RECOVERED FROM PLOWZONE SOILS, BY TYPE			
	Light Station	Moore Taylor	Wilson- Lewis
Ceramic	94.39%	98.06%	100.00%
Non-architectural Glass	86.22%	99.88%	100.00%
Architectural	88.61%	98.09%	100.00%
Metal	80.49%	100.00%	100.00%
Miscellaneous	71.86%	100.00%	97.37%

To further explore our interpretations and ensure that the results of our comparisons were not a direct reflection of biases caused by the abundance of architectural artifacts collected at the Light Station, we conducted comparisons of five specific types of artifacts from the three sites. The five artifact categories compared were ceramic, non-window glass, architectural, metal and miscellaneous. Artifact percentages for the five categories were calculated using the following basic formula:

$$f(x,y) = \frac{T_{(x,y)}}{T_{(x)}} * 100$$

x = type of artifact
 y = type of soil
 $T_{(x,y)}$ = total of artifact type x in soil type y
 $T_{(x)}$ = total of artifact x

The distributions of specific artifact types between plow zone soils and subsurface feature further confirmed our suspicions. Once again, of the three sites in our sample, the percentages of the Bombay Hook Light Station ranked lowest among the three sites, in artifacts recovered from plow zone type soils within each of the five artifact categories. These percentages are presented in Table 3 and in Figure 14. However, as shown in Table 4 and in Figure 15, within each of the five artifact categories, the Light Station ranked highest in artifacts recovered from subsurface feature soils.

Further examination of the distributions of artifacts between plow zone and feature type soils within artifact types yielded a number of additional interesting and supportive observations. As stated earlier, one of the primary objectives of our examination of artifact distributions was to determine whether or not the abundance of architectural remains recovered at the Light Station introduced any biases in our data. Comparison of the Light Station architectural assemblage (37.7%) to those of Wilson-Lewis (37.76%) and of Moore-Taylor (22.00%) indicated that the Light Station assemblage was not unusually high (Figure 12). The Light Station architectural assemblage was less than one percent (<1%) greater than that of Wilson-Lewis. Rather, of the three sites, the proportion of architectural artifacts from the Moore-Taylor Site was considerably lower and deserves further investigation.

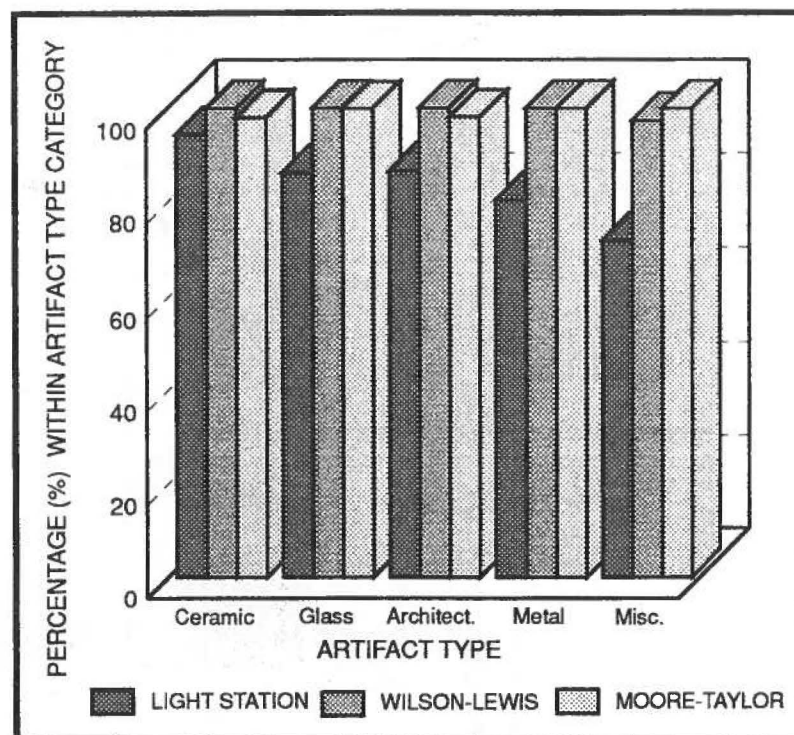


FIGURE 14. Proportion of Artifacts Recovered from Plow Zone Soils Within Each Artifact Type.

