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"The Art and Mystery of Shipbuilding": An Archaeological Study of Shipyards, Shipwrights and Shipbuilding in Somerset County, Maryland 1660-1900

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“THE ART AND MYSTERY OF SHIPBUILDING”: AN ARCHAEOLOGICAL STUDY OF
SHIPYARDS, SHIPWRIGHTS AND SHIPBUILDING IN SOMERSET COUNTY,
MARYLAND 1660-1900

By

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DEDICATION

This work is dedicated to my parents, Carl and Pat for their love and support. It is also dedicated to my wife Shannon for all of the love, grace, and patience she has shown throughout this process.
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ABSTRACT

Maritime archaeological sites located in the inter-tidal zone are common throughout the world. Such sites are difficult to investigate yet their state of preservation often provides unique archaeological data unavailable on most terrestrial sites. This study outlines a model and a process for understanding shipyards, their contexts, and ways in which to compare particular sites and groups of sites. This study investigates the maritime landscape of historic shipbuilding sites on the Lower Eastern Shore of the Chesapeake Bay where shipbuilding was conducted both by small family operated and large commercial shipbuilding facilities. This investigation combines the direct historical approach using primary and secondary historical sources and integrates these data into a Geographic Information System (GIS)-based predictive model. The study develops a typology based on historical and archaeological data to develop a series of idealized models of shipyard design and organization. These models test the relative importance of socio-cultural and environmental variables in the formation and development of the shipbuilding industry. These models were tested by identifying and classifying shipyards in old Somerset County, Maryland to compare them with the idealized models. This study contextualizes site specific data into more rigorous and less particularistic archaeological models of maritime resources than previously developed.
CHAPTER 1: INTRODUCTION

In 1978, Keith Muckelroy, described sea-going vessels as the largest and most complex machines developed by pre-industrial societies (Muckelroy 1978:3). Initially, underwater archaeologists believed that the archaeological study of these machines would provide unparalleled opportunities to study the technology, economy, administrative organization, and social organization of the respective societies which constructed these vessels. In the 30 years since Muckelroy’s description of the potential of shipwreck archaeology, the majority of shipwreck studies have focused on the identification of specific vessels and the documentation of the technology of ship construction, seafaring, and naval architecture rather than the broad spectrum of research possibilities he originally envisioned. Even these large-scale investigations of shipwreck sites have often been haphazard, largely wreck specific, and lacking in a coherent research design.

Shipwreck investigations are often hindered by the scattered nature of shipwreck events and the event-specific nature of many shipwreck sites. These site formation processes, along with the difficulties associated with collecting data from underwater sites, have resulted in a disproportionate number of shipwreck investigations compared to other types of maritime archaeological sites. During the past decade a number of archaeologists have sought to diversify their research interests to include the study of a wide spectrum of maritime sites. These investigations have greatly contributed to a more complete understanding of both the shipwrecks studied by traditional nautical archaeologists and the terrestrial cultures that built these vessels. One maritime site type of growing interest and importance to archaeologists is the shipyards in which these complex machines were built.

This dissertation seeks to comprehensively address the deficiencies associated with using the material culture of ships as source material for investigating some of the emic rules, or practice, associated with the societies which constructed them. This study seeks to redefine the argument by connecting the event (in this case the construction of a ship or the excavation of a shipwreck) within the broader socio-cultural contexts through the investigation of shipyard sites. This study also attempts to address the formidable process of integrating portions of the disciplines of terrestrial and underwater archaeology to form a more coherent understanding of shipbuilding within the larger social contexts.
Shipyards represent the linkages between event-based archaeological occurrences associated with shipwrecks and the larger cultures in which these sea-going vessels were constructed. In this manner shipyard archaeology opens the door to a variety of methodological approaches for developing more complex and accurate models of general cultural patterns and more specifically, about maritime culture.

