IV. Research Design

A. Archaeological Investigations Field Methodology

The data recovery excavations at the site were conducted in three stages. Sixteen 3x3 foot test units were conducted during the first stage. The basement foundation of structure A was cleared of all the modern wall-fall and debris by hand, the herringbone brick floor in the western half and the concrete floor in the east half were removed to reveal the original surface during the second stage of excavations, during which fifty-four additional units were excavated. The final stage of the mitigation included the excavation of an additional 19 TUs and the mechanical stripping of the plowzone and overlying fills and the subsequent excavation of the cultural features that were idenitified. In addition, Features 12, 25, 62, were monitored during their mechanical excavation. Also during this stage, the pavement removal from Weldin Road was monitored.

During the Phase III investigations of the site, conducted between February of 2003 and March 2004, a total of 89 test units were excavated within the limits of construction for the project. This resulted in a total of 109 TUs and 170 STPs excavated by McCormick Taylor, Inc. during the Phase II/III work. An additional 52 features were identified during the data recovery, for a total of 63 for the Phase II/III work.

The TUs were 3x3 foot square, although there were two exceptions. Test Unit 72, which was 2x6 feet, investigated a spatially discrete feature, and TU 109 was 1.5x4.5 feet, and was used to link the stratigraphy of two excavation areas. All of the TUs were excavated by natural strata and soils removed from them were screed through ¼ inch, mesh hardware cloth. Subsequent to the excavation of the TUs, a backhoe was used to mechanically remove all soils above the subsoil. The stripping was completed in two stages in areas where there were additional strata between the plowzone and subsoil. The plowzone was removed first, and shovel scraping was completed so that features could be identified. Once these features were excavated, all fill levels were removed and the subsoil was exposed. The subsoil was shovel scraped and features were identified and excavated. Features were excavated by hand except in cases where depth below ground surface became a safety issue.

During the Phase III excavations, Dr. Bernard Herman, authority on Delaware historic architecture and, at the time, Chair of the Art History Department and a faculty member of the Center for Material Culture Studies at the University of Delaware, provided valuable information concerning the architecture and material culture of the period. He visited the excavations while in progress and provided his professional opinions on June 17, 2003 and October 16, 2003 (Herman 2003).

Three specialized analyses were conducted for the data recovery. The first involved the analysis of the mortar from each foundation encountered during the investigations. The samples were analyzed by an architectural historian with expertise in that field ***(Appendix E).*** In addition, soil chemistry analysis was undertaken within the house basement. A two-by two-foot grid was placed across the exposed soil beneath the brick and cement basement floor and 1.0 liter soil

samples were taken from each square for chemical analysis ***(Appendix F).*** Lastly, archaeobotanical analysis was conducted of flotation samples recovered from a privy feature that was discovered during the excavations ***(Appendix G).***

B. Artifact Analysis Methodology

1. Historic Artifact Analysis

Artifact processing was carried out in accordance with the Delaware State Museums *Guidelines and Standards for the Curation of Archaeological Collections* (2001), which were current when excavations were completed and artifact processing began. All metal artifacts and organic textiles were dry-brushed and all remaining artifacts were cleaned with tap water and soft toothbrushes. Artifacts were placed in 4 ml thick polyethylene bags, with sorts made by raw material type and artifact type. The assemblage was then sorted by provenience and stored in acid-free storage boxes. Inventory of the assemblage included identification of basic traits, like raw material and artifact type, as well as identification of traits useful for dating the artifact, determining artifact function or providing more detailed description for assemblage review by future researchers.

