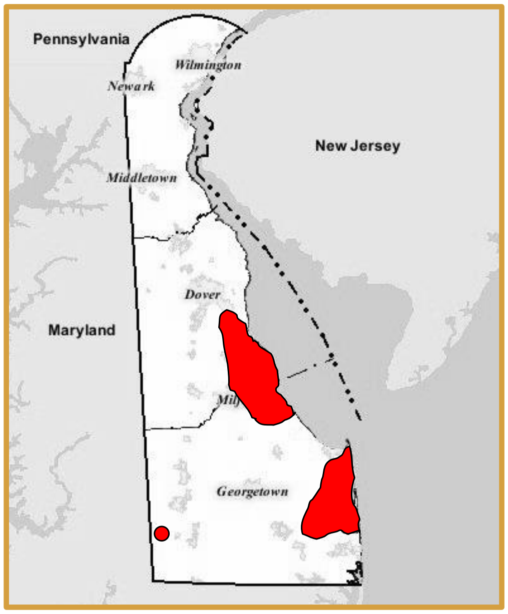
The Bulletin of the Archaeological Society of Delaware



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On the Cover (from Left): Location of Radiocarbon-Sampled Townsend Prehistoric Ceramics (Griffith); Historic Toothbrushes from the Cleaver House (Otter); and the Dairy Lift Pump from the Armstrong-Rogers Site (Lesiuk, MacKenzie, and Peckler).

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DELAWARE AMERICAN INDIAN CERAMICS RADIOCARBON DATES

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INTRODUCTION TO RADIOCARBON DATING

Radiocarbon dates provide a universal measure of time, independent of cultural-historical viewpoints and associative reasoning (van der Plicht and Bruins 2001:1164). The practical temporal limits of radiocarbon dating are approximately 55,000 to 60,000 calendar years (Higham 1999). As known human occupation in Delaware is well within those limits, radiocarbon dating is the absolute dating method best suited for chronological placement of American Indian ceramics in Delaware.

The evaluation of Delaware radiocarbon dates associated with American Indian ceramics is critical to an understanding of origins and technological developments of ceramics as well as placing the associated cultural components in a temporal framework. Once accomplished, this tool permits the investigation and description of culture history and dynamics ranging from inter-group interaction, population movement at different scales, conflict and adjustment, social and political structure, the entire range of shared values, beliefs and knowledge that contribute to the understanding of American Indian cultures in Delaware through time.

Radiocarbon dating is based on the physical properties of the radiocarbon isotope Carbon 14 (^{14}C). Generally, any material from a once living organism containing carbon can be used to obtain a date. In Delaware, the most commonly used material has been wood charcoal, marine shell and bone. Short-lived samples, like seeds and nuts, are of key importance, but multi-year charcoal or shell remains important (van der Plicht and Bruins 2001:1161). The half-life of ^{14}C is used as the standard for calculating the conventional radiocarbon age (CRA). There are three principal techniques used to measure the ^{14}C content of any given sample: gas proportional counting, liquid scintillation counting and accelerator mass spectrometry. Gas proportional and liquid scintillation counting count the products of ^{14}C radioactive decay known as beta particles. The accelerator mass spectrometry method (AMS) counts the actual ^{14}C content of the sample relative to the Carbon 12 (^{12}C) and Carbon 13(^{13}C) present in the sample. The Delaware radiocarbon dates for this study were derived from all three methods. The tables listing the radiocarbon dates for this study describe the analysis as either “Radiometric” (gas proportional or liquid scintillation counting) or AMS.

Both radiometric and AMS dating can provide very accurate dates. Accurate dates are those dates with small standard deviations. The sample size available for dating influences the choice of dating technique. Accurate radiometric dating requires sample sizes no less than 20 grams dry weight for charcoal and 50 grams dry weight for wood and shell. Accurate AMS dating requires no less than 10–50 milligrams for wood charcoal and 20–50 milligrams for shell (Beta Analytic 2011). There are, however some caveats in making the choice between methods. “There can be a tendency to collect and submit isolated flecks of charcoal for AMS dating” (van der Plicht and Bruins 2001:1160). The dating of small, isolated samples should be discouraged, as the possibility of dating erratic, post-depositional or even contemporary influences on the deposition of the sample is likely. “It is a ‘myth’ that AMS dating is better than conventional ^{14}C dating; standard deviations are not smaller” (van der Plicht and Bruins 2001:1160). The best use of the AMS dating technique is to derive dates from organic residues on artifacts or the direct dating of carbon-bearing artifacts as the carbon sample size required is quite small and would not damage the artifact.

Radiocarbon labs report dates as a CRA. This is the raw measured value of the age of the sample based on the analytical technique used. The discrepancy between a measure value and a “true value” is expressed as a standard deviation (1 sigma), which corresponds to a 68 percent probability that the “true value” falls within the 1 sigma range. A 2-sigma range generally represents a 95 percent probability, though calibration programs may calculate the probability more precisely. The variation in the 1 sigma and 2 sigma calibrated dates from the statistical normal of 68 percent and 95 percent is due to the variations in the calibration curves. The CRA never changes; it is the calculated date of a sample resulting from a specific laboratory technique. The interpreted calendar age dates and ranges though have changed through time as different calibration techniques were applied to the CRA’s. In reporting a CRA, the following conventions are used:

1) ^{14}C half-life is 5568 years
2) Oxalic Acid I or II as the modern standard
3) $^{12}C/^{13}C$ isotope corrected to 25.0 mille
4) AD 1950 as 0 Before Present (BP)
5) ^{14}C reservoirs have remained constant

In calculating the CRA, radiocarbon labs must take into account the fractionation effects of carbon isotopes. Bio-chemical processes create a certain degree of variability in the $^{14}C/^{13}C/^{12}C$ ratios that has the potential to effect radiocarbon dates if not taken into account (Thomas 2008:345). While most reports used for this study did not report isotope fraction, conventional radiocarbon lab procedures normalize the isotope fractions to a common scale (Reimer 2011). For the purposes of this study, it is assumed that all reported CRA’s have taken into account and normalized the effect of isotope fractionation based on well-established measured or estimated values.

The two largest ^{14}C reservoirs are the atmosphere and the oceans. Living organisms from the two different reservoirs take in ^{14}C differently. The Delaware radiocarbon dates from wood charcoal and bone samples were from organisms that absorbed ^{14}C from the atmospheric reservoir, while radiocarbon dates from marine shell samples were from organisms that absorbed ^{14}C from the marine reservoir. Potential differences in radiocarbon dates from different reservoirs are compounded by the fact that atmospheric ^{14}C has not remained constant (Stuiver and Braziunas 1993:137). In order to determine the "true" calendar age of a sample, the CRA is calibrated against a dataset that associates the CRA with a calendar date. The first internationally agreed upon calibration was published in 1982 (Klein et. al. 1982). Since that time, calibration datasets for both the atmosphere and marine reservoirs have been refined. It is not the purpose of this study to elaborate on the history of deriving atmospheric and marine calibration curves. However, it is important to discuss the issue of dates relating to marine shell as they represent 20 percent of the radiocarbon dates associated with ceramics in this study and in some cases provide the only radiocarbon dates available for specific ceramic types.

As early as 1977 in the literature reviewed for this study, there was some concern that radiocarbon dates derived from marine shell were not accurately representing the "true" calendar age of the sample. Daniel Griffith (1977:108) noted that a radiocarbon date on shell from the Bay Vista site (UGa-1440) did not conform to its expected temporal range based on Townsend ceramic design motif seriation. This issue was more explicitly addressed in the report on the Bay Vista and Cole sites in Sussex County, Delaware where the authors state that there are problems with shell dates on the Delmarva Peninsula (Doms et al. 1985:23). Recently this issue has been examined for the Chesapeake Bay and corrections developed (Colman et al. 2001; Rick and Lowery 2011). There are a number of advantages in deriving radiocarbon dates from marine shell (Highman and Hogg 1995:409). In Delaware, shell remains are widespread in the southern two-thirds of the state. Shell also has the potential to date an event closely as shellfish are typically processed close to where they are collected. For the purposes of determining a calendar age, radiocarbon dates on marine shell benefit from the fact that the marine calibration curve is smoother than the atmospheric calibration curve with fewer intercepts and narrower calibrated ranges. Perhaps most importantly, the association of shell with the artifacts and components to be dated is more reliable than loose charcoal in a given context. With respect to the Delaware radiocarbon dates on shell, shell was used even when charcoal was available because the association between the shell and the ceramics to be dated was more certain. In the case of the Wolfe Neck site, ceramic sherds were sandwiched between the shells submitted for radiocarbon dating (Griffith and Artusy 1977).

Research in the last 25 years has shown that apparent ^{14}C age differences occur when contemporaneously grown samples of different reservoirs are dated (Stuiver and Braziunas 1993:137). In other words, dates on shell where the ^{14}C originates from the marine reservoir produced different conventional radiocarbon ages as compared to contemporary wood charcoal where ^{14}C originates from the atmospheric reservoir. The nineteenth-century reservoir age of the global ocean, relative to the atmosphere, is estimated at 400 ^{14}C years (Stuiver et al. 1998:1131). That is, marine shell CRA's tend to be approximately 400 years earlier than contemporary wood charcoal dates. However, variations in ^{14}C do occur in the marine environment and the world average of 400 years does not take into account regional variations in upwelling of ^{14}C deficient waters or regional atmospheric variations (Stuiver and Braziunas 1993:138).

For the purposes of archaeological research, it is generally not advisable to subtract 400 years from the shell CRA to derive a "corrected" CRA. First, an independent estimate of the calendar age of a sample is needed to determine a model-generated ^{14}C age. This age can be compared to the marine CRA of the sample for a given location. The difference between the two ages is known as ΔR (i.e., change in reservoir age), an assumed time-constant offset that should be removed from sample ^{14}C ages before the application of the marine calibration curve (Stuiver and Braziunas 1993:152). As the ΔR is measuring regional offsets, the ΔR value used must be derived from data in the study area. For example, due to different oceanic processes and the effect in estuaries of the mixture of materials from different watersheds, the ΔR value for the Delaware Bay and near-shore Atlantic Coast may be different from the ΔR value for the Chesapeake Bay. In fact, recent studies have shown there are differences in ΔR values within the Chesapeake Bay ranging from ΔR= 129±22 on the western shore to ΔR= -88±23 on the Eastern Shore, while Maryland's Atlantic Coast values range from ΔR=106±46 to ΔR=2±46 (Rick et al. 2011).

There are two methods for deriving the ΔR value. The first is to obtain radiocarbon dates on historic shell collected from a known location and on a precise calendar date (Rick and Lowery 2011; Thomas 2008:349). This is a highly reliable method as the true age of the dated shell is known and provides the basis from which to calculate the ΔR value to be applied to the conventional radiocarbon ages derived from the radiocarbon dates on the shell. The second method is the paired sample method. In the paired sample method, a sample of shell and a sample of wood charcoal from the same context are dated and the resulting CRA's compared. In the case of contemporaneous wood charcoal and shell samples from the same context, the reservoir deficiency (ΔR) may be estimated without direct calibration to the calendar time scale by using a curve, which models marine conventional radiocarbon ages plotted against atmospheric conventional radiocarbon ages (Stuiver and Braziunas 1993:154). Using the curve provided by Stuiver and Braziunas (1993:154) a good estimate is provided, but I attempted to use the more accurate method of calculating the Modeled Marine Reservoir Age using a series of iterations until the Modeled Marine Reservoir Age matched the re-calibrated wood charcoal sample age at the 2 sigma range. The ΔR value and its standard deviation (ΔR error) may also be calculated by subtracting the Modeled Marine Age from the calibrated age of the charcoal sample (Bourke and Hua 2009:182; Deo et al. 2004:771).

The disadvantage of the paired sample method is one must assume that the shell and wood charcoal samples are contemporary. As charcoal is long lasting and more mobile in the soil profile, it may be difficult at times to be certain that the samples are contemporary. The best method to control for contemporary contexts is to choose samples from single component contexts and to be very certain during the collection of the samples in the field that there is a high probability that the samples were deposited at the same time.

In order to produce a reliable ΔR value and ΔR Error, both methods require a sizable number of radiocarbon dates. For example, research on St. Catherine's Island, Georgia used 11 paired dates (22 samples) and 12 dates on known-age shell to derive a ΔR value (Thomas 2008:360). Unfortunately, for this study, no research has been published that was designed to calculate a ΔR value for the Delaware Bay or near-shore Atlantic Coast. However, research for this study located three paired dates from Delaware as follows:

Wolfe Neck Site (7S-G-141), Feature 1 (Hoffman et al. 1997) –

Beta 77642 (wood charcoal): CRA 1840±70 B.P.

Beta 77643 (marine shell): CRA 2180±60 B.P.

Island Field Site (7K-F-17), Feature 119 (Custer et al. 1990) –

Beta 29737 (wood charcoal): CRA 710±60

Beta 29738 (marine shell): CRA 800±70

Gray Farm Site (7K-F-11), Feature 10 (Diamanti et. al. 2012) –

Beta 307300 (wood charcoal): CRA 330±30 B.P.

Beta 307301 (marine shell): CRA 790±30 B.P.

The ΔR value calculated from the Wolfe Neck paired dates is ΔR = 12±93 at the 2 sigma level. The value calculated from the Island Field paired dates is ΔR = -296±84, while the value for the Gray Farm pair is ΔR = 30±45 at the 2 sigma level. The ΔR value calculated from the Island Field paired dates is well beyond the range of ΔR values for the Middle Atlantic. The ΔR value for the near-shore Atlantic Coast at Atlantic City, New Jersey is 170±50, while the value for Shark River, New Jersey is 130±60 (Stuiver and Reimer 1993). Delta R values in the Chesapeake Bay range from 129±22 to -88±23, which emphasizes the need to take sub-regional differences into account (Rick et. al. 2011). The large negative ΔR value from the Island Field site likely resulted from shell and charcoal samples that were not contemporary. It is likely that "old" charcoal contaminated the sample submitted, which would not be unexpected at the Island Field site as Feature 119, a Woodland II Townsend ceramics bearing context, overlapped the Woodland I Webb Phase cemetery. It is highly probable that charcoal originating from one of the earlier components at the site was incorporated into the sample submitted for dating.

An additional clue that there may be something wrong with the paired dates at the Island Field site comes from the fact the shell and charcoal radiocarbon dates are statistically the same at the 95 percent confidence limit; in most cases they should be different. The radiocarbon samples submitted were from two different ^{14}C reservoirs that research has shown produce significantly different dates. In contrast, the paired dates at the Wolfe Neck and Gray Farm sites are statistically different at the 95 percent confidence limit, a result that conforms to expectations. The Wolfe Neck and Gray Farm sites ΔR values produce corrected marine shell radiocarbon dates that are statistically the same. The Wolfe Neck samples are from an isolated, single component, sealed shell midden containing only Coulbourn ceramics, while the Gray Farm samples are from a single feature that contained only late Townsend and Killens ceramics. Based on the nature of the context alone, it is highly probable that the shell and charcoal samples were contemporary at Wolfe Neck and the Gray Farm.

While it is tempting to use the ΔR value calculated from the Wolfe Neck and Gray Farm paired dates to re-calibrate the Delaware radiocarbon dates from marine shell, it is not statistically valid to rely on two pairs of dates. Using the Wolfe Neck and Gray Farm ΔR values may not produce reliable results. A larger sample of paired dates, or dates on known-age shell, is required to establish a statistically valid value for the Delaware Bay and near-shore Atlantic Coast. The Wolfe Neck and Gray Farm paired dates, along with other paired dates or dates on known-age shell that may be obtained in the future, will contribute to a database that will allow for the calculation of a reliable ΔR value. For the purposes of this study of radiocarbon dates in Delaware associated with American Indian ceramics, I will simply recalibrate all the marine shell dates using the current marine model curve without a ΔR correction. As the Gray Farm and Wolfe Neck ΔR values are in the low positive range, the error introduced by not calculating a combined value is likely only 20 years. When a reliable ΔR value is developed, it would be simple matter to recalibrate the shell dates using that value. As will be seen in the analysis, the recalibrated shell dates associated with the several ceramics types using the current marine model curve fall within the 2 sigma calendar age range of the types in question and do not produce any obvious outliers between dates derived from marine shell and dates derived from wood charcoal.

There is a slight tendency for the calibrated shell dates for Mockley, Hell Island and Townsend ceramics to be at the more recent end of the temporal range for the types. At least for the Townsend dates, however, the shell dates are primarily associated with ceramics which seriation studies have shown are at the more recent end of the Townsend sequence. Still, this pattern may argue for a negative ΔR value for the Delaware Bay and near-shore Atlantic coast, though the ΔR for the Gray Farm site suggests this is not the case. However, the calibrated shell dates for Coulbourn and Wolfe Neck ceramics are embedded within the range of the wood charcoal dates. This pattern suggests that using the marine model curve with little or no ΔR adjustment is appropriate. It is also possible that the ΔR value may change through time. Coulbourn and Wolfe Neck ceramics are earlier than Mockley, Hell Island or Townsend ceramics and perhaps the ΔR value becomes more negative the more recent the calibrated shell date. However, the ΔR value for the Gray Farm site associated with late Townsend and Killens ceramics is in the low positive range. Clearly more research is necessary to establish a reliable ΔR and ΔR Error for the study area that takes into account geographic and temporal changes in the value.

CALIBRATION OF DELAWARE RADIOCARBON DATES

The calibration program used in the study is CALIB 6.0.1 (Stuiver and Reimer 1993). The calibration datasets used by the program to derive the recalibrated calendar dates are “intcal09.14c” for wood charcoal dates and “marine 09.14c” for marine shell dates. These are the most current datasets available for this program. Some radiocarbon labs (e.g., Beta Analytic) use proprietary calibration programs in reporting calendar ages. In order to assure comparability of the data for this study, all reported CRA’s were re-calibrated using CALIB 6.0.1 using the datasets cited. In addition, while there is some evidence of systematic differences in the calculation of CRA's between some radiocarbon labs in Europe, studies show that it is not a widespread phenomenon (Scott et al. 1998). For the purposes of this study, I will assume that the radiocarbon labs cited produced accurate conventional radiocarbon ages. It should be noted that radiocarbon labs no longer report intercept dates for calibrations as it is statistically misleading (Telford et al. 2004:296). The "true" date has an equal chance of falling anywhere within the 1 sigma (68 percent) and 2 sigma (95 percent) calibrated ranges.

The question of "good" dates versus "bad" dates also needs some discussion. There are a number of instances in the literature reviewed for this study where the authors identify a radiocarbon date as being outside the accepted range for the ceramics types in question (cf. Custer et al. 1995:243). Such dates are often referred to as "bad" dates, while "good" dates tend to cluster with other dates for the same artifact class or component. Is there anything wrong with "bad" dates? There is a difference between the accuracy of a date and its precision (Higham 1999). Accuracy refers to the date being a true estimate of the age of the sample within the range of statistical limits, or standard deviations, of the date. Precision is the degree to which an accurate date actually reflects the time period of components or associated artifacts within a given context. The latter concept is particularly critical where the period, components or artifacts are dated by association with a dated radiocarbon sample as opposed to cases where carbon-bearing artifacts are dated directly. Archaeological recovery methods and archaeological laboratory handling of samples have the greatest effect on the precision of a date. In other words, a radiocarbon date that is older or more recent than expected is not likely a radiocarbon lab accuracy error, rather the age of the dated sample is simply older or more recent than the archaeological context within which it is found (van der Plicht and Bruins 2001:1160). Most "bad" dates are accurate in the sense defined above, but are not precise as the result of low quality association of the recovered radiocarbon sample with the context dated.

Radiocarbon dates that are "outliers" from the expected range of dates should not be quickly dismissed. They may lead to new interpretations. Assuming a date is accurate and precise; an outlier may indicate that a certain phase or artifact type continued beyond the accepted temporal range of a type or component indicating a type of lag effect in the replacement of one phase or type with another. If this is true, the outlier may show differences in geographic distribution at some scale. There should also be repeated outliers that exhibit the same pattern. The analysis of Delaware radiocarbon dates considers these concepts.

DELAWARE ^{14}C DATES ASSOCIATED WITH AMERICAN INDIAN CERAMICS

In preparation for this study, I examined the following sources:

1) Bulletin of the Archaeological Society of Delaware

2) *The Archaeolog* – Bulletin of the Sussex Society of Archaeology and History

3) All Delaware Department of Transportation Phase II and Phase III reports either on file at the Delaware Division of Historical and Cultural Affairs in Dover or on-line at deldot.gov/archaeology

4) Radiocarbon lab correspondence files at the Delaware Division of Historical and Cultural Affairs in Dover

5) Published syntheses of Delaware and Delmarva Peninsula Prehistory

6) Phase III data recovery reports at the Delaware Division of Historical and Cultural Affairs not associated with undertakings of the Delaware Department of Transportation

7) Correspondence with consultants on unpublished Delaware projects (e.g., Versar on their 2011 dig at the Blackbird Creek site)

8) Regional journals containing articles on Delaware prehistory

9) The Gray Farm Site: Phase II and III Excavations on the Murderkill River (Sites 7K-F-11 and 7K-F-169) (Diamanti et al. 2012)

The reader should refer to the report bibliography for exact citations for radiocarbon dates associated with American Indian ceramics. The summary tables of radiocarbon dates also list the specific sources cited for each date. Only radiocarbon dates with clear association with American Indian ceramics were included in this study. A number of other radiocarbon dates from sites where ceramics were recovered are reported in the literature, but in most instances the authors state that the association between the radiocarbon dates and the ceramics is not reliable (e.g., Heite and Blume 1995; Petraglia et al. 1998). I considered these dates low in precision and more likely to confuse interpretation that aide it.

In gathering the radiocarbon dates, I made two assumptions. First, the CRA's reported are accurate. That is, the CRA's did not contain any radiocarbon lab errors. Second, I assumed the authors of the reports correctly identified the American Indian ceramic types associated with the dated sample. The only way to verify the identification of ceramics would be to re-analyze all the collections, a task well beyond the scope of this study. I did examine the Frederica North Phase I/II ceramic collection and verified or modified the ceramic type identifications so the data could be incorporated into the ceramic distribution data obtained during the Phase III investigation. In reviewing the literature, there are very few instances where there may be cause to question the ceramic type identifications associated with radiocarbon dates. Where this occurs, I will discuss the issue in the following analysis.

Radiocarbon dating of samples associated with American Indian ceramics in Delaware first appeared in the literature in the 1970s (Griffith and Artusy 1975). The Delaware radiocarbon dates from the 1970s and early 1980s were not calibrated to a calendar age, as the first internationally recognized calibration curve was not available until 1982 (Klein et al. 1982). Consequently, the calendar dates reported for the associated ceramics from the 1970s and early 1980s were derived by simply subtracting the CRA from AD 1950 (0 BP). These dates were not true "intercept" dates either as intercept dates implies calibration. Since the mid-1980s, the reported 1 sigma and 2 sigma date ranges were the result of calibration. However, since the calibration curve for both the atmospheric and marine reservoirs are continually refined, the reported calibrated radiocarbon dates were calibrated against slightly different data sets. The fact that some dates in the literature are uncalibrated while others were calibrated by different data sets complicates the comparison of calibrated calendar year ages between the dates and associated ceramics.