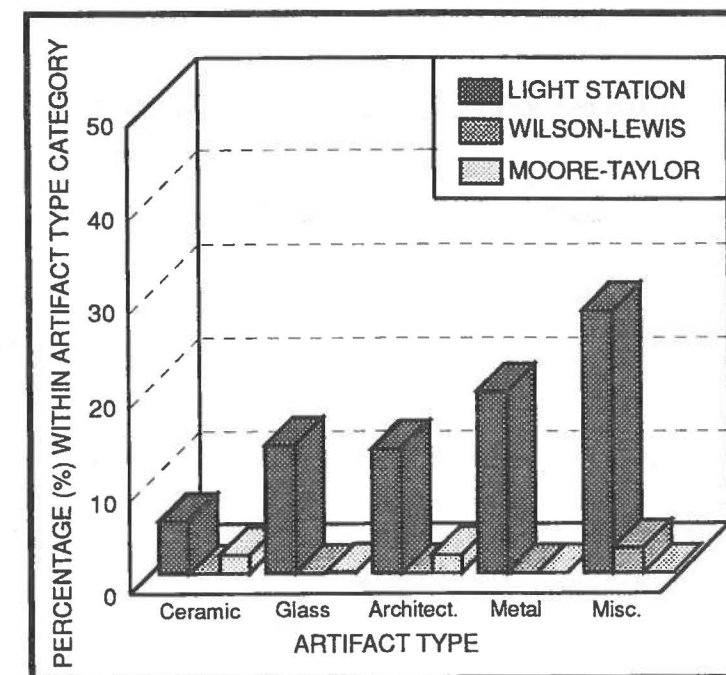


FIGURE 15. Proportion of Artifacts Recovered from Feature Soils Within Each Artifact Type.

TABLE 4 PERCENTAGES OF ARTIFACTS RECOVERED FROM FEATURE SOILS, BY TYPE			
	Light Station	Moore- Taylor	Wilson- Lewis
Ceramic	5.61%	1.94%	0.00%
Non-architectural Glass	13.78%	.12%	0.00%
Architectural	13.39%	1.91%	0.00%
Metal	19.51%	0.00%	0.00%
Miscellaneous	28.14%	0.00%	2.63%

To better quantify statistical differences observed in our frequency distributions, we conducted a series of standard two-tailed Difference-of-Proportion tests at a 95% confidence interval. Our hypotheses were set as follows:

- H_{01} : Light Station = Moore-Taylor
 H_{02} : Light Station = Wilson-Lewis
 H_{03} : Wilson-Lewis = Moore-Taylor

 H_{A1} : Light Station \neq Moore-Taylor
 H_{A2} : Light Station \neq Wilson-Lewis
 H_{A3} : Wilson-Lewis \neq Moore-Taylor

whereas, $\alpha = .05$ and $-Z_{\alpha/2} = -1.96$ and $Z_{\alpha/2} = 1.96$. Our first set of scores determined statistical significance of the overall proportion of artifacts recovered from subsurface feature soils within the three assemblages. The results were as follows:

	Moore-Taylor	Wilson-Lewis
Light Station vs.	280.31	19.55
Wilson-Lewis vs.	4.80	

TABLE 5
DIFFERENCE-OF-PROPORTION TEST, ARTIFACT CLASSES FROM FEATURES

	Light Station vs. Moore-Taylor	Light Station vs. Wilson-Lewis	Moore-Taylor vs. Wilson-Lewis
Ceramic	4.54	5.90	3.45
Non-architectural Glass	15.26	9.01	0.81
Architectural	11.39	11.11	4.02
Metal	13.21	6.95	0.00
Miscellaneous	7.39	3.44	2.01

Comparing our test statistics to the critical value of 1.96, we found that all three scores were greater. Therefore, we rejected all three H_0 hypotheses and concluded with 95% confidence that the proportion of artifacts recovered from feature soils at the Light Station, Moore-Taylor, and Wilson-Lewis were statistically different.