Artifact inventory was performed utilizing a system similar to that advocated by the Society for Historical Archaeology (www.sha.org/research_resources/artifact_cataloging_system/SHARD_how_to_manual), and was aided by various printed and on-line references. Data entry and analysis was performed in MS Access v. 2003. Traits recorded for each artifact were artifact class (e.g. Domestic, Architectural), raw material, artifact type (e.g. plate, nail), segment of artifact (e.g. rim, shank), manufacturing method, manufacturer including company name and location, beginning production date, end production date, additional traits (color, decoration, form/style), maker's marks, and any additional information unique to that artifact. References utilized included general works on artifact production dates (Finkelstein 2004; Hume 1969; Miller 2000), ceramics (Brown 1982; Cunningham and Nossaman 2002; Grigsby 1993; Ketchum 2000; Kovel and Kovel 1986; Kowalsky and Kowalsky 1999; Leibowitz 1985; McConnell 1999; Miller and Hunter 1990; Snyder 1997, 2000), glassware (Button Images 2000; Jones 2000; Lorrain 1968; Munsey 1970; Newman 1970; Polak 2000; Toulouse 1969, 1971), cutlery (Dunning 2000; Hagan 1990; Rainwater and Redfield 1998), personal items (Bradley 2000; Grist 2000; Sprague 2002; Tice 1997), coins (Mossman 1993; Yeoman 1965), architectural items (Edwards and Wells 1993; Gish 2010; Priess 2000; Schiffer et al 1979; Weaver 1964; Wells 1998), ammunition (Ammo Review 2002; Farrar 2000; Horn 1962; Steinhauer 2009), metal identification (Light 2000), plastics (Packaging Today 2003), and faunal remains (De Voe 1867; Gilbert 1993; Gilbert et al 1996; Kitchener 1822; Olsen 1964, 1968, 1979; Skulls Unlimited 2010).

Artifact classes were assigned based upon the function of the artifact type. Domestic class was assigned to artifacts generally utilized within the household, but also was assigned to personal items, such as toys, smoking pipes and bottle glass, which could have been utilized inside or outside of the household. Dietary remains were also recorded as domestic class, and were determined to be dietary based upon the presence of butchery marks or burning, or identification as a domesticated species, probable domesticated species (e.g. large mammal that was likely

cow), or species that would have been deposited as a result of dietary activities (e.g. fish remains, oyster shell). Artifact type associated with building construction were designated as architectural class, and included basic structural artifacts such as brick and mortar, as well as nails and electrical insulators, which were commonly associated with structures. The heating by-product class included material, such as coal and slag, used for or produced during fuel/fire activities. Farming-related artifacts included items such as livestock equipment, tools used specifically for agriculture, and fencing. The arms/ammunition class was assigned to armament and ammunition artifacts, which consisted solely of ammunition and gunflints in this assemblage. Ecological class artifacts were faunal remains that would not have been dietary-related, and botanical remains such as acorn and walnut shells that may or may not have been dietary. Gardening-related included artifacts utilized for gardening/landscaping activities, such as flowerpots and seed bags. Indeterminate class was used for any artifact type for which the specific function or artifact class could not be determined, and included bone that did not exhibit any cultural modification but was neither identifiable as a domesticated species or as a species that would not have been consumed.

The historic assemblage was also examined to determine probable time period of deposition. Terminus Post Quem (TPQ) and mean dates were calculated for all proveniences containing datable artifacts. TPQ dates and manufacturing date ranges were obtained using references such as Miller's TPQ list (2000), antique and collectible books and on-line resources. TPQ dates earlier than the site's known date of occupation were adjusted to the known date of occupation (1685). This change primarily affected redware, wrought nails, and blown glass. Mean dates were calculated using all datable artifacts in each provenience (e.g. ceramics, glass, nails with identifiable manufacturing method, plastics, etc). The mean date for each datable artifact in a provenience was calculated using the following formula ([Artifact Begin Date]+[Artifact End Date])/2=Artifact Mean Date. The following formula was used to then calculate the mean date for each provenience: Σ([Artifact Mean Date]*[Artifact Quantity])/[Total Datable Artifacts]. For example, a provenience containing 10 pieces of redware (mean date 1754) and 5 cut nails (mean date 1841) would have a mean date of 1783. TPQ and mean dates were then utilized to place excavated contexts within the Historic Contexts previously recorded for the State of Delaware. Excavated contexts identified as mixed contained artifacts with beginning production dates separated by 50 years or more from the earliest artifact's end production date. For instance, a context yielding shell edge pearlware (1780-1835) and machine-made bottle glass (1903-present) would be regarded as mixed.