This study presents a summary in two formats of Delaware radiocarbon dates associated with American Indian ceramics. [*Note*: For a full list of the raw data gathered during this study, see: http://www.deldot.gov/archaeology/north_frederica/GrayFarmSite/phaseII_III/index.shtml. The full list contains all radiocarbon dates and associated data as it is found in the literature sorted by ceramic type.] When gathering the project data, the following information was obtained for each sample, arranged in columns:

Lab Code- The radiocarbon lab sample identification number.

Excavation sample- Site number and excavation context for the sample.

Site name- The name of the site reported in the literature.

Material (species) dated- The sample material submitted for dating; species listed where known.

Analysis- The technique used by the lab to derive the CRA.

CRA- The calculated years and standard deviation (1 sigma) before radiocarbon present (cal AD 1950).

Isotope Fraction- The $^{13}C/^{12}C$ ratio; where reported.

Calibration- The calibration data set used; where applicable.

Reported Date- In some cases, the reported date is the calibrated intercept date (BOLD), while in other cases it is the CRA subtracted from cal AD 1950. In some reports, a specific date is not reported (NR).

2 Sigma Range- The calibrated 2 standard deviation calendar date range; where reported. Otherwise Not Reported (NR).

Ceramic Association- The American Indian ceramics reported to be associated with the radiocarbon date.

References- The bibliographic reference for the radiocarbon date and ceramic associations.

Notes- Comments regarding the radiocarbon date and its ceramic associations.

Once the base study was completed, the data was re-calibrated dates using the CALIB 6.0.1 calibration program. [This re-calibration data is also presented in full at http://www.deldot.gov/archaeology/north_frederica/GrayFarmSite/phaseII_III/index.shtml.] In addition to the data fields defined above, this re-calibrated data table adds three fields as follows:

Delta R- The marine reservoir correction for the Delaware Bay and the Delaware Atlantic coast. Not reported for this study.

Delta R Error- The standard deviation of the Delta R value. Not reported for this study.

Probability- The probability that the "true" calendar age of the sample is within the 2 sigma range. The CALIB 6.0.1 program calculates this probability.

Since relying solely on the ΔR value calculated from the paired dates at the Wolfe Neck and Gray Farm sites has been questioned, these columns are blank. However, these columns should always appear in a report of radiocarbon dates on marine shell, as in the future there will be reliable value for ΔR. The re-calibration data table drops the data field for "Reported Date" used in the initial data collection, as a single calendar year date is statistically misleading after recalibration. Recalibration of the reported radiocarbon dates was undertaken to insure that analysis and interpretation of the calendar year date ranges is based on comparable data. The following analysis of ceramic types is based on the data in the re-calibration table and the accompanying scatter plots in Figures 1–14.

DELAWARE AMERICAN INDIAN CERAMIC TYPES ASSOCIATED WITH RADIOCARBON DATES

Before conducting detailed analysis of the ceramic type recalibrated date ranges and implications of those date ranges, it is necessary to define the types identified in this study. The type definitions below list the defining criteria for each type and bibliographic references for its definition. The majority of the types defined in the Middle Atlantic are temporal types in that the defining attributes were chosen that most reliably changed through time, thereby providing a tool to place the ceramics and associated phases in a temporal framework. The attributes in the definition that are most sensitive to changes through time are temper and surface treatment. In Delaware, the reliability of using temper and surface treatment as temporal markers was demonstrated in a report of a stratified shell midden at Wolfe Neck (Griffith and Artusy 1977). The following list represents only those types where radiocarbon dates are reported in the literature. Other types defined in the literature are found at sites in Delaware (e.g., Minguannan) for which radiocarbon dates have not been reported.

Accokeek - Temper – sand and/or finely crushed quartz

Surface Treatment – cord-marked

(Reference: Stephenson and Ferguson 1963)

Coulbourn - Temper – clay nodule/grog

Surface Treatment – cord-marked or net-impressed

(Reference: Wise 1974)

Dames Quarter	-	Temper – black stone (hornblende? Goethite?) Surface Treatment – smoothed or cord-marked (Reference: Lewis 1972; Wise 1975)
Hell Island	-	Temper – crushed quartz and mica Surface Treatment – cord-marked or fabric-impressed (Reference: Custer 1989; Thomas 1966; Wright 1962)
Keyser Farm	-	Temper – fine shell Surface Treatment – cord-marked (Reference: Manson et al. 1944)
Killen's	-	Temper – fine shell and very fine grit Surface Treatment – smoothed or fabric-impressed (Reference: Blume et al. 1993; Custer 1994; Wise 1984)
Marcey Creek	-	Temper – steatite Surface Treatment – smoothed; plain (Reference: Manson 1948)
Mockley	-	Temper – shell Surface Treatment – cord-marked; net-impressed; fabric-impressed (minor) (Reference: Robinson and Bulhack 2005; Wright 1973)
Nassawongo	-	Temper – crushed quartz and clay nodules/grog Surface Treatment – cord-marked; net-impressed (Reference: Wise 1974)
Potomac Creek	-	Temper – crushed quartz/coarse sand Surface Treatment – cord-marked (Reference: Stephenson et al. 1963)

Selden Island - Temper – steatite
Surface Treatment – cord-marked
(Reference: Slattery 1946)

Townsend - Temper – shell
Surface Treatment – fabric-impressed or smoothed
(Reference: Blaker 1963; Griffith 1977; Lopez 1971)

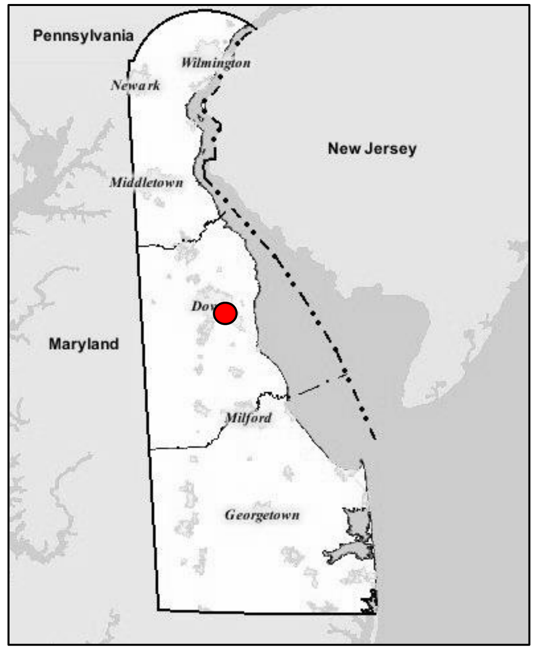
Wilgus - Temper – clay nodules/grog and shell
Surface Treatment – cord-marked; net-impressed
(Reference: Custer 1983)

Wolfe Neck - Temper – crushed quartz
Surface Treatment – cord-marked; net-impressed
(Reference: Griffith and Artusy 1977; Lewis 1972)

ANALYSIS OF RADIOCARBON DATES BY CERAMIC TYPE

The analysis of the calendar date range of each ceramic type is illustrated by a scatter plot of the calibrated radiocarbon dates for each type. The points plotted for each radiocarbon date are the mid-points of the calibrated 2 sigma range for the date. The weighted average of the probability distribution function provides the best central point estimate (Telford 2004). While calculation of the "mid-point" in this fashion may adjust the location of the points on the scatter plot, it does not change the 2 sigma range of the date. Accordingly, to arrive at the mid-points for the scatter plots I simply added the early end and late end of the 2 sigma distribution and divided by two. In the case of 2 sigma date ranges crossing the cal BC/cal AD mark, I subtracted the result from the more recent end of the 2 sigma range to obtain the mid-point. The maximum 2 sigma range for all the dates associated with each ceramic type is also cited for each chart. The maximum 2 sigma range was determined by using the most recent and oldest ends of the 2 sigma distribution for each type. Samples with large standard deviations in the CRA stretch the 2 sigma calibrated range (e.g., UGa-3439). For the purposes of discussing the calendar date range of each ceramic type, all calibrated radiocarbon dates are used. In the summary analysis for each type and in establishing a reliable 2 sigma range for the type, the CRA's with a standard deviation of ±100 or more are scrubbed from the analysis. The reason for doing so is that large standard deviations are typically due to radiocarbon sample sizes smaller than recommended for the lab technique used. This situation calls into question the accuracy of the date in question.

Accokeek



One radiocarbon date is reported for Accokeek ceramics (Beta-52096) from the Island Farm site in Kent County (Custer et al. 1995:244). The calibrated 2 sigma date range is cal AD 23 to cal AD 223 (Figure 1). This date falls within the more recent end of the accepted range for the type (Dent 1995:226). The standard deviation for the date is ±140 years. A large standard deviation is usually caused by a small radiocarbon sample size, which diminishes the accuracy of the resulting date. As this is the only date for Accokeek ceramics in Delaware, it is retained in the summary analysis of the radiocarbon date range of Delaware American Indian ceramics. Accokeek ceramics are rarely reported in Delaware. The calibrated calendar dates overlap significantly with the calibrated calendar dates of Wolfe Neck and Coulbourn ceramics. It is possible that Accokeek ceramics, abundant in the Chesapeake Bay coastal plain, represent a type that is occasionally traded into Delaware or brought to Delaware by small groups or individual potters who became part of the resident American Indian community.

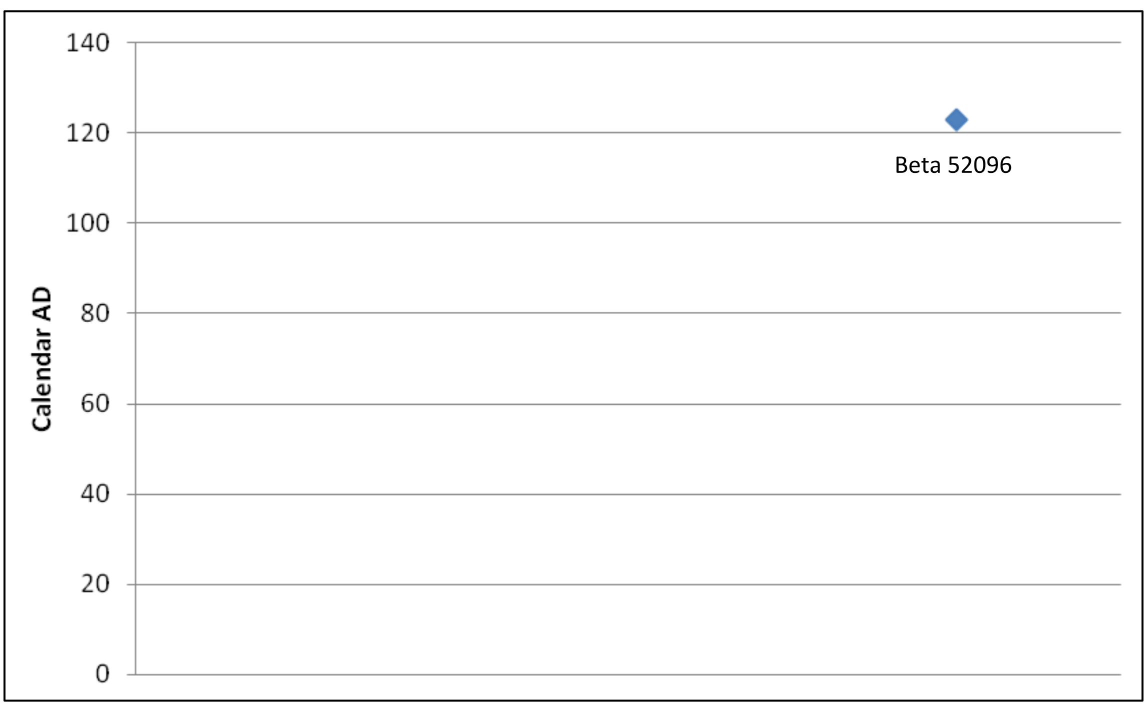
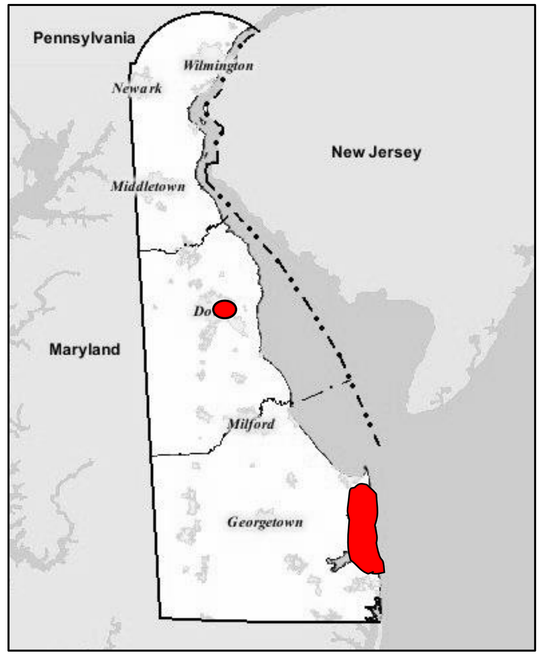


Figure 1: Accokeek Corrected Dates.

Coulbourn



Twelve radiocarbon dates are reported for Coulbourn ceramics. The scatter plot shows two clusters of dates (Figure 2). The cluster labeled “Accepted Range” encompasses six radiocarbon dates where Coulbourn ceramics were the only ceramics in the dated context. It is probable that this cluster represent the temporal range of Coulbourn ceramics. The cluster exhibits a calibrated 2 sigma date range from cal BC 55 to cal AD 349. The second cluster of dates comes from contexts where Mockley ceramics are also present in the dated context (SI-4942, UGa-1762, Beta-76644 and Beta-76838). The dates fall well within the known date range of Mockley ceramics, and it is likely that the Coulbourn ceramics were re-deposited into a Mockley bearing feature when it was filled. It is not uncommon for older ceramics to be re-deposited by later occupations. I consider these four dates to be precise Mockley dates and they are incorporated into the Mockley analysis and scatter plot. The discussion of Mockley dates allows for the possibility that the dates could be associated with Coulbourn ceramics as well.

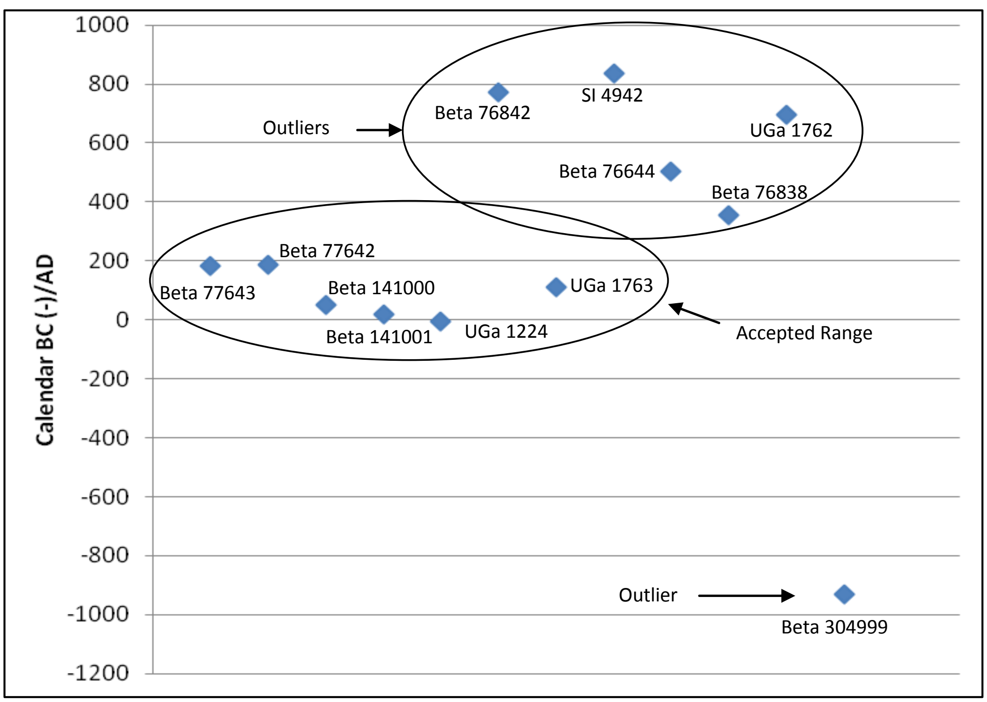
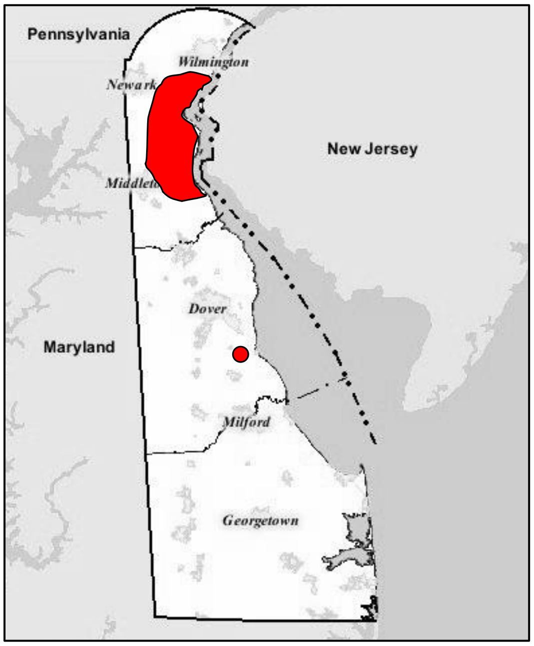


Figure 2: Coulbourn Corrected Dates.

Dames Quarter



One date (Beta-76842), noted as an outlier with a calibrated calendar date of cal AD 649 to cal AD 897, is from a context also containing Coulbourn ceramics. The authors of the Island Farm report note that the date is too recent for Coulbourn ceramics (Custer et al. 1995:146). This date could have resulted from sample contamination by more recent wood charcoal or the date is correct for a Mockley component feature, but no Mockley ceramics were deposited in the feature. This date falls within the range of Mockley ceramics, but without a clear association it cannot be considered a date for these ceramics. It is also possible that the ceramics were misidentified. This date is dropped from further analysis of Coulbourn and Mockley ceramics. Another date from the Gray Farm site (Beta-304999) is an early outlier with a 2 sigma mid-point of cal BC 932. The context associated with this date also included Wolfe Neck and Selden Island ceramics, with Selden Island ceramics dominant. The radiocarbon date likely represents the Selden Island component. Nine dates are reported for Dames Quarter ceramics. The dates are tightly clustered in the calibrated mid-point scatter plot and appear to be both accurate and precise for the type (Figure 3). The maximum 2 sigma calendar age range for Dames Quarter is cal BC 1419 to cal BC 970.

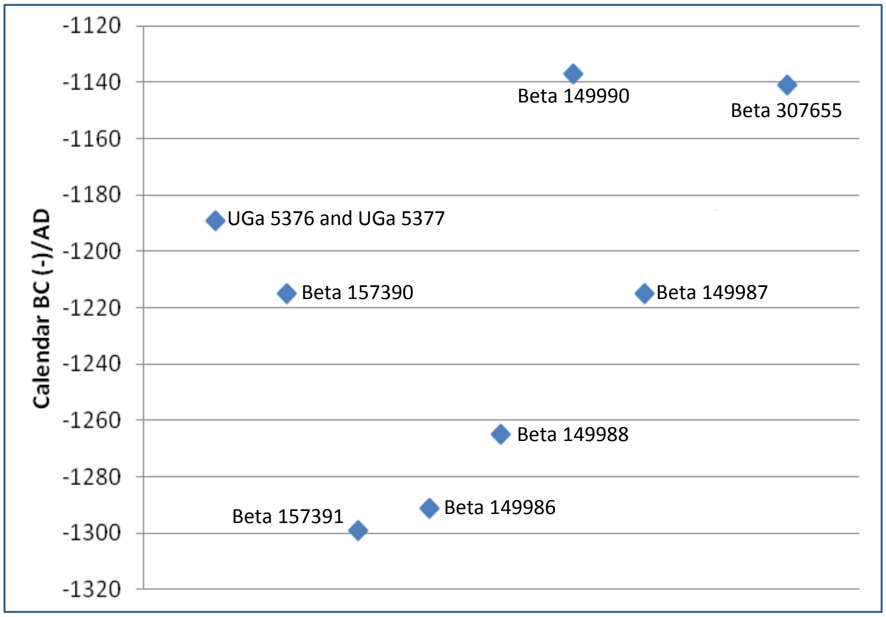
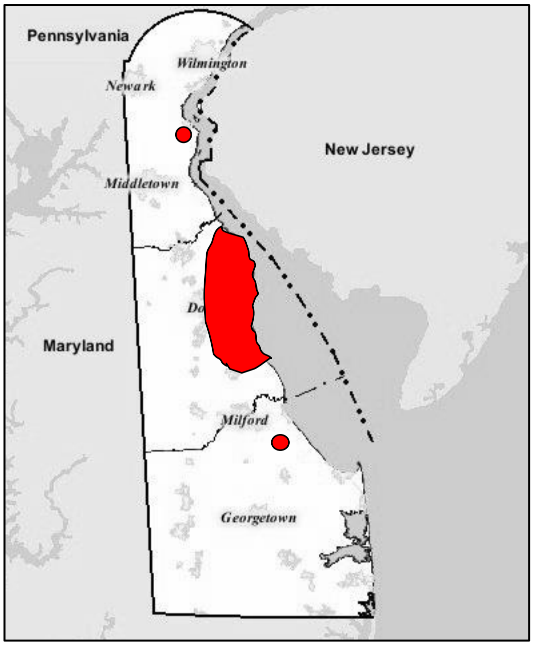


Figure 3: Dames Quarter Corrected Dates.

Hell Island



Ten dates are reported for Hell Island ceramics. The calibrated mid-points of the dates are tightly clustered on the scatter plot (Figure 4). One date (Beta-56361) was from a context containing both Hell Island and Marcey Creek ceramics. The authors of the report note that the date is too recent for Marcey Creek ceramics, but consistent with Hell Island ceramics (Custer and Silber 1995:103). One date (Beta-128586) is in the more recent end of the scatter plot, but within the accepted range for the type. Three dates (UGa-3437, UGa-3439 and Beta-42881) exhibit standard deviations exceeding ±100, which compromises the accuracy of the resulting date by the standard I have adopted. It is likely that these dates were derived from wood charcoal samples that were smaller than the recommended size. The large standard deviations stretch the 2 sigma ranges for the type as a whole. The 2 sigma range for Hell Island ceramics based on all the reported dates is cal BC 181 to cal AD 1408. The 2 sigma range without the three dates with large standard deviations is cal AD 526 to cal AD 1230. The conservative range for Hell Island ceramics is likely more precise and those seven precise dates are used to create the ceramics type date range summary (Figure 15).