We conducted a second series of Difference-of-Proportion tests with the same hypotheses and alpha levels to compare the proportions of artifacts recovered from feature soils within each of the five artifact types; ceramic, non-architectural glass, metal, architectural, and miscellaneous. The test statistics for this set of data are presented in Table 5.

In all five categories, our test statistics indicated that the various Light Station proportions differed from those of Moore-Taylor or Wilson-Lewis. These results allowed rejection of the H_{01} and H_{02} hypotheses with 95% confidence. Consequently, we able to conclude with 95% confidence that not only the overall proportion of artifacts recovered from feature soils at the Light Station but also these proportions within the five type specific assemblages were statistically different than those of the Wilson-Lewis and Moore-Taylor assemblages. However, the results of the Difference-of-Proportion test also yielded unexpected results.

One of the purposes of the Difference-of Proportion tests was to identify whether or not any of the artifact assemblages of the three sites were statistically the same (Table 5). The results of these tests indicated that only the proportions of non-architectural glass and metal artifact assemblages of the Moore-Taylor and Wilson-Lewis sites were statistically the same. These findings suggested that the proportions of artifacts from feature soils of Moore-Taylor and from Wilson-Lewis were not a similar as hoped. This unexpected result led us to search for a means of measuring the difference or similarity among the three sites.

A second type of test was conducted with intent to rank the estimated differences among the Light Station, Moore-Taylor, and Wilson-Lewis artifact assemblages. We set our hypotheses as such:

$$\begin{aligned} H_{01}: (p_{LS} - p_{MT}) &= 0 \\ H_{02}: (p_{LS} - p_{WL}) &= 0 \\ H_{03}: (p_{WL} - p_{MT}) &= 0 \end{aligned}$$

$$\begin{aligned} H_{A1}: (p_{LS} - p_{MT}) &\neq 0 \\ H_{A2}: (p_{LS} - p_{WL}) &\neq 0 \\ H_{A3}: (p_{WL} - p_{MT}) &\neq 0 \end{aligned}$$

whereas, p_x = proportion of artifacts recovered from feature soils at site x.

Using the standard formula for large populations,

$$(\hat{p}_1 - \hat{p}_2) - z_{\alpha/2} \sigma_{(\hat{p}_1 - \hat{p}_2)} < (p_1 - p_2) < (\hat{p}_1 - \hat{p}_2) + z_{\alpha/2} \sigma_{(\hat{p}_1 - \hat{p}_2)}$$

whereas, $\sigma_{(\hat{p}_1 - \hat{p}_2)}$ is standard deviation of $(p_1 - p_2)$ and is calculated by $\sqrt{\sigma^2}$ or :

$$\sigma_{(\hat{p}_1 - \hat{p}_2)} = \sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$$

TABLE 6
ESTIMATED RANGES OF DIFFERENCE-OF-PROPORTION
OF ALL ARTIFACTS RECOVERED FROM FEATURE SOILS

	MOORE-TAYLOR	WILSON-LEWIS
LIGHT STATION vs.	(.1334, .1532) 13.34% - 15.32%	(.1446, .1638) 14.46% - 16.38%
WILSON-LEWIS vs.	(.0081, .0137) 0.81% - 1.37%	

and by replacing p_1 and p_2 with their sample proportions:

$$\sigma_{(\hat{p}_1 - \hat{p}_2)} \equiv \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

we calculated the differences of the three proportions of artifacts recovered from feature soil (Table 6 and Figure 16).