Because of the many difficulties associated with excavating shipyards sites, until recently neither nautical archaeologists, nor terrestrial historical archaeologists have mounted a concerted effort to identify, evaluate and analyze these types of sites. The archaeological investigation of shipyards along the shoreline environment has required a mixture of water-oriented research approaches combined with knowledge of the maritime material culture and environment supplemented by a broad understanding of terrestrial historical archaeology (Gawronski 2003b:13). Garth Wilson (2003:2) suggests further broadening the study of shipyards to study not just the “structure, [techniques], organization and economics” of shipyard sites, but also the cultural aspects of shipbuilding (Wilson 2003:2).

Shipyards were distinctly unique locations in which communities of skilled artisans directly participated and interacted in the Atlantic World system (Wallerstein 1974, 1980, 1989). Ports, harbors, and shipyards were some of the locations where differing nationalities and cultures were exposed to the technologies and designs of others. New vessels arriving in a foreign port and needing repair were inspected and evaluated by seasoned shipwrights. In this manner, many innovations were rapidly transmitted throughout the Atlantic World system. Shipyards were the locations where novel ideas and the tried traditions co-existed while interacting with local social and economic forces and trends (Wilson 2003:2).

This study outlines a model and a process for understanding shipyards, their contexts, and ways in which to compare particular sites and groups of sites. The study accomplishes this result in three stages. First, it develops and implements an infrequently used approach known as the direct historical method, combining historical and archaeological data. Using primary and secondary sources these data are incorporated into a Geographic Information System (GIS)-based predictive model. Second, it develops a typology based on historical and archaeological data to develop a series of idealized models of shipyard design and organization. These models test the relative importance of socio-cultural and environmental variables in the formation and development of the shipbuilding industry. These models were developed using data collected
from previous historical and archaeological investigations of shipbuilding including a wide range of data from across Europe and the United States. As a result, these models are somewhat general. Using historical records and previously excavated archaeological data, the typology uses site infrastructure as a proxy measurement of shipyard function, spatial organization, and intensity of operations. Third, these models were tested by studying a particular geographic area to identify and classify shipyard sites identified within the study area and compare them with the expected results. The comparative data collected during the fieldwork further broaden the limited sample size of known shipyards, and suggest several alternative thematic models to explain the typological variability of shipyard distribution, and internal spatial organization.

This dissertation analyzes the structure and organization of shipyards combining archaeological and historical data and tests them against several alternative models of shipyard development. Chapter 2 reviews the theoretical framework of the historical archaeology of industrial sites and reviews the published and unpublished literature associated with the archaeological background of shipyard sites. Chapter 3 discusses the physical geography and development of the cultural landscape of the Chesapeake Bay. Chapter 4 discusses the history and technology of shipbuilding and its specific applications within the Chesapeake Bay. Chapter 5 describes the field study and the methodology employed. Chapter 6 describes the fieldwork methods. Chapter 7 describes the results of the field investigations. Chapter 8 relates the interpretation and the results of the analysis and model testing. The final chapter concludes with a summary and a discussion of the conclusions about the results of this study, the effectiveness of the methodologies employed, and the directions of future research in this area of study.
CHAPTER 2: THEORETICAL FRAMEWORK

Humans have exploited the sea for food and transportation for millennia. The earliest accepted evidence of large-scale use of the sea comes from the colonization of Australia and other areas of the globe that were inaccessible except through sea-based travel. Australia is believed to have been settled by at least 50,000 years ago, and perhaps earlier (Bednarik 1997). Throughout recorded history, seaborne commerce represented a sizable component of long distance economic activities. Large, heavy, staple commodities were especially well-suited for seaborne transport. Throughout the past, maritime-oriented states developed substantial political and economic power based on their control over seaborne commerce. The Phoenicians, Romans, Byzantines, Venetians, Dutch and British were all known for their primacy based on sea power and domination of maritime trade. Historically, international sea-based trade has steadily increased with the globalization of communication and transportation. Today, roughly 90 percent of world commerce (by weight) is carried by seaborne trade. Between the years 1840 and 2005, seaborne commerce has increased from an estimated 20 million tons to approximately 7.12 billion tons per year (Stopford 2009:24).