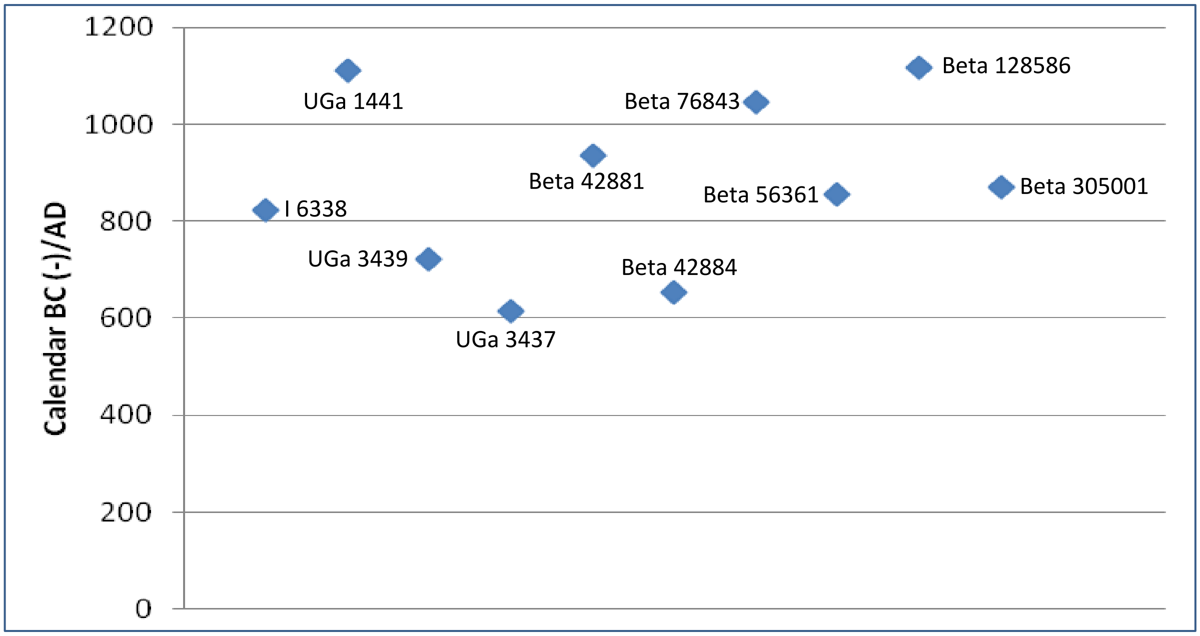
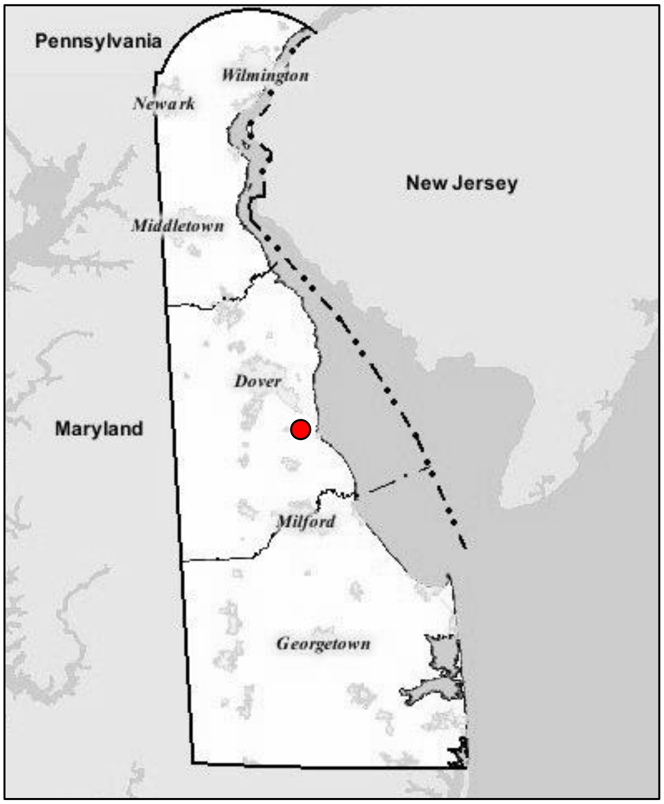


Figure 4: Hell Island Corrected Dates.

Keyser Farm

There is one reported date for Keyser Farm ceramics (Figure 5). The calibrated 2 sigma dateis cal AD 1466 to cal AD 1664, which is well within the accepted range for these ceramics (Wall 2001). The type is very rare in Delaware occurring only at the Robbins Farm site in southern Kent County (Stocum 1977).

Its presence likely represents the relocation of a small group or family moving into the area in the sixteenth century AD. The presence of the ceramics is not likely the result of trade, as trading relationships between western Maryland and central Delaware should be manifested at more than one site and in more ways than a single artifact class.



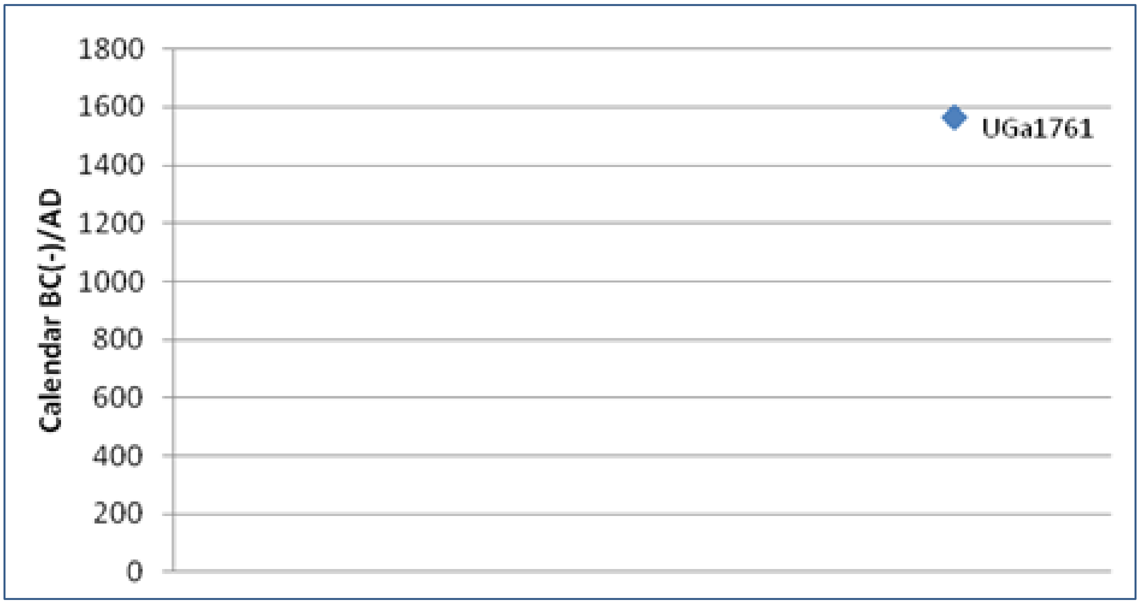
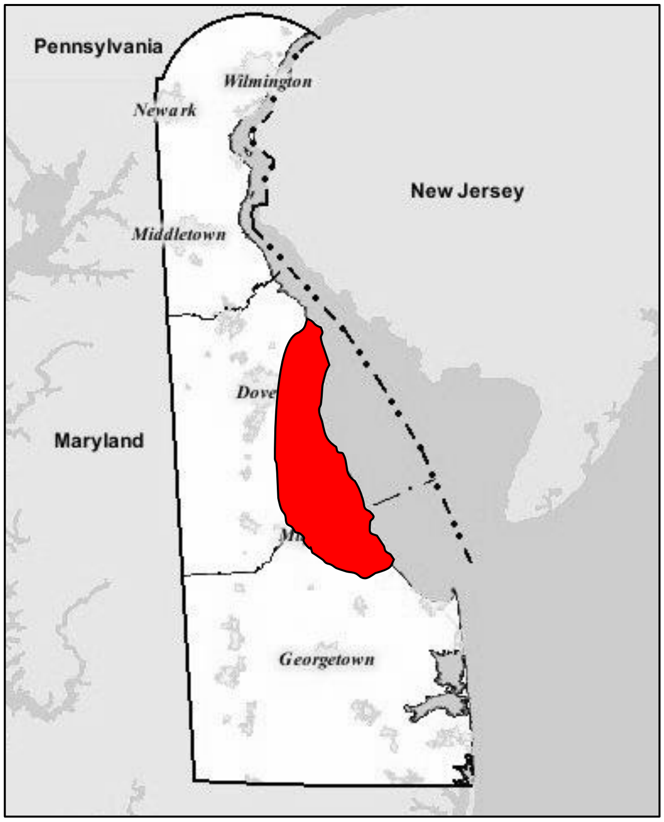


Figure 5: Keyser Farm Corrected Dates.

Killens

There are six reported dates for Killens ceramics (Figure 6). One date (Beta-42882) has a standard deviation of ±170, which calls into question the accuracy of the date. The large standard deviation was likely caused by a wood charcoal sample smaller than the recommended size for the analysis. Another date from the Gray Farm site (Beta-307304) has a CRA of 3270±30 producing a 2 sigma date range of cal BC 1622 to cal BC 1458. The one Killens sherd in the context is likely an intrusion into a much earlier feature and this date is not used in the scatter plot (Figure 6) or the calibrated ceramic type date range summary (Figure 15). The 2 sigma range of the remaining four dates is cal AD 1286 to cal AD 1706. Killens ceramics is a late Woodland II ware contemporary with Townsend ceramics in central and southern Delaware.



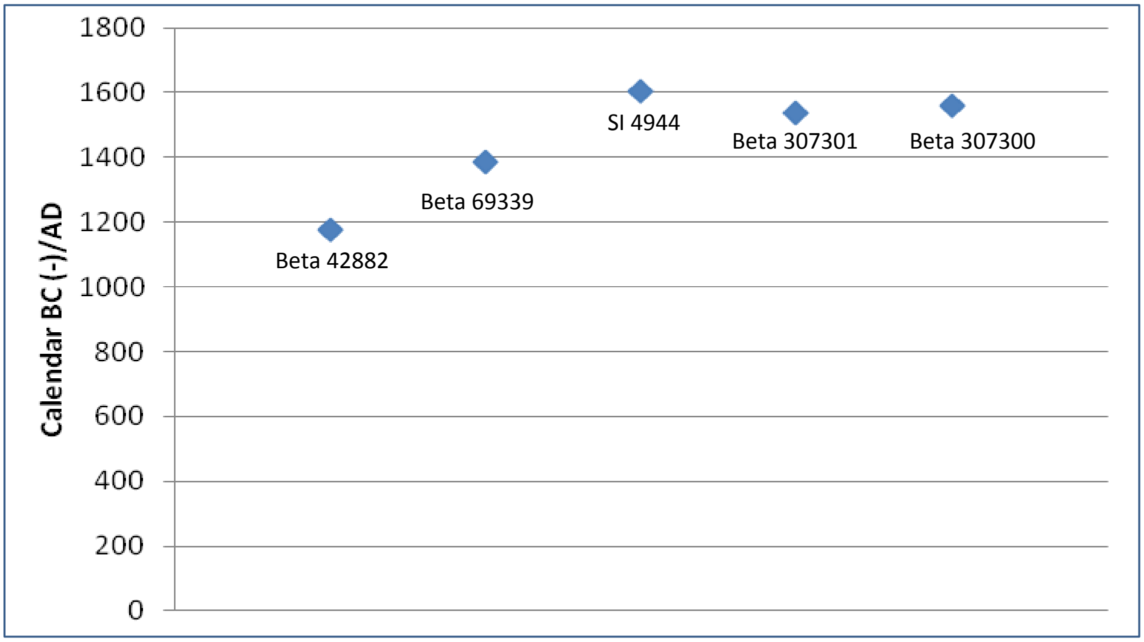
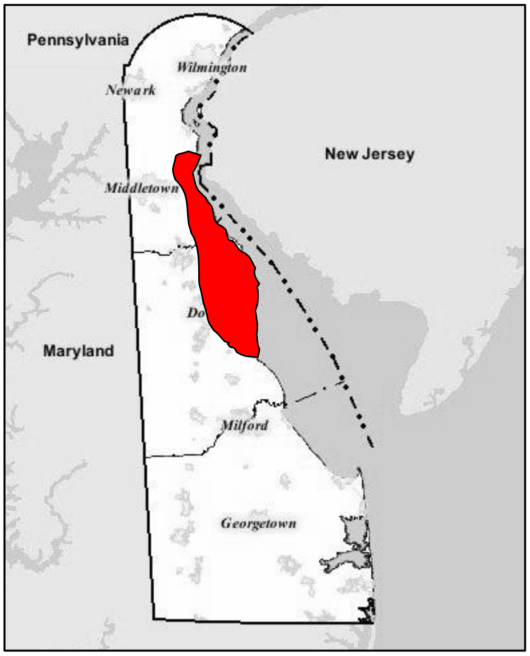


Figure 6: Killens Corrected Dates.

Marcey Creek



Seven dates are reported for Marcey Creek ceramics. The scatter plot shows two clusters of dates without a 2 sigma overlap (Figure 7). The authors of the report containing Beta-56360 and Beta-56361 state that the dates are too recent for Marcey Creek ceramics (Custer and Silber 1995:103). It is likely that wood charcoal from more recent components was incorporated into the sample submitted for analysis. The dates are more consistent with dates for Mockley and Hell Island ceramics, but there is no evidence these types were present in the dated contexts. It is possible that the ceramics were misidentified, but it is not likely as Marcey Creek ceramics have distinct defining attributes.

One date, Beta-149987, falls within the accepted range of Marcey Creek ceramics. The 2 sigma date range is cal BC 1319 to cal BC 1110. This range is consistent with the radiocarbon date range in the region (Dent 1995:226). Two other dates (Beta-128589 and Beta-117149) from the Hickory Bluff site are at the more recent end of the accepted range, overlap the range of dates for Selden Island ceramics and may represent the end of Marcey Creek manufacture in the area. Two dates from the Gray Farm Site (Beta-304997 and Beta-307658) are at the very early end of the accepted range in the region for Marcey Creek ceramics. The earliest date (Beta-307658) is a direct dating of the ceramics by bulk sherd organics and is considered accurate and precise. The two dates are included in the scatter plot (Figure 7) and the ceramic date range summary (Figure 15) as references for further discussion.

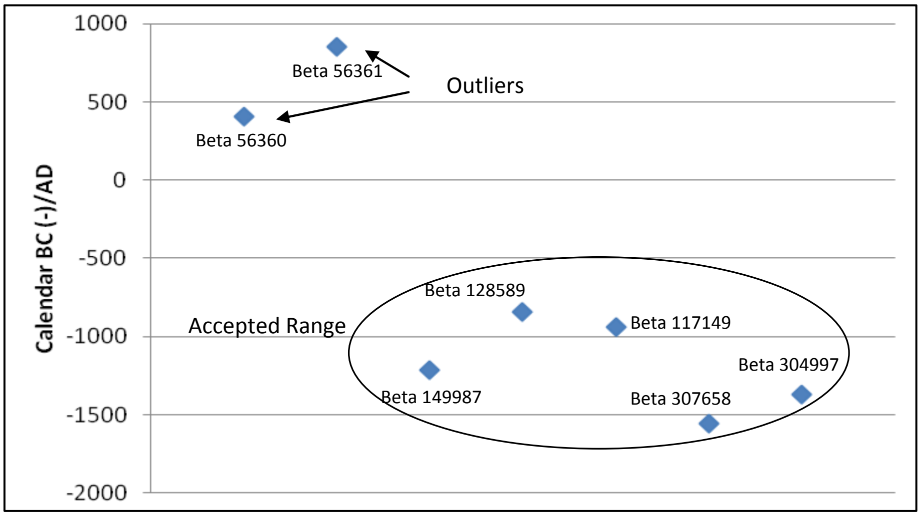
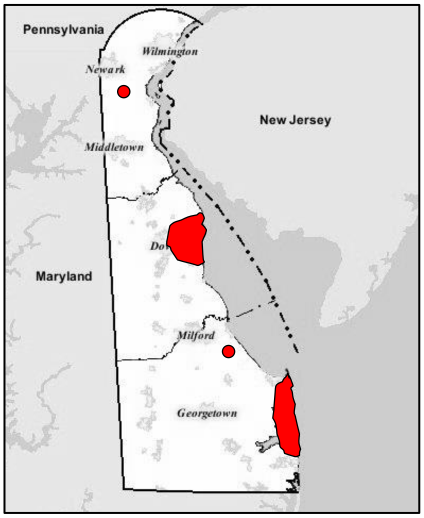


Figure 7: Marcey Creek Corrected Dates.

Mockley



Eighteen dates are reported for Mockley ceramics. The scatter plot exhibits a consistent cluster of calibrated dates with a 2 sigma range for the type from cal AD 47 to cal AD 1106 (Figure 8). Ruling out two dates with large standard deviations (UGa-1273b and Beta-42883), the resulting 2 sigma range for the type is cal AD 47 to cal AD 993.

Five dates (SI-4942, UGa-1762, Beta-76644, Beta-309416 and Beta-76838) were from features where Coulbourn ceramics also occurred and for UGa-1762 Coulbourn and Wilgus ceramics were in the same context with the Mockley ceramics. In reviewing the published reports for these dates, it was noted that for UGa-1762 Mockley ceramics were dominant in the context. I consider UGa-1762 a precise Mockley date and it is included in the ceramics type summary. The context for the Gray Farm Site producing the radiocarbon date (Beta-309416) also included Coulbourn and Townsend ceramics. As the context is mixed and Coulbourn ceramics are dominant, it is likely the date was derived from a blend of charcoal and it is not used in the scatter plot (Figure 8) or the ceramic type date range summary (Figure 15). In discussing the three other dates, the reports simply note that Mockley and Coulbourn ceramics were found in the dated context. It is possible that Mockley and Coulbourn ceramics were contemporary and these three dates represent a later expression of Coulbourn ceramics. It is equally likely that the dates represent Mockley producing components where earlier Coulbourn ceramics were incorporated into the feature when filled. A re-analysis of each context may or may not answer this question. Future excavations of Mockley-bearing contexts should be open to either hypothesis and field strategies designed to answer this question. For the purposes of the Mockley chronological summary chart, these dates are included as Mockley ceramics were clearly present in the dated contexts.

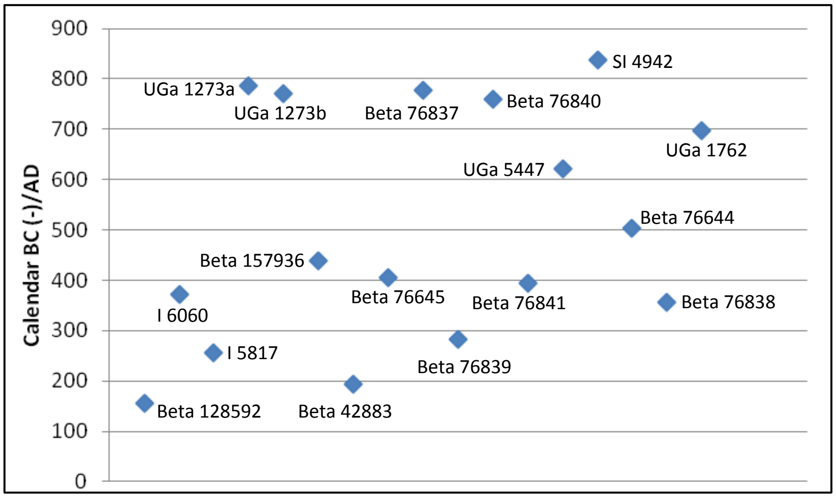
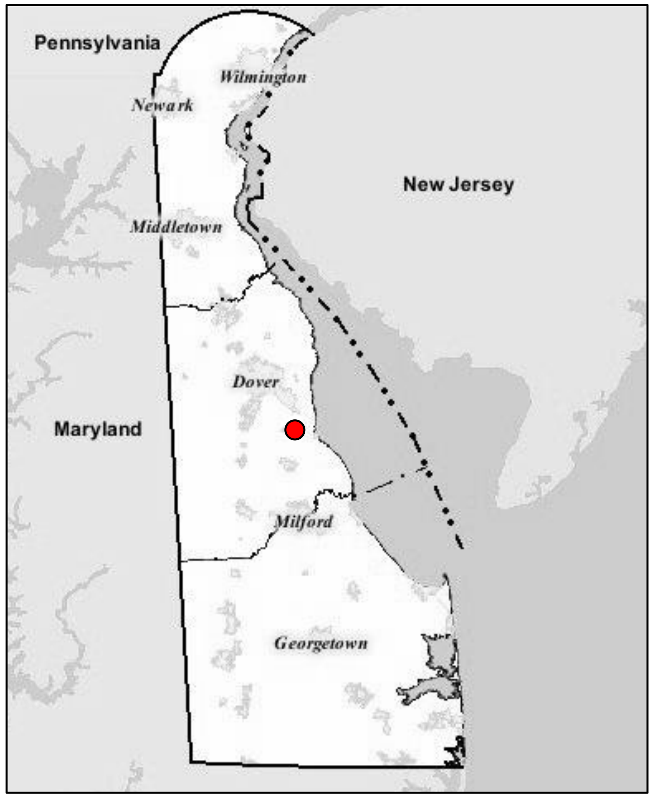


Figure 8: Mockley Corrected Dates.

Potomac Creek

There is one reported radiocarbon date for Potomac Creek ceramics (UGa-1761). The calibrated 2 sigma calendar date range is cal AD 1446 to cal AD 1664 (Figure 9). This date range is well within the reported date range for Potomac Creek ceramics in the Middle Atlantic (Dent 1995:246). Keyser Farm ceramics were also present in the dated context and the two types should be considered contemporary. Potomac Creek ceramics, like Keyser Farm, are very rare in Delaware. Their presence is likely the result of the relocation of a small group or family from the central western shore of the Chesapeake Bay sometime during the sixteenth century AD.