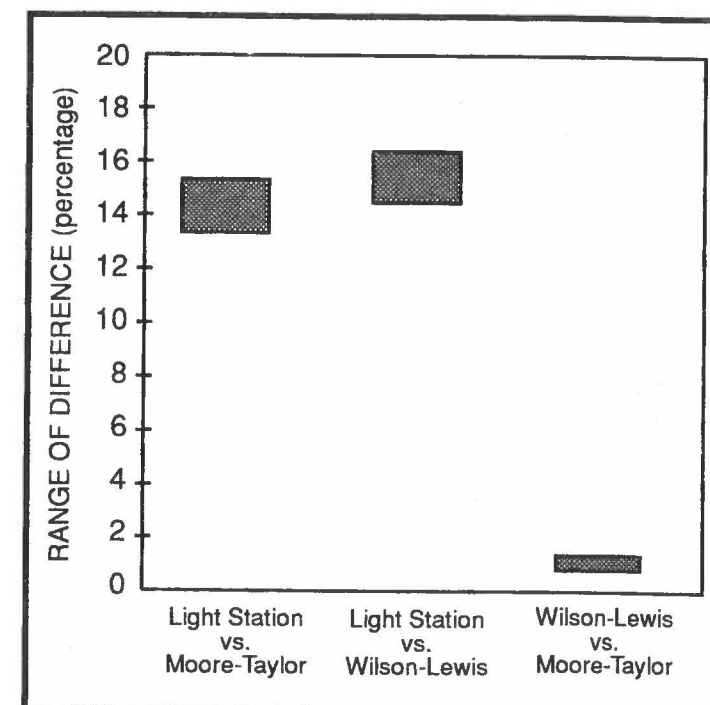


FIGURE 16. Estimated Ranges of Difference of the Proportion of Artifacts Recovered from Feature Soil/Plow Zone Soil of the Three Sites.

95% confidence that the Light Station Site is statistically less similar to the Moore-Taylor Site or the Wilson-Lewis Site than these sites are to each other (Table 6 and Figure 16).

Estimated ranges were also calculated for the proportion of artifacts recovered from feature soils within the five artifact types. These ranges are presented in Table 7 and in Figure 17.

As is apparent from our estimated ranges the proportions of ceramic, non architectural glass, architectural, and miscellaneous artifacts recovered from subsurface feature soils from the Light Station are statistically less similar to those from Wilson-Lewis and from Moore-Taylor.

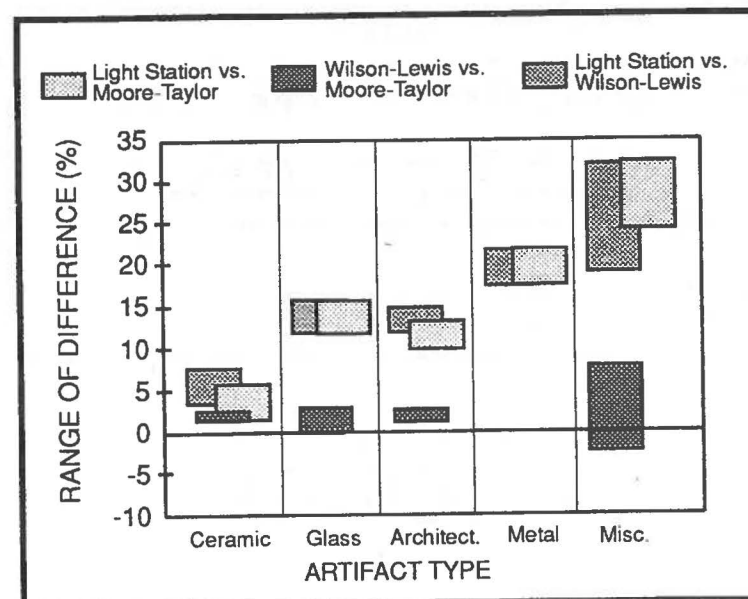


FIGURE 17. Estimated Ranges of Difference of the Proportion of Artifacts By Type Recovered from Feature Soil/Plow Zone Soil of the Three Sites.