For contexts in which less than 5% of datable artifacts appeared to be intrusive from more recent deposits, the TPQ date was adjusted to reflect a more probable date of deposition. For example, 1% (n=9) of the datable artifacts from F. 27 AC5 possessed late nineteenth century or twentieth century TPQ dates, and given the possibility they were recovered from this AC as a result of rodent disturbance, tree root growth, or wall fall during excavation, the TPQ date for this context was adjusted to 1860. This context was still regarded as mixed due to the presence of mid to late eighteenth century artifacts with mid-nineteenth century artifacts, but it was not likely deposited during the twentieth century.

Due to the fragmentary nature of most of the ceramics, cross-mending was not generally performed, and Minimum Vessel Counts were based upon rim fragments, with the exception of

lid fragments and vessel forms that possessed a decoration type only on body or base fragments. Rims were used to provide a more accurate reflection of decoration types utilized for each vessel form; for example. shell edge plates are more likely to have undecorated bases, which would lead to an inflated view of undecorated wares. Minimum Vessel Counts are provided in this report for ceramics recovered below fill levels formed after the site was abandoned, and are determined for each analytical context, rather than for the site as a whole. Mending of ceramic fragments was only performed for vessels of unique form or unique decoration, and generally was limited to fragments found within the same provenience (i.e. TU or Feature); an exception would be if proveniences not in proximity to one another produced fragments of a vessel believed to be the only one present in the assemblage (e.g. Astbury-type teapot).

CC Index Values compiled by Miller (1991) were utilized to estimate economic status and ascertain consumer behavior for the site inhabitants. Comparison of CC values for each tableware type (e.g. plates, teas, bowls) was made between assemblages associated with the Weldin family and assemblages associated with occupants prior to the Weldin family. This comparison was made in an attempt to illuminate any changes in economic status between tenants and owner occupants, especially as those changes may have related to the success of the farm, and to understand any changes or constancies in consumer behavior. CC values were assigned only to pieces that contributed to MVCs, and were based upon identified vessel form or probable vessel form, and the mean production date. Among the ceramics assigned CC values, if a fragment that could only be identified as hollow vessel exhibited decoration typical of teawares (e.g. painted decoration), it would be classified as a tea. Transfer printed fragments, which could only be identified as hollow vessel, were assigned teaware CC values since the CC value of transfer printed teas and bowls were nearly equal, and it was deemed more likely that these fragments were from cups. The mean production date for each piece that contributed to MVCs was based upon the begin and end production dates for the ceramic type and the decoration; for example, a piece of blue transfer printed pearlware would have a mean production date of 1807, based upon the begin production date of 1783 and end production date of 1830. While the whiteware vessels identified in MVCs for the pre-Weldin era assemblages possessed end production dates that extended into the Weldin family occupation, the mean dates were adjusted to reflect the likely end date for deposition (1860), so that a piece of transfer printed whiteware would have a mean production date of 1832.

The archaeological artifact inventory is contained in ***Appendix H***.

2. Faunal Analysis

All faunal remains were identified according to taxon and skeletal element. Since most of the faunal remains were fragmented specimens, segment of skeletal element was also recorded. Faunal specimens, which could not be identified to the level of species or order (e.g., Rodentia), were classified according to Class (e.g., mammal) and probable size of the individual from which they came. In the following discussion of results, *large mammal* refers to individuals weighing 300 to 2,000 lbs, about the size of a cow or larger. *Medium mammal* refers to individuals weighing 75 to <300 lbs, the size of a sheep, pig or deer. *Small mammal* refers to individuals weighing <75 lbs, ranging from shrews to beavers. *Indeterminate mammal* refers to bone that could be identified as mammal but not to size. No weight classification was available for bird

species. *Small bird* refers to bird the size of a sparrow, while *medium bird* ranges in size from pigeon to chicken, and *large bird* refers to bird the size of a turkey or larger. *Indeterminate bird* refers to bone for which the size of the bird could not be identified. Identification was conducted utilizing a comparative faunal collection and osteology guides (Gilbert 1993; Gilbert et al 1996).