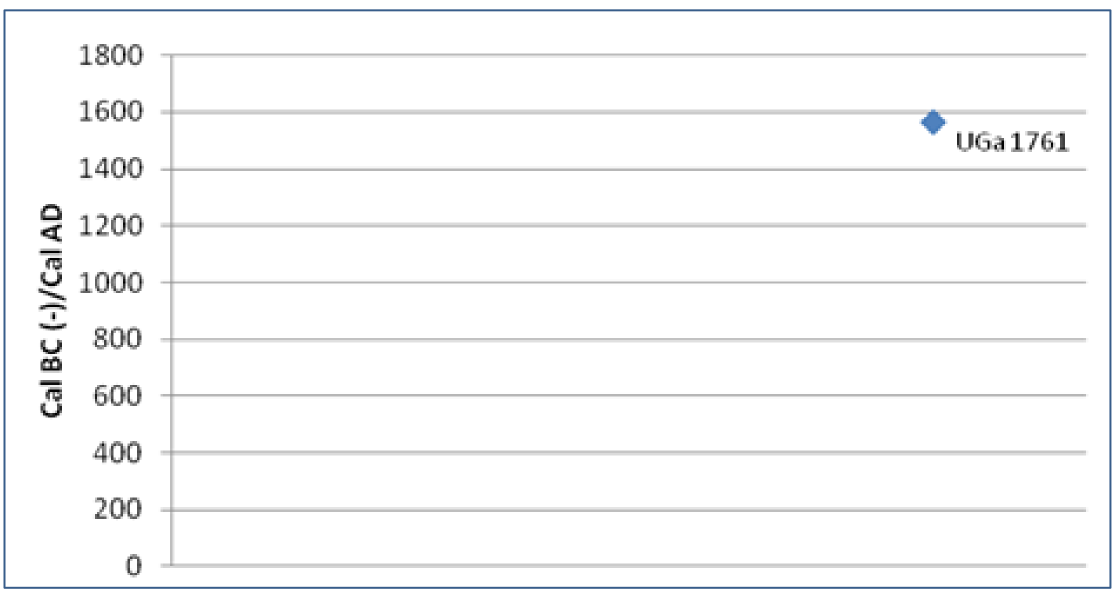
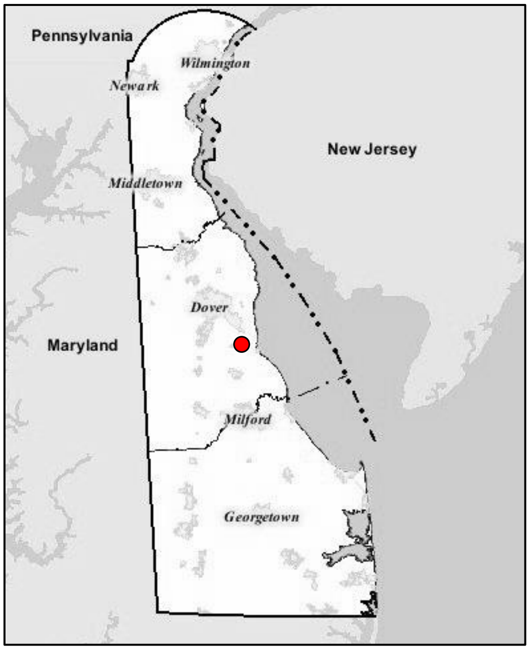


Figure 9: Potomac Creek Corrected Dates.

Selden Island



Five dates are reported for Selden Island ceramics. One date (Beta-52097) has a 2 sigma calibrated date range is cal AD 209 to cal AD 652. The published report states that the date is too recent for the type (Custer et al. 1995:243). The standard deviation for the date is ±120, which calls into question the accuracy of the date. The reported date is well beyond the accepted date range from cal BC 1000 to cal BC 700 (Artusy 1976). This date is not used in the Selden Island scatter plot (Figure 10) or in the date range summary for Selden Island ceramics in Delaware (Figure 15). Four dates for Selden Island ceramics were obtained from the research at the Gray Farm Site. One date (Beta-304998) has a calibrated age range of cal BC 2872 to cal BC 2577 and is well beyond the accepted range for the type and likely resulted from Selden Island ceramics intruding into a much earlier feature. Three dates (Beta-307657, Beta-307656 and Beta-304999) form a consistent cluster in the scatter plot. Two dates (Beta-307656 and Beta-307657) are from bulk sherd organics and are considered accurate and precise. All three dates are used to produce the ceramic type summary chart (Figure 10). The 2 sigma calibrated date range for Selden Island ceramics is cal BC 1195 to cal BC 811.

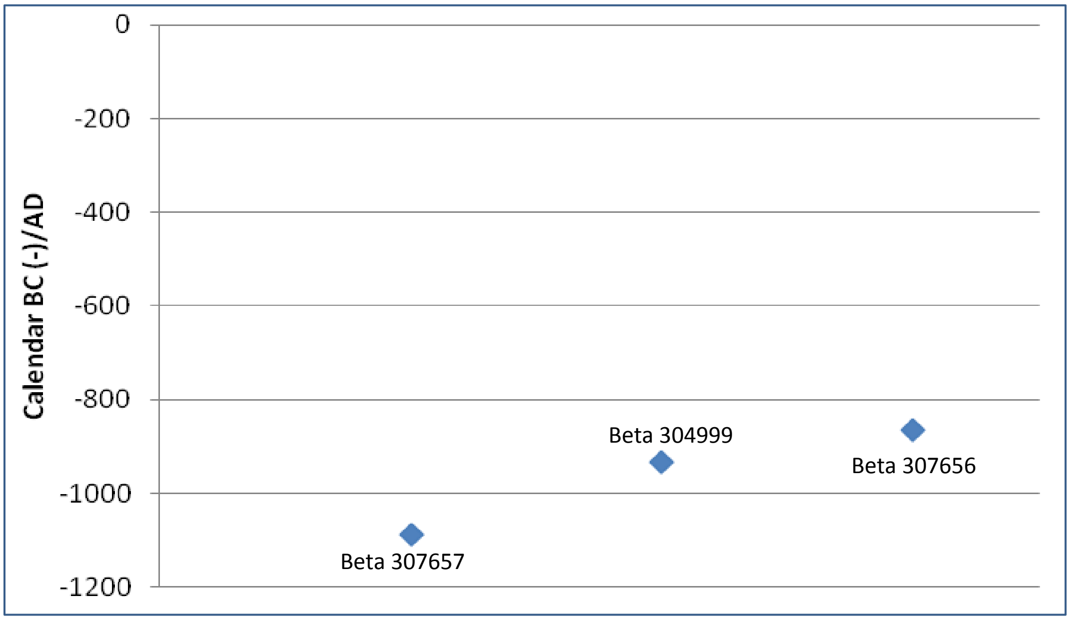
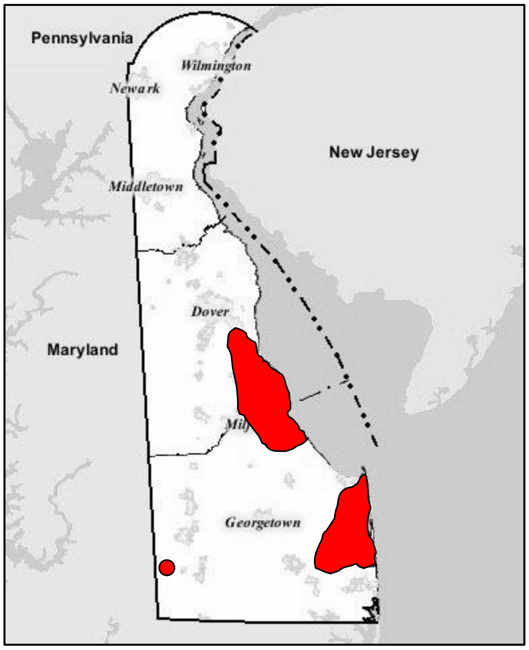


Figure 10: Seldon Island Corrected Dates.

Townsend

There are fifteen reported dates for Townsend ceramics (Figure 11). The mid-points of the calibrated dates cluster tightly with a combined 2 sigma date range of cal AD 941 to cal AD 1706. The standard deviations of all dates are less than ±100, which leads to the conclusion that the dates are highly accurate. The lack of other ceramic associations in the dated contexts, with three exceptions, indicates the dates are precise in dating the temporal range of Townsend ceramics. The three exceptions (SI-4944, Beta-307300 and Beta-307301), contain Killens ceramics in the same context. One date is from the Slaughter Creek site (Custer 1989:353), while the remaining two are from the Gray Farm site. As Killens ceramics are contemporary with Townsend ceramics, and may be considered a regional variant of Townsend, this date can be considered precise for both Killens and Townsend ceramics. The Townsend date on wood charcoal from the Island Field site (Beta-29737) was questioned in comparison to the shell date (Beta-29738) in the same context. While it seems that the wood charcoal sample may have been contaminated by earlier charcoal, the resulting calibrated 2 sigma date range is well within the range for Townsend ceramics. As the date may be both accurate and precise, it will be retained for the summary analysis. Dismissing this date does not change the 2-sigma date range for Townsend ceramics. All reported Townsend dates are used in producing the chronological summary for the type.



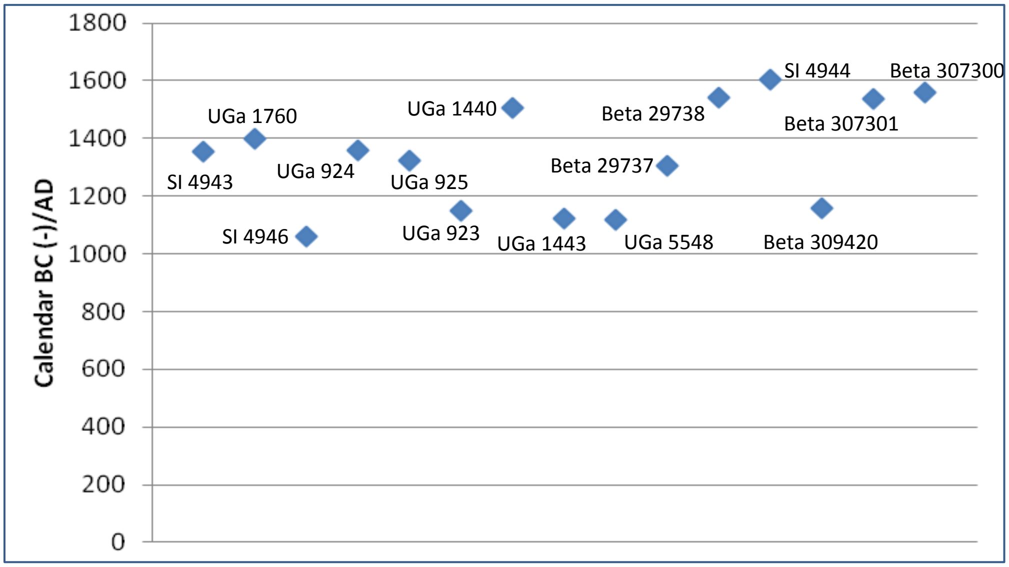
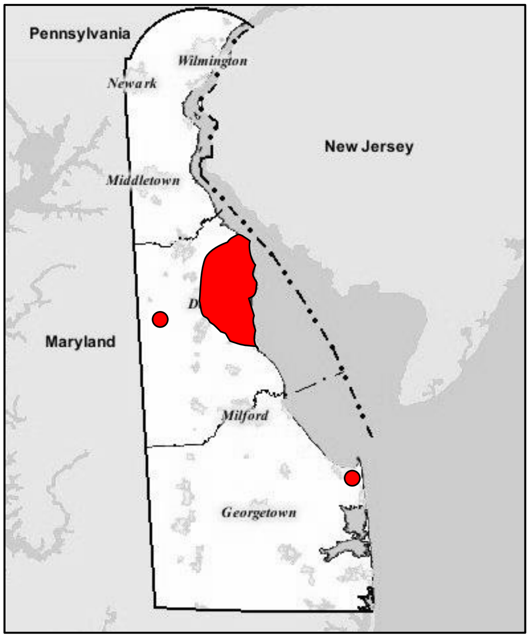


Figure 11: Townsend Corrected Dates.

Wolfe Neck



There are eight reported radiocarbon dates for Wolfe Neck ceramics (Figure 12). The scatter plot of the calibrated mid-points exhibit a cluster of five dates that likely represent the temporal range of Wolfe Neck ceramics (Beta-141542, I-6891, UGa-1223, Beta-309419 and Beta-42879). The 2 sigma calibrated range for Wolfe Neck ceramics based on these five dates is cal BC 782 to cal AD 74. Three reported dates, UGa-1763, Beta-304999 and Beta 52097, appear to be outliers. A re-analysis of the context containing the date for UGa-1763 reveals Coulbourn ceramics as the dominant type. This date is incorporated into the discussion of Coulbourn ceramics. It is possible that Wolfe Neck and Coulbourn ceramics were briefly contemporary, but further research is needed, as this is the only reported case of this association. The date for UGa-1763 is not used in producing the temporal summary for Wolfe Neck ceramics. Beta-52097 is reported to be too recent for Wolfe Neck (Custer et al. 1995:243). The standard deviation for the date is ±120, which indicates that the date is not very accurate for reasons previously stated. Beta-52097 is not used in producing the chronological summary for Wolfe Neck ceramics. Beta-304999 from Gray Farm is from a context that includes Selden Island ceramics and the associated radiocarbon date likely represents that component. This date is not used in the Wolfe Neck scatter plot (Figure 12) or in the ceramic type date range summary (Figure 15). Beta-309419 is from a cultural feature at the Gray Farm site and is considered both accurate and precise for the type.

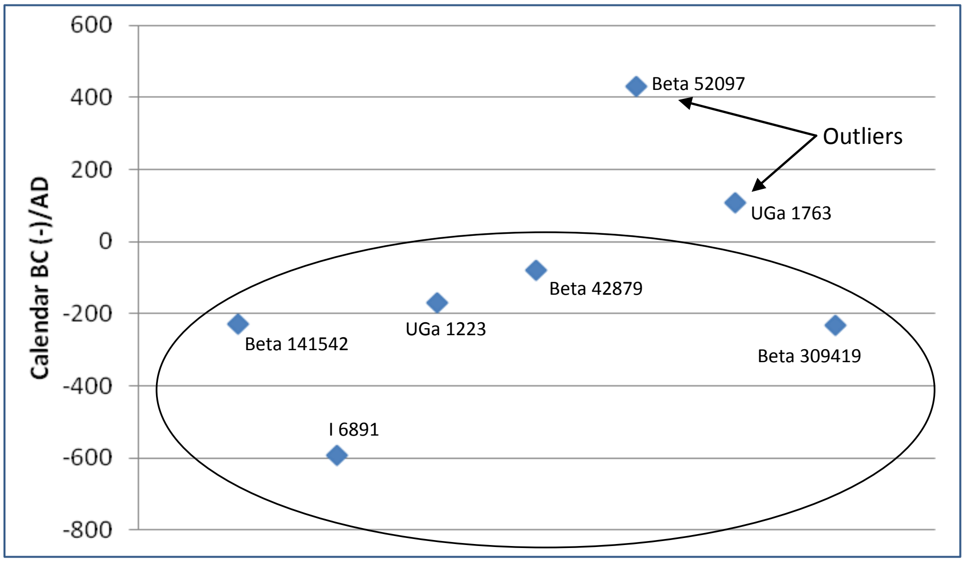


Figure 12: Wolfe Neck Corrected Dates.

Nassawongo

Because there are no precise radiocarbon dates in Delaware for Nassawongo and Wilgus (see below), a location map is not provided for these varieties. Both of these types may have a presence in Delaware, thus information from southern and coastal Maryland is presented here.

Two dates are reported for Nassawongo ceramics. The authors of the report containing the dates state that both dates are too recent for the type (Custer et al. 1995:243). Nassawongo ceramics have an expected date range around cal BC 500 (Custer 1984:183), while the reported dates from Delaware have a combined 2 sigma range of cal AD 501 to cal AD 1817 (Figure 13). In addition, the standard deviation of the CRA's for these dates is great than or equal to ±100, which calls into question the accuracy of the dates. These dates are considered neither accurate nor precise. Consequently, a Nassawongo ceramics type chronological summary is not included in this report.

Figure 13: Nassawongo Corrected Dates.

Wilgus

Two dates are reported for Wilgus ceramics (UGa-1762 and UGa-1763). The report notes that both dates are too recent for Wilgus ceramics (Custer 1983:39). However, the dominant ceramic type in the UGa-1762 context was Mockley while the dominant ceramic in the UGa-1763 context was Coulbourn. It is likely these dates are precise for those types. Wilgus ware is a cord marked or net impressed ceramic tempered with clay nodules/grog and shell, while Mockley is tempered with shell only and Coulbourn is tempered with clay nodules/grog only.

Wilgus ware has been offered as a transitional type between Coulbourn and Mockley (Custer 1983:39). While this is possible, it is equally likely that Wilgus ware is simply a variant within Coulbourn and Mockley wares and not a separate type with a distinct geographic distribution and temporal range. The two reported dates suggest the latter interpretation (Figure 14). The temporal framework summary does not include Wilgus ware for these reasons.

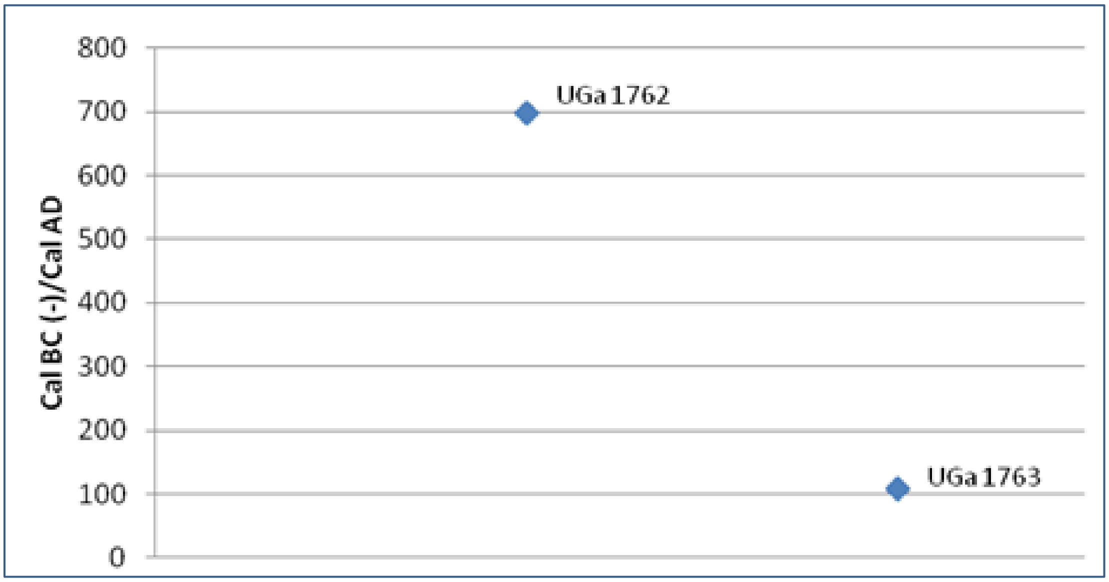


Figure 14: Wilgus Corrected Dates.

TEMPORAL RANGE OF AMERICAN INDIAN CERAMICS IN DELAWARE

The temporal ranges for radiocarbon dated American Indian ceramics is illustrated by a summary chart (Figure 15). The temporal range for each type is established using the combined 2 sigma date ranges of the component types that are considered both accurate and precise. The chart also plots the earliest and most recent mid-points of the 2 sigma range for each type, where there is more than one date for the type. Radiocarbon dates with standard deviations greater than or equal to ±100 or where the precision of the date has been questioned were not used to produce the summary chart or included in the associated data table in the aforementioned archaeological reports found online representing the full data set for this study. The data for the chart is in the re-calibrated data table contained in the report link above, Figures 1–14, and the accompanying text for each ceramic type. The geographic location of sites producing radiocarbon dates associated with American Indian ceramics is illustrated in Figure 16.

Recommendations and Factors to Consider for Future Radiocarbon Dates

Radiocarbon dates are essential to establish calendar date ranges for American Indian ceramics in Delaware. To date 72 radiocarbon dates have been obtained from 25 sites (Table 1). The radiocarbon dates associated with American Indian ceramics from the Delaware Park site were shown to not be precise.

For the purpose of establishing the general calendar date range for a specific ceramic type, I recommend acquiring a minimum of five dates from different sites, assuming one or two of the dates will be outliers due to an insufficient sample size, poor association of the sample with the target ceramic and/or contamination of the sample. However, the ceramic types in this report vary considerably in their period of production and use. Mockley ceramics, for example, span at least 900 years (2 sigma) and Townsend ceramics 550 years (2 sigma). Consequently, for site specific research designed to determine periods of occupation, it is not accurate to rely solely on the date range of the associated ceramics established in this report (Griffith 2012).

The geographic distribution of precise radiocarbon dates is also of anthropological significance. The nature and direction of regional or sub-regional influences on American Indian ceramics technology and style can be interpreted by examining temporal and geographic distributions of ceramic series, types and varieties at a fine scale (cf. Griffith 2012). It is possible, even likely, that some types are not evenly distributed within Delaware, while some types may not be present in some areas. It is precisely this kind of geographic and temporal pattern that leads to finer grained knowledge of social dynamics. The scale of the space and time framework is significant. In order to address questions at the level of living communities and even individuals, it is necessary to establish a very fine-grained space and time framework of high data quality.

As presented in the report entitled "Delaware American Indian Ceramics: Radiocarbon Dates" (Griffith 2012), there are ceramics types known to be present in Delaware for which there are no precise dates (e.g., Minguannan), there are ceramics types that do not have five precise dates, and the geographic pattern of precise dates is uneven and restricted.

The distribution of precise dates reflects the pattern of archaeological excavations driven by the location of data recovery projects and isolated research investigations. Table 2 lists the precise dates from Table 1 by geographic region within the state. It is clear from Table 2 that the location of precise radiocarbon dates within Delaware were derived from a number of restricted areas. The hatched areas on the maps shown above for each ceramic types recovery location encompass single sites or clusters of sites where precise dates were obtained for each ceramic type.