TABLE 7
ESTIMATED RANGES OF DIFFERENCE OF PROPORTION OF ARTIFACTS
RECOVERED FROM FEATURE SOILS BY TYPE

	MOORE TAYLOR	WILSON LEWIS
CERAMIC		
LIGHT STATION vs.	(.13341, .15322) 13.341% - 15.322%	(.03556, .07670) 3.556% - 7.670%
WILSON LEWIS vs.	(.01354, .02533) 1.354% - 2.533%	
GLASS		
LIGHT STATION vs.	(.1172, .1560) 11.72% - 15.60%	(.1185, .01572) 11.85% - 15.72%
WILSON LEWIS vs.	(-.000471, .002915) -.0471% - .2915%	
ARCHITECTURAL		
LIGHT STATION vs.	(.09843, .13123) 9.843% - 13.123%	(.11932, .14857) 11.932% - 14.857%
WILSON LEWIS vs.	(.01169, .02653) 1.169% - 2.653%	
METAL		
LIGHT STATION vs.	(.173395, .216887) 17.3395% - 21.6887%	(.173395, .216887) 17.3395% - 21.6887%
WILSON LEWIS vs.	0 0%	
MISC		
LIGHT STATION vs.	(.2407, .3222) 24.07% - 32.22%	(.18997, .3203) 18.997% - 32.03%
WILSON LEWIS vs.	(-.07721, .02458) -7.721% - 2.458%	

By reforming and retesting our hypotheses as prior, we can prove with 95% confidence that the proportions of each artifact type recovered from feature soils are statistically more similar between the Wilson-Lewis Site and the Moore-Taylor Site than those proportions recovered from the Light Station Site.

The analysis presented above of the material culture assemblage recovered from archaeological excavations statistically proves the difference between the Light Station and two contemporaneous sites. Although we cannot show that the Wilson-Lewis Site and the Moore-Taylor Site are statistically equivalent, we have shown that they are more similar to each other than either site is to the Light Station Site.

As stated earlier, it was suspected that the dearth of artifacts present in plow zone type soils most likely to contain remnants of surface or sheet midden refuse deposits and the high proportion of artifacts contained in subsurface feature soils may be an archaeological manifestation of findings in the archival record. Our analysis supports our initial suspicions that the former inhabitants of the Light station conscientiously practiced fastidious habits of refuse disposal.

The lack of artifacts recovered from soils with high probability for sheet midden contexts at the Light Station compared to the proportions recovered at the other two sites indicates different patterns of trash disposal. Although these data presented strongly suggest differences of trash disposal between the Light Station Site and other contemporaneous sites in Delaware, these conclusions should remain tentative. Because of the reclamation of the Light Station front yard by the Delaware Bay, specific methods of refuse disposal by the inhabitants cannot be accurately determined from the archaeological record and warrants further investigation. It must also be noted that the data used in these comparisons represents only a small sample (Phase I and Phase II survey results) of both the artifacts and the features of these sites. Moreover, a larger sample of sites which includes other light stations, privately operated homesteads, and perhaps other types of government homesteads may be able to further enhance our understanding of light keeper families' trash disposal, yard keeping, land use, and landscaping activities and practices.

Nevertheless, the archival record and archaeological record together, suggests that the Light Keepers and their families at the Bombay Hook Light Station and Keeper's House Site did in fact accept, if not share, the United States Government's concern with appearances, clearly if not eloquently embodied in the dictum "Slovenliness will not be tolerated."

Evaluation of Significance

The significance of the Bombay Hook Light Station Archaeological Site lies not so much in its level of integrity as in the nature of the site itself.