Studies of maritime commerce led largely by nautical archaeologists have overwhelmingly focused their research on the ship as primary mechanism for transporting the goods and commodities. This focus on sailing ships and steam vessels has provided a better understanding of different aspects of the organization of maritime commerce and the technologies associated with increasing efficiency of the system through time. Unfortunately, this focus by archaeologists on the investigation of ships has underrepresented the study of other aspects of maritime commerce. Among these understudied types of maritime sites are those sites associated with maritime infrastructure. Within the maritime infrastructure sites, shipbuilding sites are among one of the most understudied site types.

Shipyards were locations in which workers participated and interacted in the Atlantic World system (Wallerstein 1974, 1980, 1989). They were the locations in which different cultures mixed and people were exposed to the technologies and design capabilities of other nationalities. Shipyards and ports were the nexus of larger patterns of social, economic, technological and cultural changes. They influenced the manner in which these “embedded” aspects of society formed the technology that was developed for individual vessels. These represent links to the social, economic, and environmental contexts of the society to the
productions of both individual vessels and whole classes of vessels. New vessels arriving in a foreign port and needing repair were inspected and evaluated by seasoned shipwrights. In this manner, many innovations were rapidly transmitted throughout the Atlantic World system. Shipyards were often centers of innovation where traditional wooden shipbuilding techniques co-existed with local, national, and international trends.

This study addresses the formidable process of investigating and understanding shipyards in three ways. First, it develops and implements a unique methodological approach by combining historical and archaeological data. Second, it implements a systematic broad-scale approach to the study of shipyards as a class of industrial and maritime archaeological sites rather than the particularistic approaches often employed by earlier researchers. Third, it seeks to both develop and test a series of anthropological models which incorporate field data.

The discipline of archaeological anthropology has wrestled with the problem of how to "properly" use information gathered from historical documents. The ambivalence regarding the use of historical documents has created a continuing debate that has significantly postponed the intellectual development of the discipline of historical archaeology within the field of anthropology (Armstrong 2001; Cleland 2001a; Cleland 2001b; Deagan 1982; Deagan 1988; De Cunzo 2001; Deetz 1988; Deetz 1989; Dollar 1978; Hardesty 2001; Harrington 1978; Lyman and O’Brien 2001; Majewski 2003; Mrozowski 1988; Noel Hume 1978; Trigger 1988).

Currently, archaeologists use information from historic documents to supplement the archaeological source material in several ways. Documents are frequently used to provide behavioral analogies similar to the "ethnographic" analogies used by prehistoric archaeologists. Additionally, historical archaeologists have used historic documents as a means of imbuing the archeological processes with human agency (Johnson 1989).

This debate over the role of history in anthropology has largely resulted from preconceptions about which respective data set is more useful. As recently as 1988, James Deetz (1988:362) argued that historical archaeology needs both anthropology and historical perspectives "to be fully effective." The basis for this debate was a critique that was made by Charles E. Cleland. Cleland observed that historical archaeology was turning towards the "description and interpretation of unique historical events" and becoming what J.C. Harrington called an auxiliary science and a "handmaiden of history" (Harrington 1978; Hardesty 2001:23).
In Cleland’s view this trend was driving historical archaeology away from its full potential (Cleland 2001).

Cleland and others also believed that many studies, which classify themselves as historical archaeology, involve neither excavation nor artifacts (Cleland 2001; Hardesty 2001:23). This is perhaps a moot point since, as Philip Phillips pointed out so many years ago, "archaeology is anthropology or it is nothing" (Willey and Phillips, 1958:2). Certainly, the distinctions which lie between the fields of architectural history, landscape studies, material culture studies, history, historical archaeology, and anthropology have become blurred over the years.

Many archaeologists have an impression that historical documents are subjective. The manner and the intentionality in which historical documents and records are created differentiate them from the cultural processes that create material culture. Individuals who create historical records are conscious of their actions during the process of creation and are seen as biased. To a great extent this is true. Documents do reflect part of the mindset of those who both create and use them. For these reasons, material culture has been perceived as the embodiment of objective data that was created as an unconscious, rather than conscious, reflection of behavior (De Cunzo 2001:16).