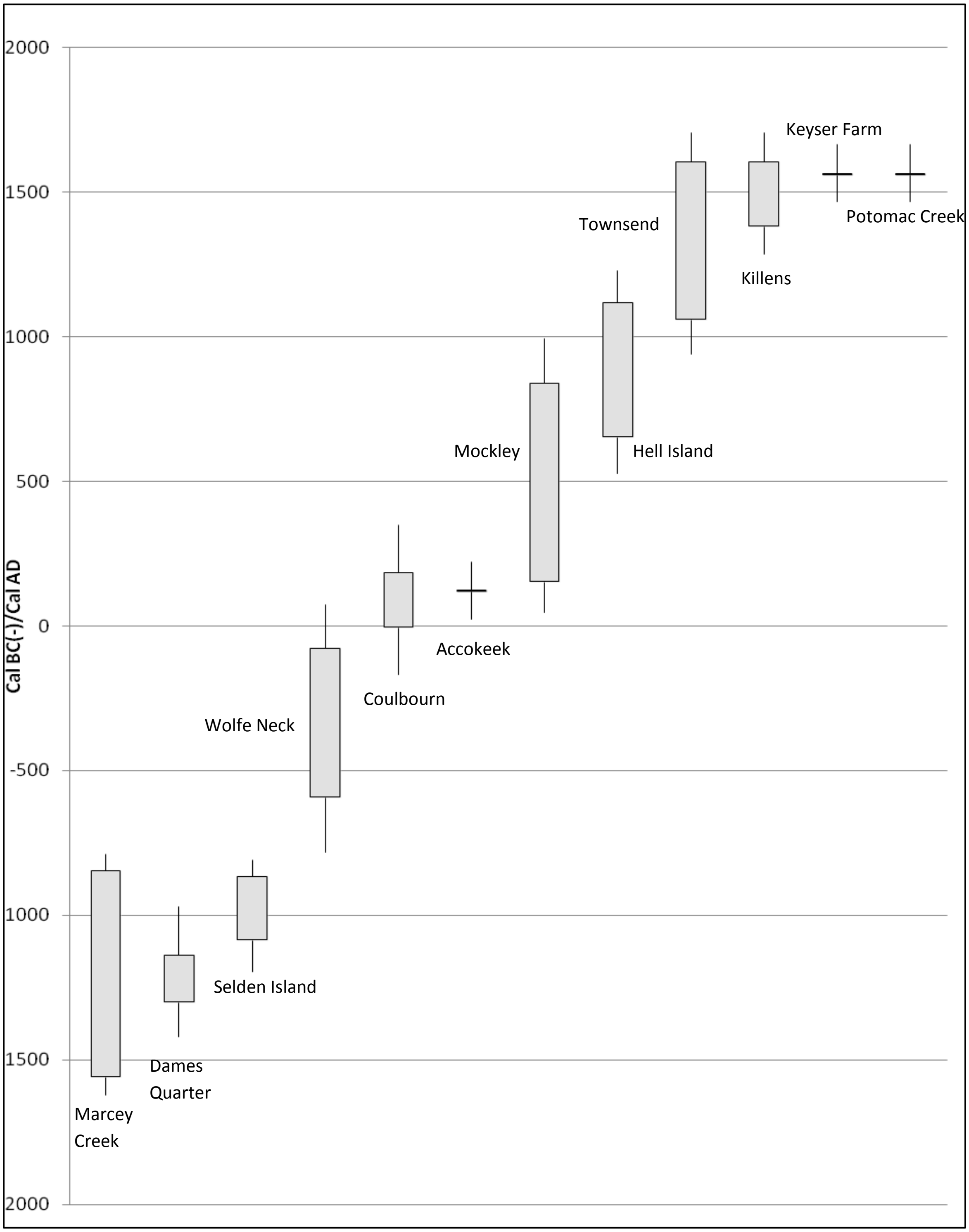


Figure 15: Delaware American Indian Ceramics Calibrated Date Range Summary (Shaded areas are the mid-point ranges; extensions are the maximum 2 sigma ranges).

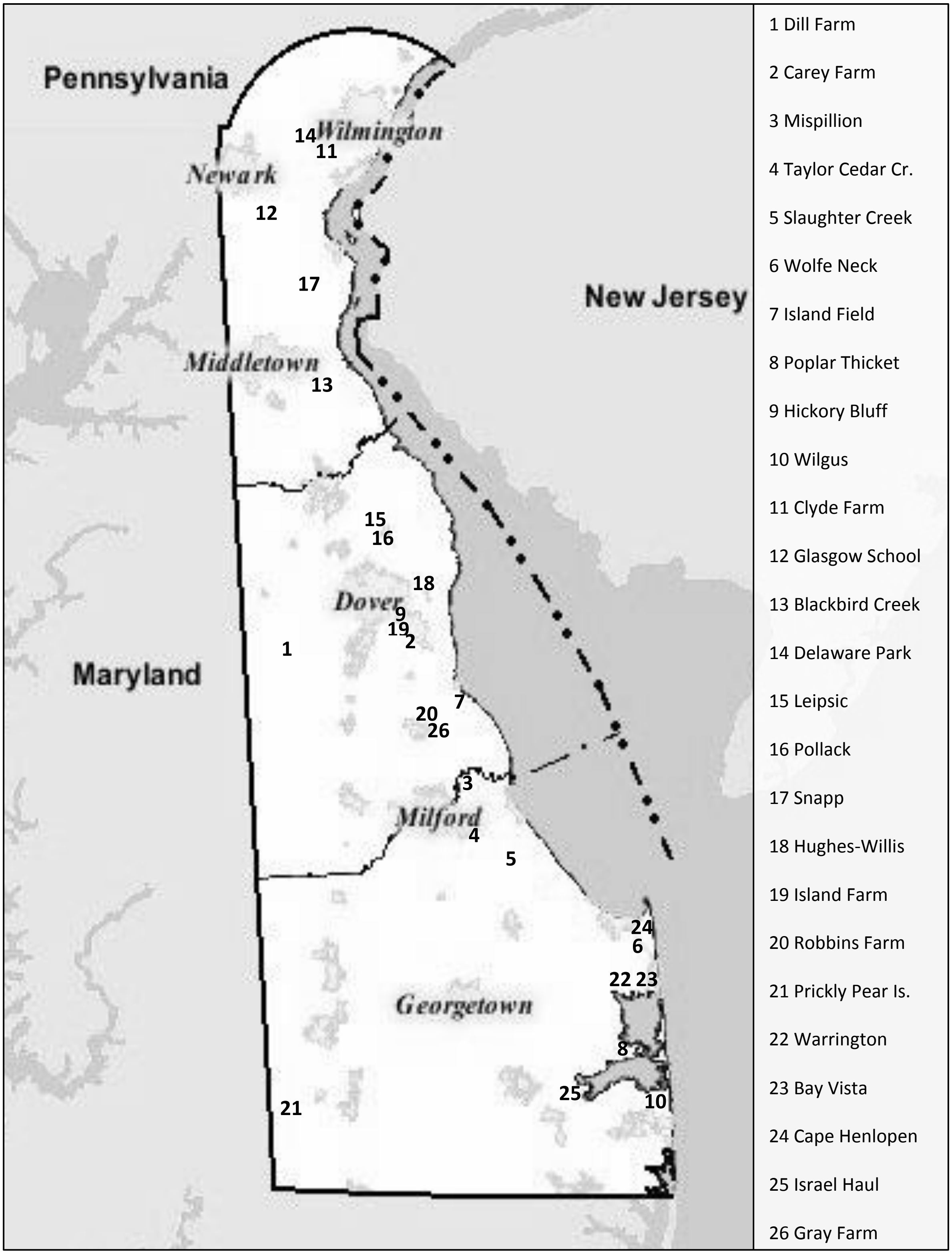


Figure 16: Site Locations of Radiocarbon-Dated American Indian Ceramics in Delaware.

Table 1: Ceramic Temporal Ranges and Sites, Re-Calibrated Dates.

Ceramic Type	Lab Code	Site	2 Sigma Range	Mid-Point
Accokeek	Beta-52096	Is. Farm	AD 23: AD 223	AD 123
Coulbourn	UGa-1224	Wolfe Neck	BC 168: AD 161	BC 4
	Beta-141001	Hickory Blf	BC 55: AD 91	AD 18
	Beta-141000	Hickory Blf	BC 39: AD 139	AD 50
	UGa-1763	Wilgus	BC 41: AD 260	AD 109
	Beta-77643	Wolfe Neck	AD 31: AD 339	AD 185
	Beta-77642	Wolfe Neck	AD 23: AD 349	AD 186
Dames Quarter	Beta-157391	Glasgow	BC 1407: BC 1191	BC 1299
	Beta-149986	Blackbird	BC 1395: BC 1187	BC 1291
	Beta-149988	Blackbird	BC 1419: BC 1111	BC 1265
	Beta-157390	Glasgow	BC 1319: BC 1110	BC 1215
	Beta-149987	Blackbird	BC 1319: BC 1110	BC 1215
	UGa-5377	Clyde Fm.	BC 1407: BC 971	BC 1189
	UGa-5376	Clyde Fm.	BC 1407: BC 970	BC 1189
	Beta-307655	Gray Fm	BC 1259: BC 1024	BC 1141
	Beta-149990	Blackbird	BC 1264: BC 1010	BC 1137
Hell Island	Beta-42884	Leipsic	AD 526: AD 779	AD 653
	I-6338	Is. Field A	D 659: AD 989	AD 824
	Beta-56361	Snapp	AD 689: AD 1020	AD 855
	Beta-305001	Gray Fm.	AD 776: AD 966	AD 871
	Beta-76843	Carey Fm.	AD 932: AD 1162	AD 1047
	UGa-1441	Cedar Crk.	AD 994: AD 1230	AD 1112
	Beta-128586	Hickory Blf.	AD 1023: AD 1213	AD 1118
Keyser Farm	UGa-1761	Robbins	AD 1466: AD 1664	AD 1565
Killens	Beta-69339	Pollack	AD 1286: AD 1481	AD 1384
	Beta-307301	Gray Fm.	AD 1457: AD 1617	AD 1537
	Beta-307300	Gray Fm.	AD 1477: AD 1642	AD 1559
	SI-4944	Slaughter Cr.	AD 1500: AD 1706	AD 1603
Marcey Creek	Beta-307658	Gary Fm.	BC 1622: BC 1492	BC 1557
	Beta-304997	Gray Fm.	BC 1435: BC 1298	BC 1366
	Beta-149987	Blackbird Cr.	BC 1319: BC 1110	BC 1215
	Beta- 117149	Hickory Blf.	BC 1039: BC 835	BC 937
	Beta– 128589	Hickory Blf.	BC 900: BC 790	BC 845
Mockley	Beta-128592	Hickory Blf.	AD 47: AD 263	AD 155
	I-5817	Carey Fm.	AD 72: AD 441	AD 257
	Beta-76839	Carey Fm.	AD 133: AD 433	AD 283
	Beta-76838	Carey Fm.	AD 237: AD 474	AD 356
	I-6060	Hughes Wls.	AD 134: AD 608	AD 371
	Beta-76841	Carey Fm.	AD 256: AD 534	AD 395
	Beta-76645	Carey Fm.	AD 245: AD 564	AD 405
	Beta-157936	GlasgowA	D 317: AD 560	AD 439
	Beta-76644	Carey Fm.	AD 404: AD 604	AD 504
	UGa-5447	Cape Hnlpn.	AD 549: AD 692	AD 621
	UGa-1762	Wilgus	AD 548: AD 848	AD 698
	Beta-76840	Carey Fm.	AD 644: AD 876	AD 760
	Beta-76837	Carey Fm.	AD 660: AD 896	AD 778
	UGa-1273a	Wolfe Neck	AD 651: AD 923	AD 787
	SI-4942	Slaughter Cr.	AD 682: AD 993	AD 838

Table 1 (continued): Ceramic Temporal Ranges and Sites, Re-Calibrated Dates.

Potomac Creek	UGa-1761	Robbins	AD 1466: AD 1664	AD 1565
Selden Island	Beta-307657	Gray Fm.	BC 1195: BC 977	BC 1086
	Beta-304999	Gray Fm.	BC 1029: BC 835	BC 932
	Beta-307656	Gray Fm.	BC 918: BC 811	BC 865
Townsend	SI-4946	Slaughter Cr.	AD 941: AD 1180	AD 1061
	UGa-5548	Israel Haul	AD 1016: AD 1218	AD 1117
	UGa-1443	Poplar Thkt.	AD 1021: AD 1225	AD 1123
	UGa-923	Mispillion	AD 1028: AD 1270	AD 1149
	Beta-309420	Gray Fm.	AD 1052: AD 1261	AD 1157
	Beta-29737	Is. Field	AD 1213: AD 1398	AD 1306
	UGa-925	Warrington	AD 1215: AD 1430	AD 1323
	SI-4943	Slaughter Cr.	AD 1283: AD 1422	AD 1353
	UGa-924	Poplar Thkt.	AD 1290: AD 1432	AD 1361
	UGa-1760	Prickly Pear	AD 1316: AD 1485	AD 1401
	UGa-1440	Bay Vista	AD 1393: AD 1617	AD 1505
	Beta-307301	Gray Fm.	AD 1457: AD 1617	AD 1537
	Beta-29738	Is. Field	AD 1421: AD 1659	AD 1540
	Beta-307300	Gray Fm.	AD 1477: AD 1642	AD 1559
	SI-4944	Slaughter Cr.	AD 1500: AD 1706	AD 1603
Wolfe Neck	I-6891	Dill Farm	BC 782: BC 399	BC 591
	Beta-309419	Gray Fm.	BC 358: BC 107	BC 232
	Beta-141542	Hickory Blf.	BC 366: BC 88	BC 227
	UGa-1223	Wolfe Neck	BC 337: BC 1	BC 169
	Beta-42879	Leipsic	BC 231: AD 74	BC 79

Table 2: Radiocarbon Dates by Region.

Ceramic Type	# Precise Dates	# Sites with Precise Dates	Piedmont	Delaware River	Delaware Bay	Atlantic Coast	Chesapeake Bay
Accokeek	1	1	0	0	1	0	0
Coulbourn	6	3	0	0	2	4	0
Dames Quarter	9	4	0	8	1	0	0
Hell Island	7	7	0	1	6	0	0
Keyser Farm	1	1	0	0	1	0	0
Killens	4	3	0	0	4	0	0
Marcey Creek	5	3	0	1	4	0	0
Minguannan	0	0	0	0	0	0	0
Mockley	15	8	0	1	11	3	0
Nassawongo	0	0	0	0	0	0	0
Potomac Creek	1	1	0	0	1	0	0
Selden Island	3	1	0	0	3	0	0
Townsend	15	9	0	0	9	5	1
Wilgus	0	0	0	0	0	0	0
Wolfe Neck	5	5	0	0	3	1	1

General recommendations for additional radiocarbon dates:

1) Date any new or newly defined type within an existing series or any unknown series or type.

2) Obtain at least two additional paired shell and charcoal dates from the Delaware Bay/Atlantic Coast to establish a marine reservoir correction for those areas. Refer to Griffith 2012 for a discussion of the need for and methods of determining a locally established marine reservoir correction.

3) Date any ceramic series or type with less than five precise dates from different sites with high quality contexts where the association is clear between the material submitted for radiocarbon dating and the target ceramic type.

4) Date any ceramics series or types outside the known recovery areas for each type, as shown on the maps above.

5) Date any non-local ceramic series or type (e.g., Potomac Creek).

6) Date high quality contexts for site specific research to determine periods of settlement.

The recommendations in this summary are based on the current state of knowledge of American Indian ceramics and their temporal and geographic distributions. As research continues, it is likely that new ways of organizing and interpreting the American Indian ceramics of Delaware will require additional radiocarbon dates or other means of absolute dating. Additionally, the radiocarbon dates evaluated here are the result of nearly 40 years of research and radiocarbon dating in Delaware. It may be determined that some of the dates are not accurate or precise, necessitating the application of more modern absolute dating techniques to address the questions of chronology and geographic distribution of the types.

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TRASH UNDER THE FLOOR: A REFUSE MIDDEN AT THE CLEAVER HOUSE, PORT PENN, DELAWARE

Edward Otter
Edward Otter, Inc.

The Cleaver House is located within the town of Port Penn on the northeast corner of East Market Street and N. Congress within the town of Port Penn (Figure 1). Built in 1834 with modifications and additions during the nineteenth and twentieth centuries, this brick structure is one of the largest in Port Penn. Owned by Delaware Department of Natural Resources and Environmental Control (DNREC), there are long-term plans to renovate the property as a museum. As part of this work, the floor in the north wing addition was partly removed. A trash dump was discovered under this floor. It is this dump that is the focus of this study. Funding for the project was provided by Delaware Department of Natural Resources.

Work included collecting the material culture from below the floor and testing the deposits for depth. Traditional mapping of the material was abandoned in favor of a photographic record to save time and money. No detailed analysis of the material was planned or conducted. A catalog of material was prepared and minimum vessel counts were conducted. An overview of the material itself is presented.

Port Penn was locally important as a port town beginning in the eighteenth century. Dr. David Stewart had the town laid out in 1764, and the first store was opened there June 7 of that year (Warner et al. 1996:2). The town was intended to provide access to overseas shipping as evidenced by the taverns “convenient for seafaring gentlemen” (Warner et al. 1996:3).

In 1801 William Cleaver purchased the lot on the northeast corner of N. Congress and Market Street. On that lot, the Cleaver House, also known as Linden Hall, was constructed in 1834 for Joseph and Catherine Cleaver (Warner et al. 1996:41). From the time it was built, it was one of the largest homes in town and one of three surviving brick buildings.

The main portion of the house is a two-and-a-half story Georgian-styled structure made of red brick. There is a two-story addition on the north end of the house that measures 16 feet (4.9 m) north to south and about 40 feet (12.2 m) east/west (Figure 2). Besides serving as a residence, the building contained commercial functions including a grain wholesale business, a general store, and a post office. Both the 1868 Beer's Atlas (Figure 3) and the 1893 Baist map (Figure 4) show a store and a post office in the building. The store was located on the south end facing Market Street while the residential entrance is on N. Congress Street.

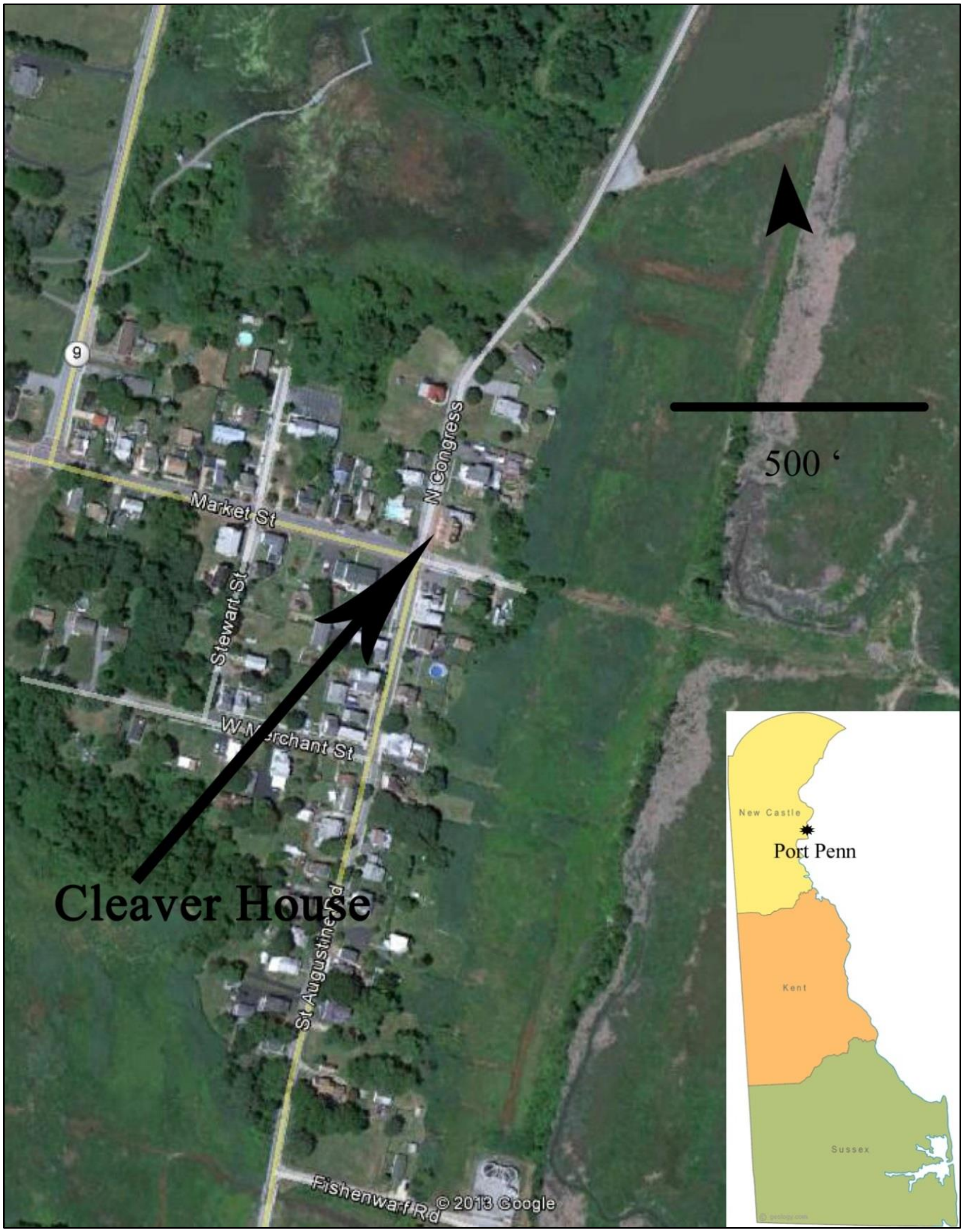

Figure 1: Cleaver House Location (Google Earth map).

Figure 2: Cleaver House (Linden Hall), 1877.

The grand vision of Port Penn as a major transportation hub focused on the Delaware River was diminished by the C & D Canal and the railroad, both of which bypassed the town. Port Penn retained a local importance for shipping agricultural product and fishery products (Warner et al. 1996:11). The wharf just east of the Cleaver house and store remained active until 1884 (Warner et al. 1996:96).

The economy of the early-twentieth century was largely devoted to fishing and trapping. Agricultural products were canned locally and other business did exist. The town experienced a phase of new buildings at this time (Warner 1996:19). From that time unit today, Port Penn has remained a small town, bypassed by major transportation networks and development.

SCOPE OF WORK

The scope of work for this project was to collect the material culture from below the floor in a manner that would allow some meaningful analysis at some future date. Time and money were limited and a full analysis and traditional hand mapping and recovery were not viable. Material from the deposit collected by DNREC was not examined as part of this study.

A grid was established within the area to be collected. Material was photographed, rather than being mapped, and then collected by grid. Archaeological testing was conducted after the surface material was removed in order to determine the horizontal depth of the deposits. Standard archaeological methods were used. The grid unit provenience will allow for some understanding of dispersal of material when further analysis is undertaken.