The domestic economy (see De Cunzo and Catts 1990) of cash wage-earning families living on an island in the marshes along the Delaware Bay shore, a rich ecosystem that characterizes much of the state's coast, can be explored at this site. Questions concerning the interrelationships of self-sufficiency and participation in a barter and/or market economy can be addressed: To what extent were the families exploiting local wild resources? Were they doing so themselves or trading or buying local resources such as oysters or muskrats? Were they exploiting them for their own use only or to supplement the wage paid the lighthouse keeper? To what extent were they raising their own food, engaging in horticulture and/or animal husbandry? To what extent were they dependent on the national, even international market, as accessible in the shops of Deaknyeville and Smyrna, not only for food but for their other worldly needs? What did constitute the material world of the lighthouse keeper's house? How did material goods function in the lives of these families? Are important social (eg. status) and ideological functions discernible, or does the concern seem solely with utilitarian function? What does all of this say about the domestic goals and strategies of the keepers' families? Even this small sample of research questions suggests the potential of this site to extend understanding of domestic life in nineteenth century Delaware.

The site's architecture and landscape (see De Cunzo and Catts 1990) are also of interest. Like so many nineteenth century Delawareans, the lighthouse keepers were tenants. However, unlike their neighbors', their landlord was not a large planter or gentleman farmer, but the United States government. Their job differed as well, with implications for the site's architecture and landscape. Many lives and much valuable cargo depended on the keepers maintaining the Bombay Hook light in prime condition. The keepers' employer, the federal government, was so concerned with this and with the government's image as expressed through these public sites, that they required keepers to hang a placard in their living rooms admonishing them to maintain the premises in "neat and proper order" (U. S. Light-house Establishment 1871: 138). Furthermore, the government undertook or contracted for most of the repairs and maintenance of the facility,

although the keepers were often dissatisfied with the level of maintenance and supplemented it through their own efforts. Furnishing the house, and landscaping and maintaining the yard and garden were the keepers' responsibility, thus providing an opportunity to explore choices the keepers and their families made themselves. The harshness of the environment- the virtually unbearable insect seasons, the violent storms, the constant erosion, the steady encroachment of the marshes- and the keepers' and the government's continual and ultimately unsuccessful struggle against nature; this saga too warrants further investigation.

Finally, the site can potentially offer unique insights into social identity, behavior and interaction (see De Cunzo and Catts 1990). As a residential site, but the home of an almost unique Delawarean (there were never more than a few lighthouse keepers in the state), the Light Station expressed to relatives, neighbors, friends, government inspectors and workmen, and the visiting public the keeper's and his family's ideas about their place, or their desired place, in society- their status. Moreover, although no evidence has been uncovered to date, the potential exists to explore social interaction at a public site- the lighthouse as tourist attraction.

The archaeological potential of the Bombay Hook Light Station is further augmented by the opportunity it affords to compare two families. The Stewarts and the Bensons, different in many ways, occupied the lighthouse as keepers for over 30 and over 40 years respectively. More is known about each family than is often the case with tenants, and this documentation can only enrich the archaeological interpretation. It allows variables such as ethnic background, family size and composition, point in the life cycle, and economic means to be explored as they intersect with the research themes of domestic economy, architecture and landscape, and social identity, behavior and interaction. The comparative wealth of documentation on the Bombay Hook Light Station does not render the archaeological record redundant; rather it provides the tight chronological control needed to move beyond chronology to more substantive research issues. At the same time, the documents offer an alternative data source against which the archaeological interpretations can be compared. A lack of concurrence can serve to identify fruitful avenues for further investigation.

Nevertheless, none of the above negates the fact that the Bombay Hook Light Station Archaeological Site has suffered a substantial loss of integrity through erosion, demolition, and marsh encroachment. Had this not occurred, the site's archaeological potential would be even greater still. Were the site one of the many nineteenth century tenant farmsteads along the Delaware coast, it would probably not be considered significant with its integrity so compromised. Erosion and demolition activities, however, have not completely destroyed the integrity of the site. As the documentary and archaeological research summarized here have indicated, there remains some potential to address significant historical archaeological research questions at the Bombay Hook Light Station Archaeological Site (7K-A-130) (Figure 7). Thus it has been recommended the site be considered eligible for the National Register of Historic Places, at least until such time as the Delaware Bay's reclamation of the site is complete.

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