Certain meat cuts were identified only as large mammal or medium mammal. Butchery and fragmentation often made determination of taxon difficult for meat cuts; however, meat cuts identified as large mammal were most likely beef due to the absence of other large mammal taxa in the assemblage. No elements were identified as deer, and therefore medium mammal meat cuts would likely have been veal, lamb or pork.

Taphonomic factors that physically modified the assemblage were also identified, since processes like butchery, burning and rodent disturbance play important roles in assemblage formation. Destructive factors such as rodent gnawing, butchery, burning, corrosion, and post-depositional breakage of remains often result in an inability to assess specific taxon and/or skeletal element. Some of these processes also provide information, though, about consumer practices and refuse disposal. For example, recognizing location of butchery marks on elements can aid in determining which meat units were purchased; whether the proprietors purchased individual-size meat cuts, and whole or halves of animals. Bone burnt to the point of blackening or calcination is indicative of human produced fire, such as garbage incineration.

Calculations were then made for Minimum Number of Individuals (MNI). Minimum Number of Individuals was calculated to provide insight to the number of individuals present in the assemblage, and was based upon the most represented element, by skeletal side and segment of that element, for each identified species. For example, if there were two pieces of bone recognizable as the proximal end of a pig radius from the right side, one piece as a distal end of a pig radius from the left side, and three distal ends of a pig radius from the right side, the resulting MNI count would be three; there is one distal end for each radius and only two radii occur in each skeleton.

3. Oyster Analysis

Oysters, unlike many other types of mollusks can survive in a wide range of environments. As the oyster spends all but the first three months of its life as a sessile or sedentary creature, it cannot flee if threatened by predators or fluctuations in its environment. To cope with the wide range of environments where the oysters can live, the oyster modifies the shape, thickness, and external features of its shell to so as to accommodate the challenges of its chosen environment. Therefore, the size and shape of the oyster shell indicate what kind of physical environment the oyster lived in. A number of organisms also live in a symbiotic relationship with the oyster and leave tell tale marks on the shell. Several of the symbiotic organisms have more limited ranges of distributions than the oyster so their presence can be used to identify where in the bay the oysters grew.

The oysters from the Weldin Site (7NC-B-11) site were analyzed using procedures set forth by Brett Kent (Kent 1988). All oyster specimens examined are the American Oyster (*Crassostrea*

Virginica). For each left valve, the type of oyster, size, salinity, season of death, age, opening technique were recorded where possible.

The size was measured in inches so as to correlate them with historic harvesting practices. The size and shape of the oyster as well as the evidence of parasitic organisms indicate what kind of environmental the oysters grew in. These are as follows:

Sand oysters: short, broad oysters (Height-length ration (HLR) less than 1.3) from beaches and bars of coarse, firmly packed sand. Sand oysters grow in intertidal or shallow water. The shells frequently have well-developed radial ribs and strongly colored valves caused by exposure to ultra violet light.

Bed oysters: oysters of intermediate HLR (between 1.3 and 2.0) that occur on mixed muddy sand, either singly or in loose clusters.

Channel oysters: large, elongated oysters (HLR greater than 2.0) from soft mud, generally in deeper channels.

Reef oysters: small, thin, elongated oysters (HLR greater than 2.0) from densely clustered oyster reefs. Reef oysters have radial ribs and colored markings on the exposed ventral edges of the valves.

The salinity is broken down into four regimens ***(Table 5)***.

Table 5: Delaware River Salinity Regimens

Regime I	Salinity below 10 ppt for one half of the year and rarely above 20 ppt
Regime II	Salinity below 10 ppt for one quarter of the year, below 15 ppt for about one half of the year, and occasionally above 20 ppt
Regime III	Salinity occasionally below 15 ppt and above 20 ppt for one fourth to one half of the year
Regime IV	Salinity rarely below 15 ppt and above ppt for most of the year

The season of death and age were determined by visually examining the growth rings on the hinge of the left valve with the aid of a 10x hand lens. The season were broken into six categories ***(Table 6)***.