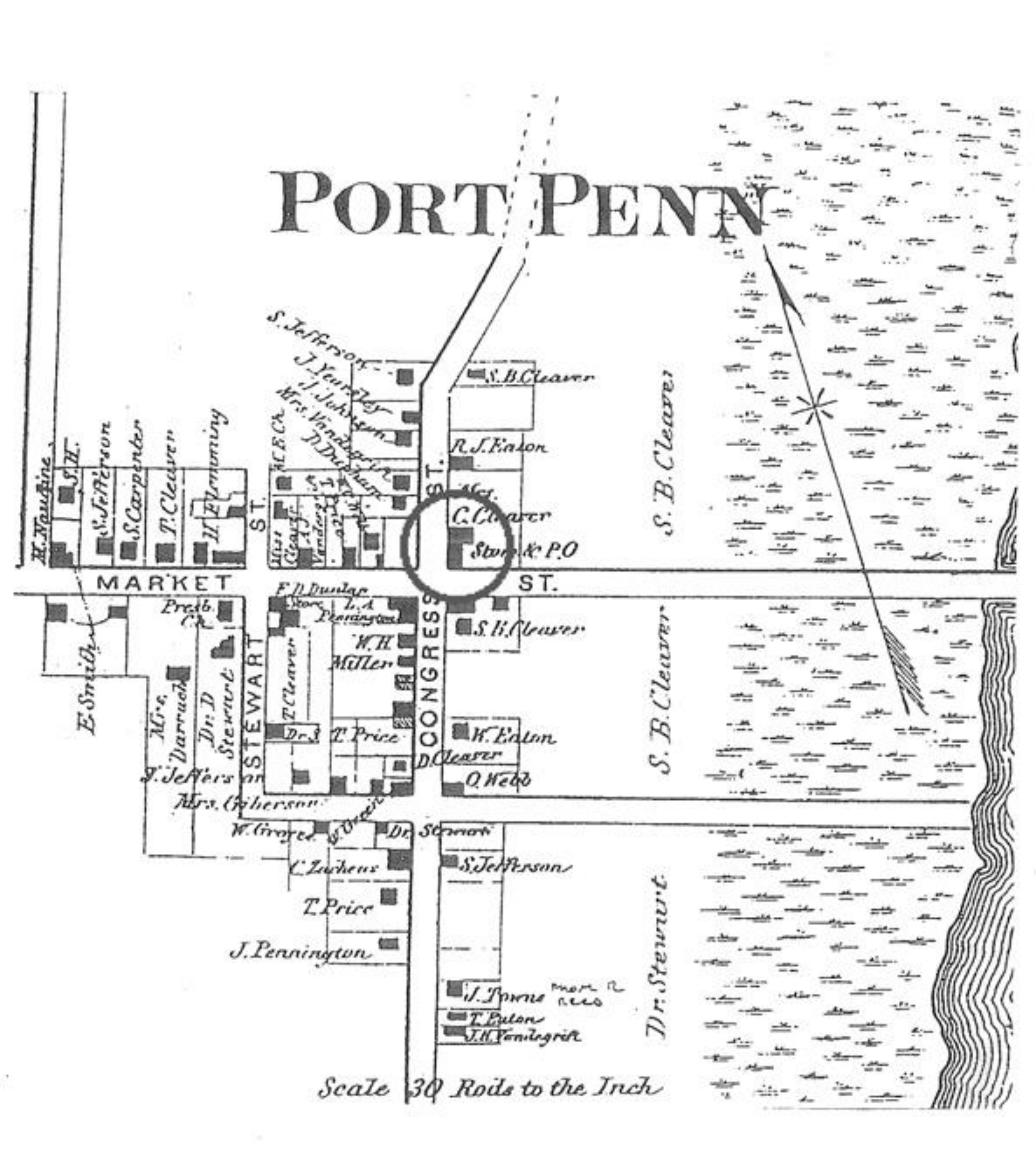

Figure 3: 1868 Beer's Atlas of Port Penn. Cleaver House is circled.

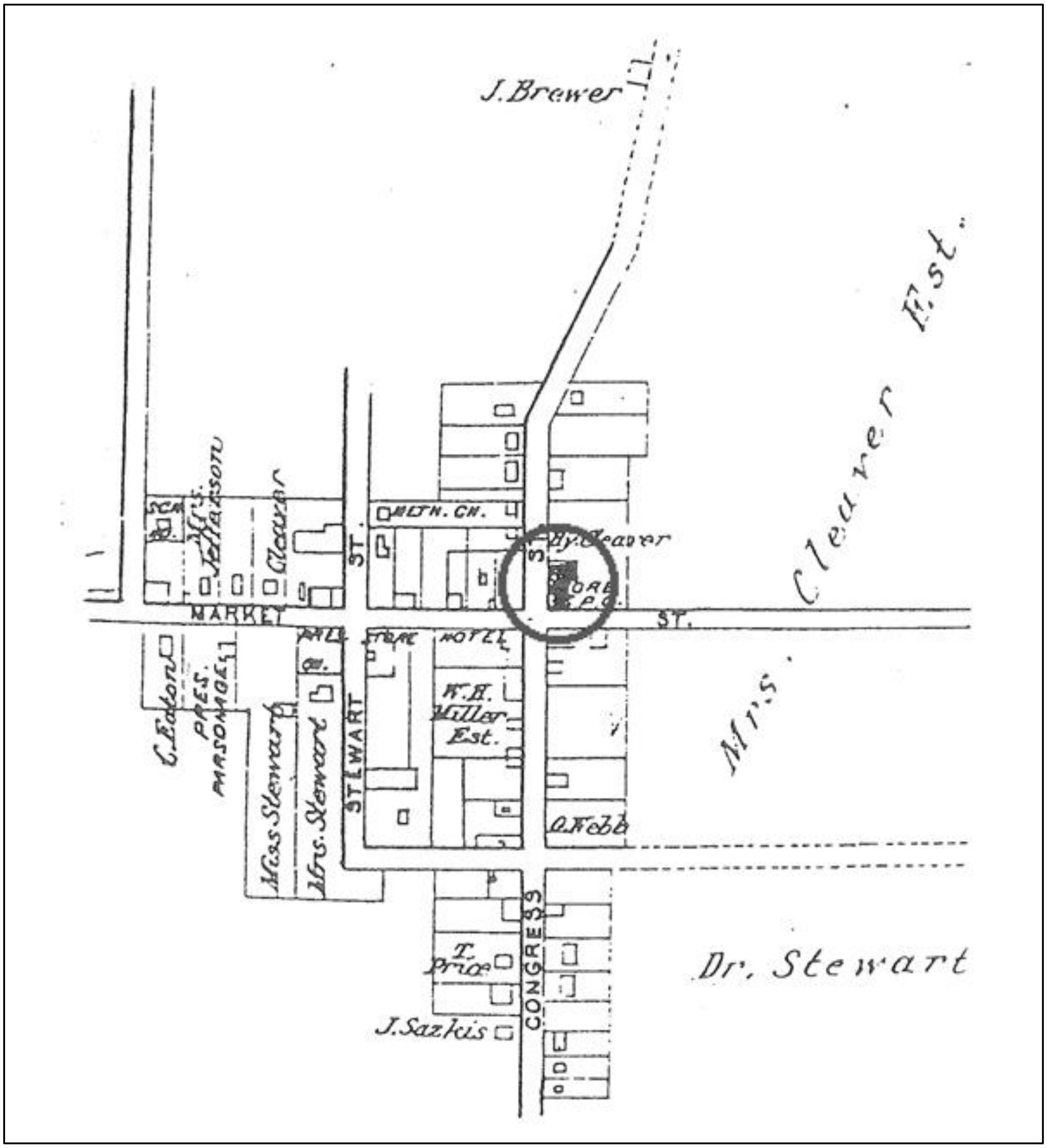

Figure 4: Baist's Map of 1893. Cleaver House is circled.

METHODS

The large quantity of material visible beneath the floor and the short amount of time to remove that material, presented a logistical problem. Traditional piece plotting of each artifact by hand would have required an immense amount of time and money. On a previous project, Edward Otter, Inc. used digital photography to record successive images of excavation. Since the material at the Cleaver House was essentially two dimensional with little depth, this approach was deemed feasible. After discussions with DNREC, it was agreed that this approach would be used.

During the earlier project, it was learned that the two major drawbacks to photogrammatic recordation are shadows and parallax. More easily remedied problems are stability and resolution. All of these factors were considered when designing the details of the photography.

Photography was done using a 10 megapixel Nikon D-80 SLR digital camera. Various aperture and shutter speed settings were tested for results and it was found that auto-settings produced better images. Image files were recorded in RAW format as well as JPG. RAW images have been archived and JPG images converted to TIFF format to conform to State standards. JPG images have been used for photography production. Adobe Photoshop was used to adjust contrast and color settings for printing.

In taking the pictures, parallax was of major concern. In order to minimize this, it was determined that the photographic angle needed to be as directly above the photo subject as possible. To achieve this, a scaffold was employed (Figure 5). Using a scaffold provided other advantages. The scaffold provided a stable base for the camera that could be positioned at a set height above the ground and directly over any point desired. The scaffold also provided a platform for multi-angled lighting to eliminate shadows.

Figure 5: Scaffold with Lights and Camera Used for Photography.

An articulating ladder provided the scaffold. It was lightweight and versatile. Shop lights on either side provided lighting in addition to the camera flash. The camera was set on a photo stand modified to allow the camera to shoot between rungs of the ladder. To center the camera a plumb-bob was used. Because the scaffold would hold a person's weight, the camera could be directly manipulated.

The area to be collected was divided into 2.5-foot (0.8-m) squares. These squares were given alpha-numeric designations beginning in the southeast corner with A-1 (Figure 6). Row A was the southern-most and contained squares A-1 through A-4. Rows progressed from A to B along the east wall with row E being the northern-most row. Because of the dimensions of the area, Row E measured 1.25 feet (0.38 m) north to south. The lack of artifacts in the northeast squares is due to collection of this area by DNREC.

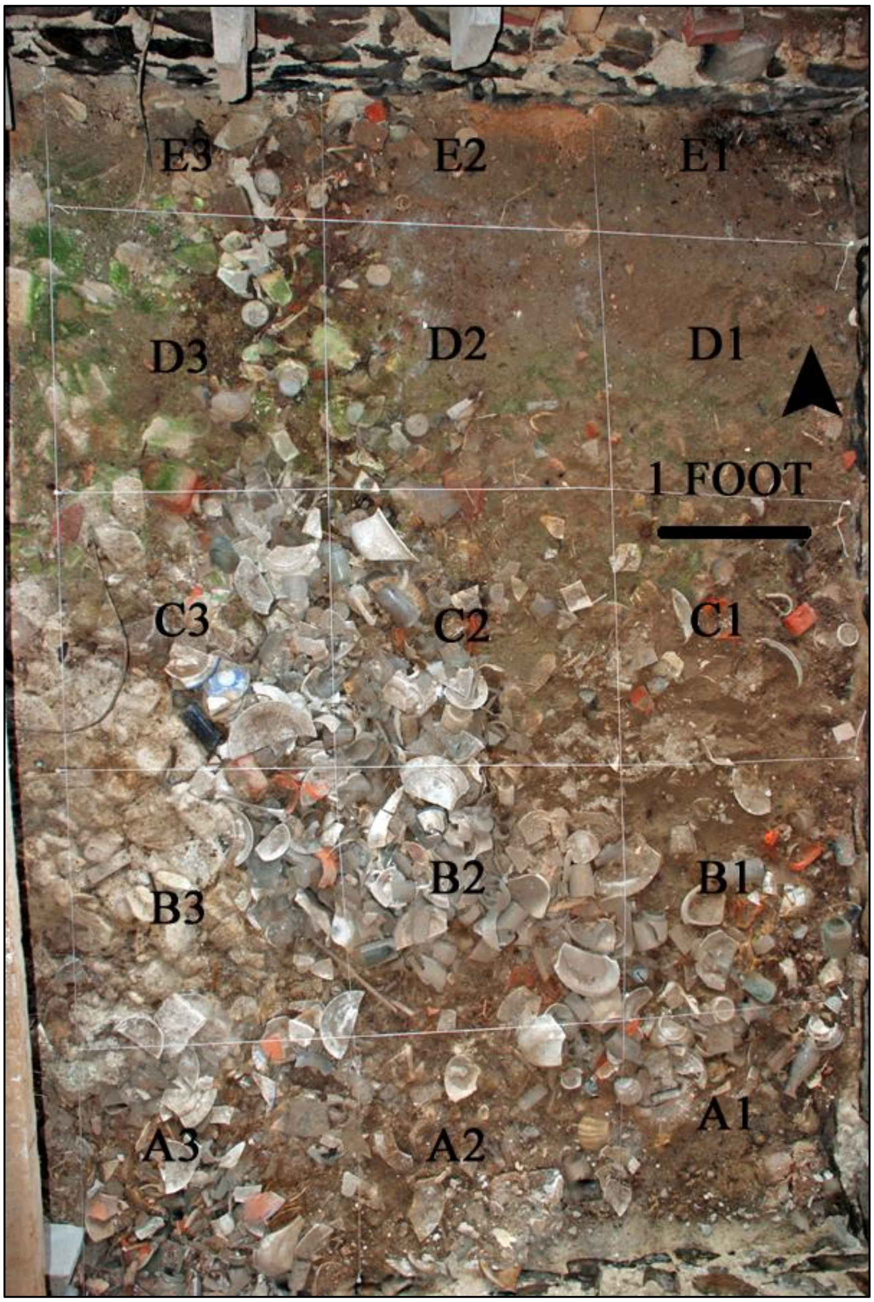

Figure 6: In-Situ Artifacts.

Photographs were taken of each individual unit by moving the scaffold across the area. A few floor joists were left in place to act as a support for the scaffold. Photographs were examined in the field by test printing the pictures. Once it was determined that an acceptable image had been acquired for all of the units, the scaffold and remaining floor joists were removed and collection of the material commenced.

FIELD WORK

The first task required for this project was to remove the flooring (Figure 7). Tongue and groove pine flooring was nailed to large floor joists. There was some variation in the boards and nails used in the flooring along with a trap door. The floor was mapped before removal in the hope that some information relevant to the time the artifacts were deposited would be revealed.

Figure 7: Floor as Left by State Workers.

After mapping, the floor boards were removed with hand tools. Joists were then lifted out of place. After this process it became possible to better examine the stone walls that enclosed the artifact deposit. This stone wall was on the north, east, and south sides of the deposit. The stone wall on the south side had been capped with brick and served to support the main section of the house. On the north side the wall extended west to the roadside limits of the building.

Floor joists were found to stretch from the main house foundation to the stone foundation. Additional short joists were used to extend the width of the building and these sat on the stone wall projecting slightly south towards the main house. The joists and original flooring was fastened with cut nails. The replacement flooring used wire nails indicating twentieth-century repair. This repair work allowed a few twentieth-century objects to enter the crawl space but these were found on the west end of the dump and were clearly on top of the older material. Among the twentieth century material were building materials including plaster. Except for the few twentieth century items, this deposit is a well-sealed nineteenth century collection.

Collection of the material was done the old-fashioned way. People got on hands and knees and picked the artifacts up with their hands to put them in labeled bags (Figure 8). Material was collected down to the underlying sand. This sand contained some smaller artifacts which were not collected as they were, at that time, not assumed to be part of the surface scatter.

Figure 8: Wayne Mellin and Tim Hitchens Recovering Artifacts.

Once all material had been collected from the surface, two units were selected for excavation. The purpose of this was two-fold. Partly, this to work was to determine the full depth of deposits. It was unknown whether this was a filled basement or simply a scatter of material on the earth. If the deposits were not within a basement, it was deemed possible that materials pre-dating the construction of the house might be found. Such information could be useful for interpreting the use of the property.

Units B-2 and D-2 were selected. These were chosen because they were not against a wall or under a floor joist and were not adjacent to each other, providing more room to work. Excavation was conducted with trowels and all soil was screened through ¼-inch (0.6-cm) hardware cloth. Material was bagged by unit with level designations.

Unit B-2 was the first to be excavated. The upper layer of soil was a 10YR3/3 silty sand (Figure 9). Within this layer, 2,322 artifacts were recovered. These artifacts were clearly similar to the surface material but smaller fragments. Below the silty sand layer was a 2.5Y6/3 clay. No cultural material was found in this layer. Layer 2 was about 0.4-feet (12.7-cm) thick, and below it was another clay soil with a munsell color of 2.5Y5/2. About 0.4 feet (10 cm) of this second clay (layer 3) was removed before abandoning the excavation. No cultural material was found in layer 3.

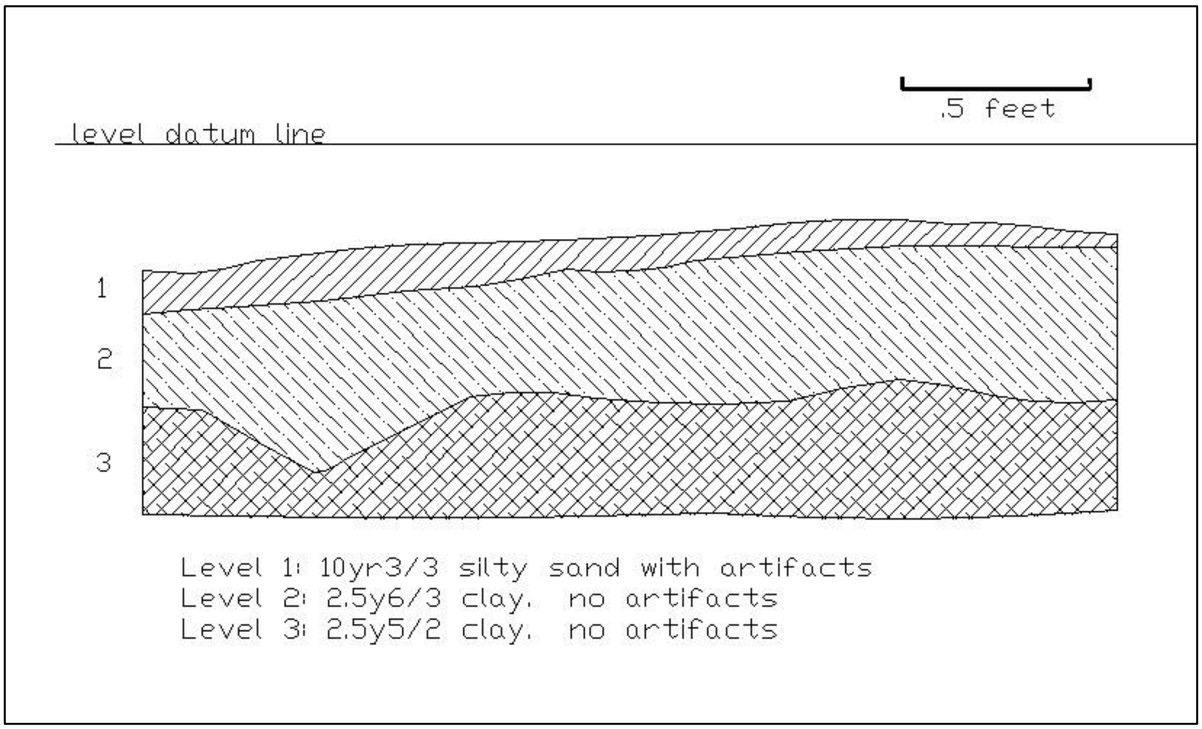

Figure 9: South Profile, Unit B-2.

Unit D-2 was similar to B-2 (Figure 10). There was an upper layer of 10YR3/3 silty sand permeated with small artifacts. There were 3,169 artifacts recovered from layer 1. Below the silty sand was culturally sterile 2.5Y6/3 clay. Like in B-2, no cultural features were found during the excavation.

The two units excavated within the Cleaver House show the area to be a crawl space, not a basement. Silty sand lay on top of sterile clay soils. There were no strata pre-dating the house and no intrusive cultural features. For all intents and purposes, this is interpreted as a single stratigraphic unit and hence, a single episode of deposit.

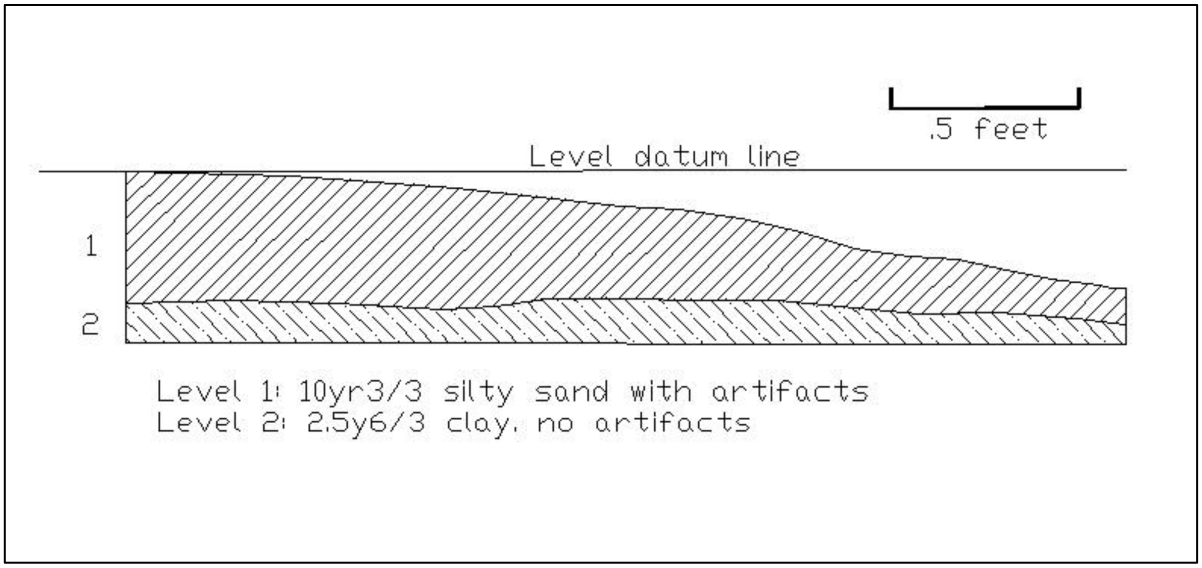

Figure 10: Soil Profile, Unit D-2.

RECOVERED MATERIAL

The source of the material is unknown but it is presumed they came from the Cleaver House and store. Approximately 25,000 artifacts were recovered during this project. Ceramic and glass items were the most common. Iron and brass items were not rare. Bone was present but clearly in a minority. There were a number of whole glass bottles, several large portions of ceramic vessels and kerosene lamp parts. During recovery, the value of this material as a research collection was noted. There is a variety of slip-decorated ceramics and pressed glass. Also present are a number of brass kerosene lamp parts possibly covering the early development of this type of lighting device.

Materials were sorted into categories loosely based on historic artifact categories first presented by Stanley South (1977). South's framework has been modified for application to the late-nineteenth century. The utility category was not used by South yet it has relevance in the nineteenth and twentieth century in relation to changing technologies for heating and plumbing.

Kitchen artifacts comprised a major portion of the recovered material. Included in this category are table wares of all types, glass and ceramic, as well as food storage containers. Specific examples would be glass tumblers, dinner plates, mason jars, spoons, and condiment dishes. Household artifacts are those that would be found within a dwelling but outside of the kitchen. Lamp parts are the most common item in this category at Cleaver House. Other items are vases, wash-set items (pitchers, basins), and flower pots.

The architectural category is self evident. It includes materials used in construction. Organics are bone and wood items. Personal artifacts are those used primarily by individuals. This category includes tooth brushes, clothing items, eye glasses, and medicine bottles. Utility artifacts are those associated with modern household utilities of electricity and heating. Artifacts in this category include coal, copper wire, light bulbs, and plumbing pipe.

Material was not evenly distributed. Table 1 shows raw numbers of artifacts recovered from the surface of each square. These numbers do not reflect the artifacts excavated from unit B2 and D2 nor does it account for material collected by DNREC before this project. Unit A3 contained over 40 percent of the surface material with A4 and B2 containing another 27 percent of the total. Two thirds of the material was present within three squares.

Table 1: Representation of Artifact by Type per Unit.