Table 6: Oyster Harvesting Seasons

Fall	September – November
Late/Fall/Early Winter	December
Winter	January – February
Late Winter/Early Spring	March
Spring	April – May
Summer	June – August

Some opening techniques leave distinctive marks and fractures on the edge of the shell. Only three types of opening techniques were observed in this sample, side stabbing, frontal stabbing, and cracking. Stabbing involves forcing a knife between the valves and prying the valves apart. Side stabbing sometimes produces a shallow crescent notch on the right hand margin of the shell. Frontal stabbing commonly leaves a shallow curved fracture along the ventral edge or beak of the oyster. Cracking involves placing the ventral edge of the oyster over an iron wedge and striking the overhanging shell with a hammer. Cracking leaves a sharp diagonal break across the ventral edge.

Oyster shells from two proveniences were examined; Test Unit 80 Stratum IV and Test Unit 81 Stratum IV. Test Units 80 and 81 are adjoining units. The oyster shells come from a shell lens beneath a clay layer. The shells were analyzed by unit to see if there was a significant difference in the shells across Stratum IV.

4. Botanical Analysis

Sediment samples from the features were individually processed at the archaeological laboratory of McCormick Taylor, Inc., in Harrisburg, Pennsylvania using water flotation. Samples were individually processed using a Flote-Tech flotation system equipped with very fine mesh fine fraction and 1/16" coarse fraction screens. The Flote-Tech system is a multi-modal flotation system which facilitates the separation and recovery of plant materials from the soil matrix via agitation in water. Processing resulted in two size fractions (heavy and light). Floted portions were air dried.

A comprehensive list was compiled of recovered botanical remains from all contexts ***(Appendix G).*** Recovered material from only one feature appeared to contain sufficient integrity and density of artifacts to make botanical analysis of the flotation samples worthwhile. Phase III excavations at the Weldin Plantation Site (7NC-B-11) included the excavation of a late nineteenth/early twentieth century privy (Feature 49) associated with the main house on the property. Privy fill was sampled for the recovery of archeobotanical remains, and flotation processing yielded abundant plant artifacts relating to the ownership and operation of the property after 1860. Archeobotanical data secured from privy features contribute to our understanding of the diet and domestic life of site residents, and to a more complete interpretation of the form and function of dependencies and yard features.

Recovered botanical remains from Feature 49 were submitted to archeobotanical consultant Justine McKnight at her Severna Park, Maryland laboratory for analysis ***(Appendix G)***. Four discrete contexts within the privy (Feature 49) were sampled. An estimated 5.585 liters of privy fill derived from three vessels found within the privy as well as from general feature fill were processed and analyzed.

Samples were individually passed through 5 mm and 2 mm geological sieves, producing standard size divisions to aid analysis. Organic preservation within the privy was excellent, and abundant uncarbonized botanical remains were extant within the feature. Identifications were routinely attempted on all plant macro-remains recovered within the privy samples following standard procedures. Identifications of all classes of botanical remains were made to the genus

level when possible, to the family level when limited diagnostic information was available, and to the species level only when the assignment could be made with absolute certainty.

Identifications were made under low magnification (10X to 40X) with the aid of standard texts and checked against plant specimens from a modern reference collection representative of the Coastal Plain flora of Delaware.

C. Public Outreach Program

In fulfillment of the stipulations of the MOA, a robust public outreach program was developed in concert with DelDOT. Numerous tours of the site were given while the excavations were in progress in 2003. McCormick Taylor will attempt to contact the groups that had toured the site during the excavations to present to them the results of the analysis and obtain feedback from them. McCormick Taylor is proposing to have two of these meetings, to be held whenever it is convenient for the groups (e.g. in the evenings or on the weekend).

It is anticipated that McCormick Taylor will produce a poster for display in local venues and a booklet geared toward the public summarizing the excavations and results. The booklet will include an overview of the history of the site and a summary of the field work that was conducted. Important themes will include a brief regional agricultural context, the economic factors influencing agricultural choices on individual farmsteads, and a discussion of how the organization of space on the farmstead reflected the practical needs as well as the cultural perspective of the inhabitants. The poster will be a partner to the booklet and will extract information from it.

Additional public outreach will be completed at the request of DelDOT or DNREC, such as a display, PowerPoint presentation, or additional printed materials, such as additional posters, a brochure, or exhibit signs.