Unit	Personal	%	Kitchen	%	Household	%	Organic	%	Utility	%	Architectural	%	Indeterminate	%	TOTALS	%
A-1	16	1.93	116	1.94	80	1.76	12	2.09	0	0	26	0.62	0	0	250	1.53
A-2	13	1.57	157	2.63	126	2.78	5	0.87	2	2.41	56	1.33	28	24.78	387	2.37
A-3	322	38.84	1757	29.41	2831	62.41	72	12.54	39	46.99	1496	35.64	37	32.74	6554	40.19
A-4	84	10.13	748	12.52	460	10.14	74	12.89	22	26.51	1240	29.54	15	13.27	2643	16.21
B-1	17	2.05	127	2.13	48	1.06	14	2.44	3	3.61	27	0.64	1	0.88	237	1.45
B-2	110	13.27	932	15.6	394	8.69	54	9.41	1	1.2	295	7.03	22	19.47	1808	11.09
B-3	105	12.67	504	8.44	279	6.15	12	2.09	3	3.61	223	5.31	5	4.42	1131	6.94
B-4	7	0.84	129	2.16	31	0.68	0	0	0	0	104	2.48	5	4.42	276	1.69
C-1	6	0.72	94	1.57	6	0.13	21	3.66	1	1.2	38	0.91	0	0	166	1.02
C-2	72	8.69	549	9.19	113	2.49	85	14.81	5	6.02	146	3.48	0	0	970	5.95
C-3	31	3.74	417	6.98	43	0.95	40	6.97	5	6.02	151	3.6	0	0	687	4.21
D-1	9	1.09	28	0.47	4	0.09	9	1.57	0	0	21	0.5	0	0	71	0.44
D-2	8	0.97	100	1.67	13	0.29	22	3.83	0	0	44	1.05	0	0	187	1.15
D-3	11	1.33	171	2.86	31	0.68	87	15.16	1	1.2	141	3.36	0	0	442	2.71
E-1	0	0	5	0.08	1	0.02	2	0.35	0	0	3	0.07	0	0	11	0.07
E-2	10	1.21	82	1.37	36	0.79	25	4.36	1	1.2	63	1.5	0	0	217	1.33
E-3	8	0.97	59	0.99	40	0.88	40	6.97	0	0	123	2.93	0	0	270	1.66
TOTALS	829	100	5975	100	4536	100	574	100	83	100	4197	100	113	100	16307	100

The small area from which this material was collected makes the creation of distribution maps meaningless. There was a lot of material culture in a small space. There was no apparent stratigraphy to the deposit indicating a single dump episode.

It was not within the scope of this study to do a total analysis of the material. The description and interpretations provided are basic. More detail and a better understanding of the deposit can be achieved through a more detailed analysis.

Personal Items

Items in this category include items for personal use. Clothing, smoking equipment and medicinal items are in this category.

Clothing items include one button, two leather fragments from shoes, and 172 pieces of metal from clothing, mostly garter clips. Miscellaneous personal items include four eye glass lenses, two stick pins, three buckles, a straight razor, three wooden alphabet blocks, 17 straight pins, and 14 fragments of smoking pipe bowls and stems.

Eight bone toothbrushes were collected (Figure 11). Four of them were recovered from unit B-2. One brush is marked “wanamaker” and presumably came from Wanamaker’s, the first department store to open in Philadelphia (1871). Another was marked “A.D….Paris.” It cannot be determined if the toothbrushes were store stock or used by the people living in the house but the individuality of the brushes suggests family use rather than store stock.

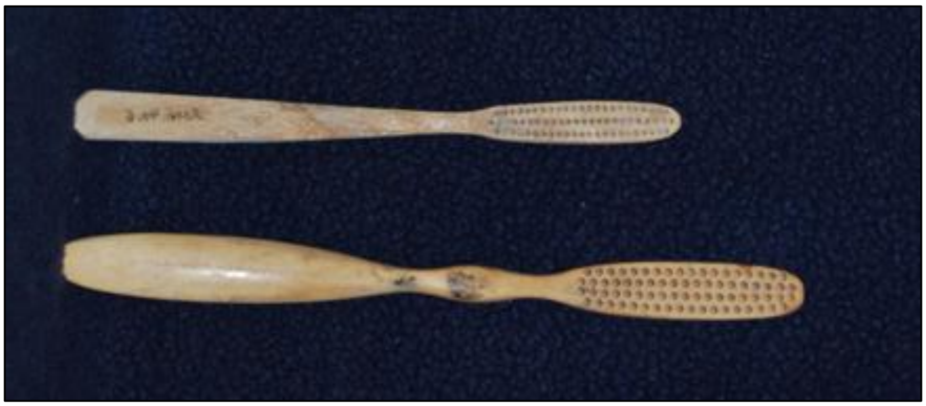

Figure 11: A Sample of Toothbrushes.

Included in the personal category were medicine bottles and vials. At least six different perfume bottles are present. One ointment bottle made from cobalt blue glass was found. Three small medicine vials were recovered as were some hollow glass tubes believed to be pipette fragments. At least 56 medicine bottles were present. Most of these were made from clear glass but brown and aqua colored bottles were also present. At least 10 of these bottles were marked “A. Wiltberger, Phila”; five alone were found in unit B2. These are believed to have come from the wholesale drug business of Alfred Wiltberger. Alfred inherited the business in 1849 from his father, Thomas Wiltberger, one of the founders of the Philadelphia College of Pharmacy (England 1922:371). Alfred operated the business until his death in 1872 (Anonymous 1886:163).

There were many marked bottle fragments, most of which had only a few letters, preventing identification. Besides the Wiltberger bottles at least one from Dr. D. Jaynes of Philadelphia was present. A 3-inch (7.6-cm) tall bottle was marked Hance Brothers & White, another Philadelphia firm and a manufacturer of pharmaceuticals.

The bottles from the Wiltberger Company appear to be little known to the medicine bottle collecting community. Hance Brothers & White produced pharmaceutical chemicals as well as retail products such as soft drinks. If these are, in fact, wholesale containers it might be concluded that drugs were mixed on-site. Of the five Wiltberger bottles from unit B-2, three were corked, suggesting they were unsold store stock. Apothecary equipment found in the assemblage includes glass pipettes, an apothecary bowl and a ceramic pestle.

Architectural Items

The architectural material from the assemblage was not considered to be of importance. There have been numerous building and remodeling episodes within the house, including the floor covering the deposits. There is plaster, wood, and nails from these episodes within the assemblage. These were counted and discarded.

Kitchen Items

The kitchen-related items include ceramic and glass items commonly used in the kitchen. These items make up the largest part of the collection. Pearlware, creamware, whiteware, ironstone, and porcelain ceramics are present. Most of the glass is mold blown and pressed soda glass. Ceramic items include bowls, plates, saucers, cups, pitchers, platters, tureens, and other items found on the table. Glassware includes a large quantity of drinking glasses of various forms.

Pearlware, creamware and whiteware ceramics constitute most of the decorated ceramics. Slip-decorated wares in pearlware, creamware, and whiteware are present. There were also a number of painted and transfer-printed pieces. The slip-decorated wares consist of at least two creamware carrinated bowls, one pearlware bowl, and a yellowware mixing bowl. Slip-decorated whiteware consists of at least three mugs, 18 bowls and a pitcher. It appears that there are no two slip-decorated vessels with the same decoration. Decorative elements on the slip ware were predominately banded (Figure 12) but cats eye appears on at least one piece, circles are found on one bowl, and mocha (dendritic) can be seen on at least two pieces (Figure 13).

Transfer-printed wares consist of five bowls, one of which fits the category of flow blue. There are four dinner plates, six small plates, and seven cups. There were also six painted vessels, three different sponge decorated cups, and a luster ware vessel. Except for two matching cup and saucers, these objects appear to be individual pieces, the same as the slip-decorated items. One of the painted items was a mug with text from Cock Robin. As an exception to this are parts from at least 12 feather edge pearlware plates. Three different rim styles were noted.

The bulk of the ceramic artifacts were ironstone and porcelain dishes. Unlike the decorated wares, these were clearly parts of sets with multiple examples of form and makers marks. These items constitute table wares. Plates of different sizes, cups, saucers, serving bowls, soup tureens, small pitchers and salts were present in the assemblage.

Porcelain items included mostly cups and saucers. At least 25 cups were counted, 17 with a paneled pattern of the type seen in Figure 14. There were 23 saucers, 20 of these with the same paneling. Gold trim appeared on some of the saucers and cups, and it is unknown if they were all decorated when new. Besides the cups and saucers, there were two salts, nine small bowls and 12 plates in at least two sizes. Six of the plates were marked “OFM (over) GDH France.”

Figure 12: Sample of Banded Slip Decoration.

Figure 13: Various Slip Decoration Styles.

Figure 14: Paneled Porcelain Cup and Saucer.

Ironstone ceramic items were more commonly plates and larger items. There were at least eight cups in three different styles. A minimum of five saucers were counted, one of them marked “James Beard.” Larger items include a chamber pot, three large and one small pitcher. Two soup tureens were counted, one with a Wedgewood stamp. One individual salt, also with the Wedgewood stamp, was counted and a platter with the “W. Taylor” mark was seen.

Other table wares include at least six small but relatively deep bowls (Figure 15). Based on the rim pattern and one piece with a makers mark, these are identified as coming from the Anchor Pottery in Trenton, New Jersey. Also present were six small oval serving bowls and 12 other shallow bowls. Three of these smaller bowls had a registry mark stamp under the glaze making it mostly illegible. Two others had marks from “W. Taylor, Hanley.” Six bore the anchor mark. Two gravy boats were present, one marked “Johnson Brothers.” There were 15 dinner-sized plates. Five were marked “W. Taylor.” Three others were marked “W & E Corn.” Three small plates, all of different manufacture were present. One was from James Edwards, on from Anchor Pottery, and the third was marked “Elsmere & Forster.”

Registry marks on the ironstone and porcelain ceramics indicate a wide-reaching market network. There were marks from at least five different English manufacturers, one from France, and one from the United States. Available information places these marks in the last half of the nineteenth century. William Taylor operated out of Hanley between 1860 and 1881, and W. & E Corn was at Burselm between about 1850 and 1890 (Potteries.com).

Anchor Pottery was founded about 1894. The marks seen on the Cleaver House pots were used between 1894 and 1898 (Barber 1904).

Marks were not common on the pearlware and whiteware vessels. One mark was found on a whiteware plate with brown transfer design. The mark is a beehive surrounded by leaves with a ribbon across it reading "Florentine china." Across the top is the word "Manila." The beehive mark was used by the Alcock Pottery in Burselm dating this vessel to about 1830 (Neale 2005).

Figure 15: Various Bowl Styles in Ironstone.

The types of ceramic, and the registry marks on them, clearly indicate a time depth not suspected by the sealed context of the deposit. It was assumed that this was a one-time dumping episode and that the material would be tightly dated. Clearly, there is at least a 60-year span on the ceramic materials within the deposit. Because the materials were not stratified the initial assumption about a one-time dump appears valid. The aged materials must have been curated to be found with the more recent materials.

Glass ware within the kitchen group was largely tablewares. There were also jars and bottles. Mason jars of various types and sizes were found. Ale bottles, wine bottles, and other bottles of unknown contents were present. At least one decanter is present. This may be indicative of the elevated status of the household (Jones 2000:197).

Without doing refits, the number of glass tumblers (Figure 16) cannot be counted with any sense of accuracy. It seems that there are at least 50 individual glass tumblers (some may actually be spooners). Most of these are paneled. This form is common and can still be purchased today. Present in the assemblage are a few pieces of acid etched and frosted glasses but these are a minority.

Figure 16: Tumblers.

At least eight individual glass bowls were counted. These are pressed glass with various patterns. Depression glass colors are not present. In fact all of these bowls are made of clear glass. Other glass items include a breast milk cup, a candlestick, and a pitcher.

Household Items

Household items are represented by a number of material types. Lamp parts were common and include glass chimneys, ceramic and glass fonts, and brass burners. There were four different glass vases, two metal candle wick trimmers, and terra cotta flower pots. Like the tumblers, the number of lamp chimneys cannot be determined with any closeness without doing refits. There are 32 lamp burner parts. These are kerosene lamp burners and, as such, post-date 1859 when kerosene became readily available to the public. The variety of burners (Figure 17), in size and style may be useful as a study collection on the changes in lamp technology during the late-nineteenth century.

Organic Items

The collection includes a variety of organic items: a few seeds, bottle corks, wooden items, and some leather. By far, the greatest number of organic artifacts were bone. Like the other artifacts, these were not subject to a thorough analysis. There were 495 bone fragments recovered from the surface and another 635 fragments from the excavations. The bone from the excavations was mostly small fragments.

Figure 17: Lamp Burners.

Large mammal bones in the assemblage include cow, pig, and sheep. There seems to be representation of most parts of the body, including heads and feet. This is not surprising considering these parts were available in butcher shops during the late-nineteenth century (Otter 2002). Butcher marks on the bones are symmetrically sawn with a mechanized saw. This type of butchering is done by professionals in shops and dates after the Civil War.

Birds are represented by turkey, chicken, and duck or goose remains. The relative quantity of these to the large mammals suggests a more upper status household (Otter 2002). Incidental bone inclusions are from cats and rodents. A muskrat skull is present and may have been a food item or an accidental inclusion.

INTERPRETATION

The most obvious question asked of the material under the floor is when was it deposited. Relevant to this are specific artifacts such as a Heinz jar bottom found in unit B-2. On this bottle is a patent date of June 9, 1891. There are other dateable items. English registry marks from 1849 were present, and there are marks from the Trenton, New Jersey Anchor Pottery that date between 1893 and 1898. Rumford bottles made after 1849 and kerosene lamp parts, after 1859, are present. Other bottles with patent dates from 1867 and 1869 were found. A McCormack bottle dates after 1889 when the company was founded. Based on the Anchor Pottery marks, the *terminus post quem* for the assemblage is 1893. The lack of depression glass indicates the deposit was made before the 1930's.

Among the ceramic artifacts are types associated with differing date ranges. Pearlware, whiteware, ironstone and semi-porcelain ceramics are all present. Like the patent dates and registry marks these collectively show the material within the assemblage is not tightly dated. Materials within the assemblage span at least 60 years. Based on the unstratified nature of the deposit, however, it appears that this material was dumped in a single episode. Pearlware vessels were found resting on top of ironstone pieces.

The slip-decorated wares within the assemblage are one of the more visually striking features. When looking at these as a group trying to determine the number of vessels, it was noted that there does not appear to be two vessels that match. Among the variety of vessel forms, there are lots of carrinated bowls but no two have the same exact slip patterns. It might be chance that there are no two matching vessels but it might also be that this was a collection of curated items selected for being different. A similar situation seems to exist with transfer-printed wares. However, in at least two cases matching transfer-printed cup and saucer sets are present.

In opposition to the individuality of vessels seen in the slip-decorated wares and transfer-printed wares, the ironstone and porcelain pieces, as well as drinking glasses, are present as numerous examples of the same style. There are at least 17 porcelain cups with paneled sides and no decoration and 20 saucers that seem to match the cups. There are at least three oval bowls bearing the mark of the Anchor Pottery of Trenton, New Jersey. Also from this same company are five small bowls with a definable molded decoration. There are at least 30 plates from various English manufacturers such as W& E Corn, W. Taylor, and Wedgewood. Those pieces that have marks date from between 1850 and 1890.

The quantity of matching porcelain and ironstone vessels, and the history of the building can be cited as evidence that at least some of the material is related to the store operated on site. Clearly, some elements appear to be household in nature. An example is the faunal material. A curated collection of decorated pottery and miscellaneous tooth brushes are likely household items. The quantities of matching dishes could be store stock or from a house that served either a large family or held social gatherings. The 1893 Baist map, coincidentally the year of the *terminus post quem* for the assemblage, does identify a store within the building (see Figure 3).

There are some items that do appear to be store stock or non-household items. These include the wholesale pharmaceuticals represented by the A. Wiltberger bottles, especially the corked ones, and the bottle from Hance Brothers & White. Small glass pharmaceutical vials glass stirring rods, and a mortar and pestle suggest some mixing and dispensing of drugs did occur on the property.

Regardless whether the material is store related or household in nature, it is possible to comment somewhat on the commercial markets of the day. Late-nineteenth-century ceramics from Trenton, New Jersey, from Burslem and Hanley, England, and from France were present in the assemblage. Clearly Port Penn was tied into international market channels. Pharmaceutical bottles and pottery suggest that the Delaware River towns were part of the market network and it is likely that overseas items made their way to Port Penn via Philadelphia. A McCormack bottle from Baltimore, Maryland does show, however, that goods from other regions of the United States could be found in Port Penn.

CONCLUSION

The material culture recovered from under the floor at the Cleaver House dates from the very end of the nineteenth century. While it cannot be stated with certainty, there appears to be a mix of household items and old store stock. Presumably, all of the material originated in the Cleaver House.

As a research collection the items could be valuable in a number of ways. The slip-decorated wares can provide a good start for a type collection of decorative style. A number of pieces refit and nearly complete vessels can be reconstructed. Lamp burner parts vary in style, and it is likely that these can be a valuable collection showing changes in oil lamp technology during the second half of the nineteenth century.

As a whole, the collection can be informative. The temporal range of artifacts within a synchronous deposit exemplifies curation within archaeological contexts. It may be that the assemblage of porcelain, ironstone, and glass, along with the faunal remains can be collectively examined as a representation of status within a non-urban context.

It is recommended that the remaining materials be collected from the deposit. This will require archaeology in the unexcavated units. Also, material collected by DNREC was not included here. All material should be compiled and a thorough analysis of the material should be conducted. When completed, this analysis and collection will likely become a point of reference for other late-nineteenth century archaeological sites of the region.

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WHAT'S CHILLING IN THE DAIRY?: DISCOVERIES FROM AN ATYPICAL EIGHTEENTH-CENTURY WORK YARD AT THE ARMSTRONG-ROGERS SITE IN NEW CASTLE COUNTY, DELAWARE

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ABSTRACT

From September through November of 2012, Dovetail Cultural Resource Group conducted a Phase III archaeological data recovery of a seemingly typical domestic site in New Castle County, Delaware. With archaeological excavations mainly focused in one portion of the site, they excavated over 130 features associated with a historic work yard. With the 3,000 artifacts ranging from architectural hardware to utilitarian ceramics found in Phase III excavations alone and the incredibly well-preserved main features of a work yard, including a perplexing dairy set up, archaeologists have been able to further understand the self-sustaining characteristics of a domestic and agricultural site in St. George's Hundred during the eighteenth and nineteenth centuries.

INTRODUCTION: A BRIEF HISTORY OF THE PROPERTY

The Armstrong-Rogers archaeological site (7NC-F-135) located in New Castle County, Delaware is an eighteenth and nineteenth-century domestic site that has been thoroughly investigated by several cultural resource firms at the request of the Delaware Department of Transportation (DelDOT) and the Federal Highway Administration (FHWA). Located north of Middletown, along the existing U.S. Route 301, the Armstrong-Rogers site is situated in St. George's Hundred, one of the original 'hundreds' established in 1680s. The predominantly rural area is currently slated to be used for the expansion of Route 301 by DelDOT. Work began on the site in 2008 by cultural resource management firm, Hunter Research (Burrow et al. 2009; Liebknecht et al. 2010). Another company, Louis Berger and Associates (Berger), completed additional survey in 2011(Berger 2011). Dovetail concluded work on the site in the fall of 2012 (Barile et al. 2013) (Figure 1).

Archival research completed by all three firms gathered primary and secondary resources from entities including, but not limited to, the Delaware Public Archives, New Castle County Circuit Court, and the Historical Society of Delaware and consulted online resources such as Ancestry.com and the Library of Congress. These resources revealed that the site had been occupied for about 300 years and had changed ownership multiple times. A 1680 survey showed that the site is situated on a parcel of 250 acres (101 ha) which originally belonged to John Taylor, a constable and farmer living near Appoquinimink Creek in St.

George's Hundred. The property changed hands several times after Taylor's death in 1684. Eventually, the property was sold with additional acreage to Alexander Armstrong from Cecil County, Maryland in 1739. Originally, Armstrong had divided the land among his children in his will. However, Cornelius, one of Alexander's sons, purchased his siblings' shares of the property in 1767. Based on archival evidence as well as artifacts uncovered from the site, it seems that Alexander Armstrong or his son, Cornelius Armstrong, was the first landowner to actually reside on the site (Figure 2).

Figure 1: Map of Delaware Depicting the Location of the Armstrong-Rogers Site, 7NC-F-135 (yellow star).

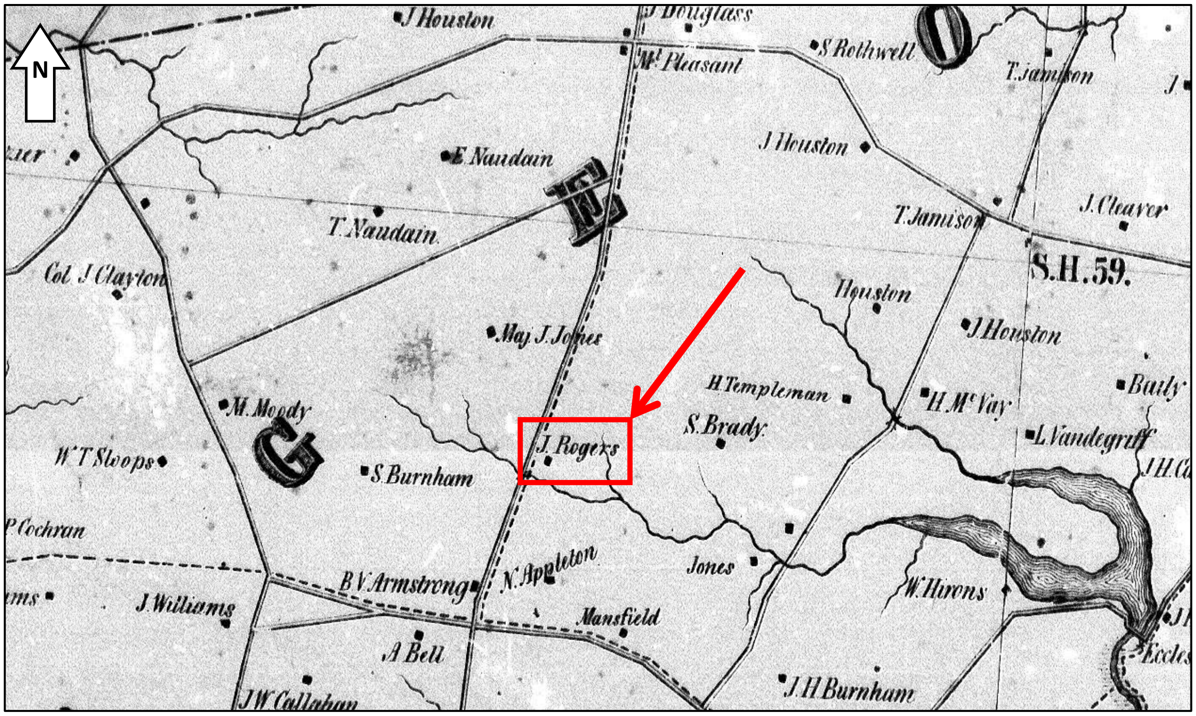


Figure 2: Detailed View of the Armstrong-Rogers Site, Price & Rea Map of Delaware, 1849.

The first detailed description of the built environment of the Armstrong-Rogers property was found in a 1797 New Castle County tax assessment. The document stated Cornelius owned some 200 acres (80 ha) consisting of a log house and barn. Armstrong additionally possessed livestock and five slaves. Although the property was to be passed along to Armstrong's sons upon his death in 1805, it was eventually sold to James Rogers Esq. in 1824 after an unpaid mortgage caused the previous owner to sell. Rogers owned the property until 1849. A man named William Crawford then purchased the 200 acre (80 ha) parcel and called it Willow Bridge Farm. Crawford died in 1854 and a couple named Benjamin and Sarah Lloyd purchased the land. However, they did not live there, their son and his family did. In an 1861 insurance policy, it states that the property had a "new 2-story frame dwelling with a 2-story dining room and kitchen." The couple eventually lost the parcel when they defaulted on a hefty mortgage made to Archibald Robb. The parcel again transferred through several hands until it was sold to 1908 to a 'buttermaker' named Jacod S. Staats. Staats divided the parcel and sold the 46-acre (18-ha) tract (which includes our site) to Arthur Doolittle a year later. No buildings are listed on this parcel in a 1909 tax assessment. The parcel stayed in the Doolittle family until 1915 when Mary V. King purchased a portion of the tract. In 1946, the 6.5-acre (2-ha) parcel was purchased by Henry P. Eihinger Sr. and Sophia A. Eihinger. They are the most current owner of the parcel. It is believed that the modern residential structure on the property was built by the Eihingers.

Phase III Data Recovery: Finds Within the Work Yard

Through archival research and previous archaeological investigations, it was found that the Armstrong-Rogers site straddles two distinct environments. In the northeast portion of the site where the highest knoll on the parcel is located, was the site of the Armstrong-Rogers house as well as a recently demolished, late-twentieth century dwelling. During the Phase I survey, archaeologists from Hunter Research noted the presence of a deeply buried historic drainage pipe running north-south through the southern portion of the site. After the pipe was re-exposed by backhoe during the Phase III excavations, it was followed to the knoll where it terminated, revealing the location of the former main house. It would make sense that this would be the chosen location for the previous dwelling given the geography. This work also confirmed that directly in front of the dwelling would have been the front yard with a garden or shallow landscaped area in the northwest portion of the site (Figure 3).

Figure 3: Map Showing the Two Different Environments of the Armstrong-Rogers Site.
The yellow-bordered areas represent the front yard of the historic house (top) and the work yard (bottom).
The historic house sat on the same knoll as the modern building shown in this image.

That discovery also led archaeologist to the conclusion that the southern portion of the site was a work yard due to its downhill location from the main house during the eighteenth and nineteenth centuries. Because the main house was destroyed by the construction of the modern dwelling and the area in front of the house contained few artifacts, the main focus of investigation was in the southern work yard. The Phase III data recovery produced five main areas of interest. Using information recovered during previous efforts, Dovetail excavated 25 test units and a total of 33 features, in and around a house well, possible smokehouse, unknown structure, and dairy with associated well. A total of 135 features were uncovered during mechanical stripping, 18 of which were previously identified by Berger during Phase II work (Figure 4).

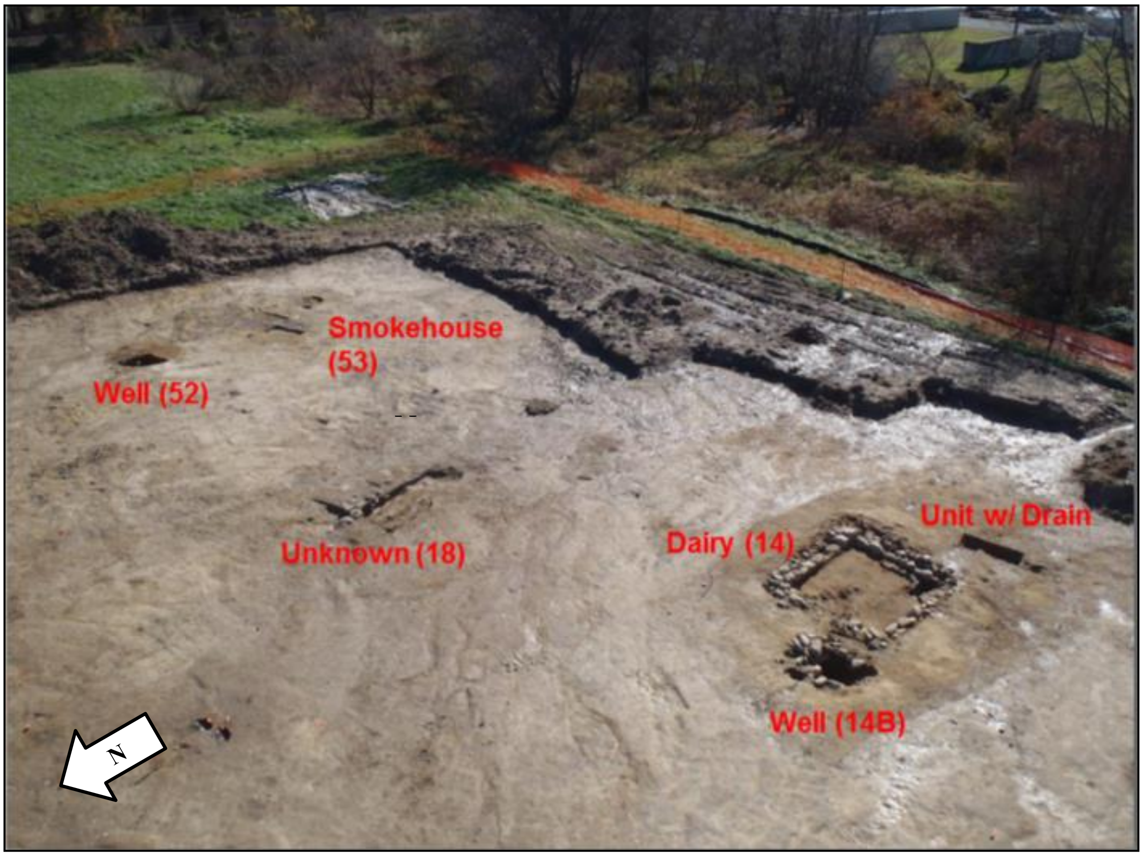


Figure 4: Detailed Overview of the Work Yard in the Southern Portion of the Armstrong-Rogers Site.

Located in the southern core of the project area, the house well measured 8.3 feet (2.5 m) across the east/west axis, and 7.6 feet (2.3 m) along the north/south axis. Quaded prior to excavation, the northwest section was removed to approximately 9 feet (2.7 m) by backhoe to expose the interior of the well. The outer fill contained over 100 artifacts consisting of architectural hardware, organic remains, and historic ceramics, while the inner fill produced only eight artifacts.

At least 36 pieces of wood were collected during backhoe excavation of the house well. This wood comprised the remains of the interior well support system. The well cribbing consisted of cut planks and rounded posts fastened with pegs. A sample was collected and is currently being conserved at the Dovetail office. Other wood samples were also collected and will be sent for dendrochronology studies, the science of dating wood using tree ring research. The results of the dendrochronology study will produce a time frame when the wood was cut to be made into the well pump. Having this information can help narrow down dates pertaining to when this well was built and used (Figures 5 and 6).

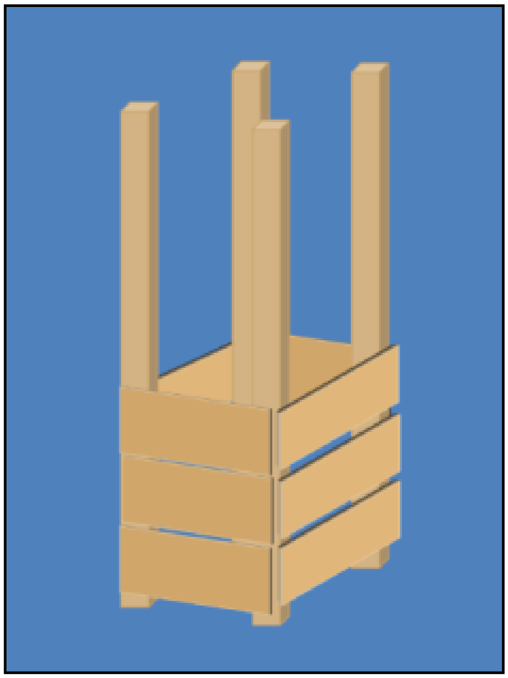


Figure 5: Example of a Box/Crib Well Framing System.

Figure 6: Cut Planks and Rounded Posts Fastened With Pegs Made Up the Interior Well Support System.

The supposed smokehouse is located in the southern core of the project area, in the northeast corner, just south of the house well. Surrounded by 27 adjacent features, consisting primarily of post holes, post molds and pits, the smokehouse feature lies in a low area. Measuring 11.4 feet (3.5 m) across the east/west axis and 5 feet (1.5 m) along the north/south axis, the smokehouse was quaded prior to excavation. Field crews removed dirt by sectioned portions. Artifacts from the quadrants excavated comprised a significant amount of mammal bone and utilitarian ceramics, some of which were burnt. The feature also yielded fire cracked rock, architectural hardware, and several lithics. In the end, the smokehouse was designated as such due to dimensions, the high concentration of bone remains (some of which were burnt), extensive charcoal flecking within the feature fill, and the presence of several butchering and roasting features downhill.

Originally identified by Berger during the Phase II as a “robbed foundation trench,” the unknown structure was designated Feature 18 or Foundation 2. This feature is centrally located between the well and dairy. Resting in situ as an amorphous pile of various sized stones, the unknown structure measured 10.6 feet (3.2 m) along the east/west axis and 11.9 feet (3.6 m) along the north/south axis. The unknown structure was quartered and the southwest and northeast quadrants removed. After excavation was completed, archaeologists were able to firmly establish that this feature was not a foundation after all.

Perplexed, archaeologists ultimately determined two possibilities regarding the origin of Feature 18. Located in a drainage tract, it is possible that rocks impeded water flow. The high artifact concentration, mainly redware, and highly corroded metal and bones, could have washed into this area from higher elevations, becoming trapped amongst the rubble. It is also possible, although less likely, that Feature 18 marks the location of a small sheet midden. No evidence was uncovered to suggest that Feature 18 was ever a foundation. The rocks, bricks, feature staining and stratigraphic layers exhibited no particular order or organization.

Southwest of the unknown structure lies the dairy. Initially, this historic foundation was thought to have been the location of the Armstrong-Rogers main house. Archaeologists were able to firmly identify this feature as a dairy through Phase III excavations. Dairying was a major part of farm life in New Castle County during the eighteenth and nineteenth centuries. Unfortunately in the eighteenth and nineteenth centuries, convenient refrigerated grocery stores did not exist and if a family could afford it, they could produce their own dairy products on site. Dairy processing, be it milk, cheese, or butter, generally occurred in a dairy or buttery, often a separate outbuilding.

The work yard at Armstrong-Rogers site had, for at least some portion of time, one of these dairy outbuildings. The foundation, measuring 14 feet (4.3 m) in length and 12 feet (3.7 m) in width, was constructed of uncut stones held together with a mud mortar. Measuring approximately 16 inches (0.4 m) across and 12 to 18 inches (0.3 to 0.5 m) in height, the foundation walls were once completely bordered on the inside by a brick sill. Remnant brick flooring lay along the majority of the southern and eastern walls as well as the northwest corner. A clay cap was found in the northwest corner of the inside of the foundation, as was a small trench. A brick-lined drain, measuring 30 inches (0.8 m) long by 18 inches (0.5 m), tapering to 12 inches (0.3 m) in width, was also found. Located in the southwest corner, the drain, as we would later determine, continued into a channel, was used for draining water away from the dairy.

So, why was there a need to drain water away from the dairy? Well, as everyone knows, dairy products are best when refrigerated. In order to keep the dairy outbuilding cool, water was pumped into and across the dairy floor which, acted as a cooling agent. Furthermore, the water also needed to constantly be cleansed as to not contaminate the dairy products. These factors are why a majority of historic dairies are found near springhouses, small streams, or wellheads (Olmert 2009). Without a proper springhouse, which was the case in at least two dairies in Delaware, a well was used as a water source for the dairy (Barile et al. 2013; Bedell et al. 1999) (Figure 7).

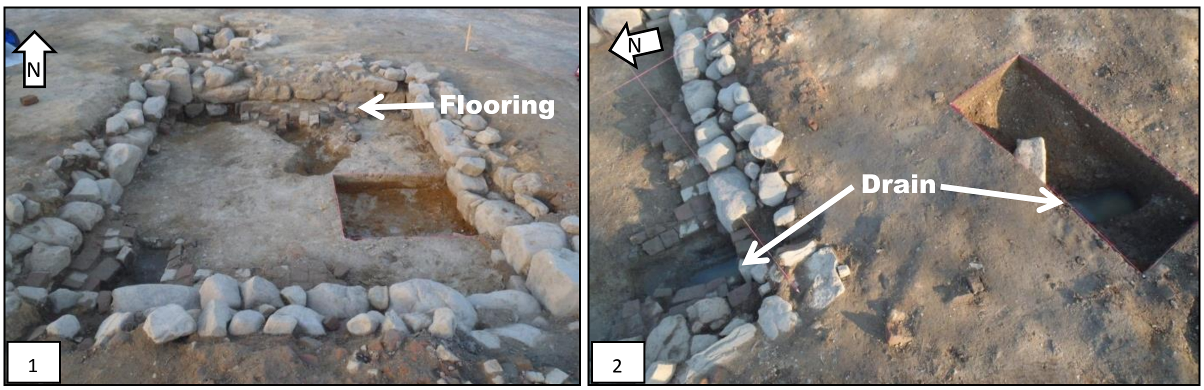


Figure 7: (1) The Dairy Foundation, Constructed of Uncut Stone Held Together with a Sandy Mortar, Had a Brick Floor; (2) The Brick-Lined Drain Extended Away from the Dairy to Channel Water Towards the Nearby Stream Further South.

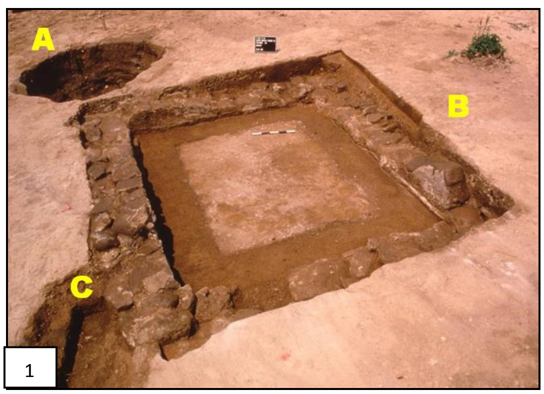
Documented just north of the dairy foundation, a brick-lined well shaft measuring approximately 8.6 feet (2.6 m) in length and 2.5 feet (0.76 m) in diameter was found. A pump, made of an octagonally hewn and hollowed out wooden shaft, measuring 90 inches (2.3 m) long by 10.5 inches (0.27 m) in diameter, nesting within circular wooden disks, occupied the center of the well shaft. Constructed for pumping water from the well, into the dairy, the pump was found in fairly good condition. Using a backhoe, the interior of the well was fully exposed and discs were removed in two pieces, one measuring 48 inches (1.2 m) in length and 1.5 inches (0.04 m) in width and the other, 20 inches (0.5 m) in length and 1.5 inches (0.04 m) in width. The components of the lift pump were eventually transported to the Maryland Archaeological Conservation Laboratory (MAC Lab) for full conservation (Figures 8 and 9).

THE MCKEAN/COCHRAN SITE: COMPARING DAIRY OUTBUILDINGS

Dovetail archaeologists were extremely intrigued by the peculiar pump well and adjacent dairy set up and became curious to find other local examples. Coincidentally, the dairy set up discovered this past fall was not the first of its kind located in Delaware. Discovered by Berger in 1994, at a site known as the McKean/Cochran Farm also located in New Castle County, an 11 foot by 13 foot (3.4 m by 4.0 m) dairy (ours was 12 by 14 feet[3.7 by 4.3 m]) constructed with a stone foundation and adjacent well, was surveyed and recorded (Bedell et al, 1999) (Figure 10).

Figure 8: View of the Interior Structure of the Dairy Well Showing the Central Hexagonal Shaft and Circular Pump Base.

Figure 9: Circular Wooden Discs, Part of the Pump System of the Dairy Well.



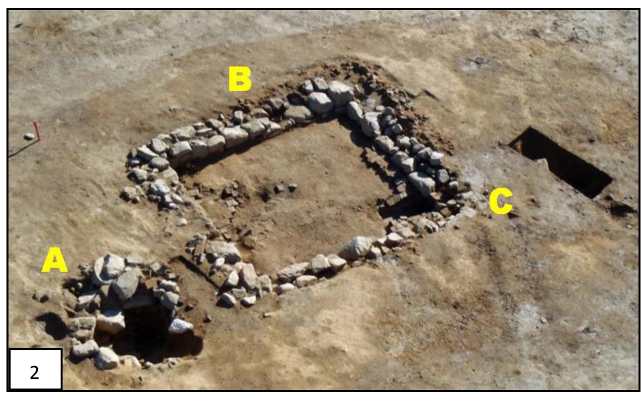


Figure 10: (1) Dairy and Well System Found at the McKean/Cochran Farm (Berger 1994); (2) Dairy and Well System Found at the Armstrong-Rogers Site. In both photos, the dairy building is labeled 'B', the associated well labeled 'A', and the drainage tract from the dairy is labeled 'C'.

Used between 1800 and 1840, this dairy was also lined with a brick sill on the interior of the foundation. A ditch, measuring 14 inches (0.4 m) across by 3 to 6 inches (0.1 to 0.2 m) deep, bordered the inside of the wall. Berger's dairy also contained a drain and channel, however, their drain was traced at least 16 feet (4.9 m) off of the dairy. In the center of their foundation surface was a raised clay floor. The dairy foundation walls at the McKean/Cochran Farm were slightly larger than those found on our site. Dovetail's foundation walls measured about 16 inches (0.4 m) wide and 12 inches to 18.5 inches (0.3 mto 0.5 m) tall while Berger's were 18 inches to 24 inches (0.5 m to 0.6 m) wide by 14 inches (0.4 m) in height. There was an adjacent well found on Berger's site too but no pump. As of current research, these are the only two known dairies of their kind to be archaeologically recorded in Delaware.

THE ARTIFACT ASSEMBLAGE: CAN THE ARTIFACTS SUPPORT THE THEORIES?

Nearly 12,000 artifacts were recovered during the Phase I, II, and III archaeological excavation of the Armstrong-Rogers site. Over 6,300 artifacts were recovered in the Phase III work alone. The overall assemblage was significantly dominated by ceramic artifacts. The collection also contained a moderate amount of architectural and organic remains. The remainder consisted of smaller portions of glass, metal, lithic, and personal items. It is important to note that this information was derived from artifact field counts and not a final artifact catalogue. Therefore, a full evaluation of the entire artifact assemblage has yet to be completed (Figure 11).

A significant amount of the artifacts recovered during Phase III work came from the southern portion of the site. The five main areas of interest alone yielded a total of 2,952 artifacts, 2,836 of which were historic. The assemblage is not dominated by any category of artifact in particular, however, it moderately consists of ceramic fragments, architectural items, and organic remains. A majority of the organic remains found on the site originate from this area, potentially due to the possible smokehouse. Artifacts found in a lesser density include metal, glass, lithics, and personal items. The distribution of the artifact assemblage coincides with the identification of these features as a well, possible smokehouse, unknown structure, and a dairy and associated well (Figure 12).

Figure 11: Sample of Artifacts (clockwise from upper left): Annular Mocha; Glazed Redware; American Blue-Grey Salt-Glazed Stoneware; Hand-Painted Pearlware; Blue and Green Shell-Edged Pearlware; "Cat's Eye" Mocha.

Figure 12: Sample of Bone: a) Pig, lower mandible; b) Pig, humerus; c) Cow, long bone shaft.

The northern portion of the site was almost entirely void of artifacts except for Excavation Unit 22 and Feature 23. The unit and feature yielded a total of 87 artifacts. Architectural items such as brick, window glass, and a variety of nails primarily composed the artifact assemblage. The remainder of the artifact collection consists of ceramic fragments, glass, lithics, and organic remains. It is important to note that this area was negative for any personal artifacts and had a low density of other artifacts such as a gun flint.

Some patterns were noticeable from the first phase of processing the artifact assemblage from the entirety of the Armstrong-Rogers site. Many of the artifacts recovered are typical of a site that was occupied from the mid-eighteenth to the late-nineteenth century. Overall, the artifact collection of this site is visibly dominated by historic ceramic fragments. During the washing process, it was noticed that the ceramic assemblage was mostly a type of utilitarian ware such as redware. This is to be expected due to the projected uses of the buildings in the area in which a majority of the collection was found. The lack of artifacts in the northern portion of the site is to be expected considering the amount of construction and deconstruction that has occurred there through the years. The extremely low density of prehistoric artifacts may prove to be thin lithic scatter or might indicate that a prehistoric site may have existed in or around this location at one point. A common trend for Native Americans was to settle on a knoll or finger ridge near tertiary clusters and the knoll in the northern portion of the site would have been an ideal option for settlement. The prehistoric assemblage could also have been the result of wash down from that knoll. However, any significant evidence of a prehistoric site would have been destroyed by the several centuries of historic occupation.

CONCLUSION

The totality of work conducted at the Armstrong-Rogers site has provided adequate and fairly conclusive evidence that this site was used for farming and agriculture during the mid-eighteenth century through the late-nineteenth century. Found within the work yard of the once-extant house, the five areas of interest, consisting of the well, possible smokehouse, unknown structure, dairy, and well associated with the adjacent dairy, were used by inhabitants of this property to thrive in rural Delaware. The information retrieved from the features and artifacts have enlightened archaeologists about the lifeways of adaptive, self-sufficient agriculturalists located in St. George's Hundred over 300 years ago. The excavation and documentation of this site, especially the dairy, may be prudent in the future for studies pertaining to work yards and outbuildings in the Mid-Atlantic region.

ACKNOWLEDGMENTS

Only through persistent study and continued funding were these finds possible. Information gleamed from this archaeological site is part of a larger endeavor that has already offered insight regarding eighteenth and nineteenth-century rural and agricultural homesteads in Delaware. Thanks are extended to the FHWA, DelDOT, and the Delaware State Historic Preservation Office. Additional thanks go out to each and every staff member and volunteers (some from the ASD) that donated their time by helping excavate and curate artifacts at the Armstrong-Rogers site.

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