Cleland and others have called for historical archaeologists to use archaeological data in conjunction with information collected from historical documents. He advocated using the scientific method to test the hypotheses generated from one data set by using the other to independently test historical hypotheses and to "objectively test propositions formulated by the opposing data set (Cleland 2001:6). The oppositions between these different types of data should also be "recast as questions and tested against the archaeological record," but this should not be the sole relationship between the historical records and material culture (Armstrong 2001:11). Often the inferences that can be drawn from one set of data are inappropriate for testing using the opposing source material. The types of questions of a particular type of data are also frequently incompatible. The strength of the historical archaeologist lies in the promise of the integration of both disciplines that can generate significant questions with "answers that would have been unobtainable through either discipline alone" (Deagan 1998:51).

The structure of this dissertation has been heavily influenced by the theoretical debate about the goals, methods, and paradigms that are appropriate to the pursuit of knowledge in
historical archaeology. This study is designed to ask “questions that count” by deriving the maximum benefit from both history and archaeology in a complementary style (Deagan 1988; Armstrong 2001). The most informative projects use both disciplines and incorporate data from related fields from "faunal analysis to landscape architecture, to explore and expand our understanding of the parameters of people’s lives" (Armstrong 2001:10). “Historical archaeologists, therefore, should consider taking advantage of their strength in having multiple sources of information to acquire detailed knowledge of events to work on the development of "event-centered" theories of cultural practice (Hardesty 2001:23).

This study incorporates elements of the direct historical approach to link primary historical sources directly to recognizable archaeological phenomena. It incorporates processual archaeological theory to develop more systematic environmental and cultural models of site formation and site locations using environmental, geographic and site formation data. By combining the historical information about individuals involved in the shipbuilding with archaeology sources, patterns of large socio-economic processes can be identified. Finally, this study uses primary and secondary historical data to draw analogies and inferences about these processes that created these specific patterns of material culture. This rich historical documentation, which is generally contemporaneous with the material culture, may provide even stronger analogies and inferences than prehistorians can draw from ethnographic data. Through these methods, this dissertation will address “questions that count” about the socio-economic organization of craftsmen and the communities in which they lived, as well as the economic organization of the shipbuilding industry in the Chesapeake region.

Both prehistoric and historic archaeologists have focused on two separate scales of anthropological inquiry (Mrozowski 1988:18). On one hand, they have focused on broadly applicable socio-cultural issues such as ethnogenesis, cultural contact, cultural complexity, class formation and race relations (Majewski 2003; McGuire 1982; McGuire and Walker 1999; Otto 1980). On the other hand, they also have focused on unique events, and particularistic, idiosyncratic research questions related to specific sites or classes of material culture (Armstrong 2001:9; Cleland 2001a; Mrozowski 1988).

This study also uses both archaeological and historical data to bridge the gap between micro and macro scales of research (Binford 1964; Binford 1965; Binford 1977; Goodyear and Raab 1984; Kosso 1991). It combines archaeological source material and data derived from
historical documents to create typologies, develop GIS predictive models, and generate agency-based models of diachronic change. These methods will diminish the effects of divergent scales of archaeological research, and will assist in the investigation of large complex historical sites such as shipyards.

**Models**

Social, environmental, geographic, technological, and economic factors account for a considerable amount of variability on most historic archaeological sites and provide the basis for current models in historical archaeology. The degree to which these variables affect shipyard development are reflected in differences in site distribution, site size, internal organization, and diachronic development. In this study, I create and test a series of explanatory models of shipyard development and organization for Somerset County, Maryland during the Colonial and Early Republic (1666-1820) and later periods.

**Social**

The social model, predicts that kinship ties between shipwrights and the local communities (especially local merchants) play an important role in the location and organization of a shipyard site. In an era with few permanent financial institutions such as banks or formal creditors, shipwrights often formed limited partnerships based on kinship relations with wealthy planters and merchants (Mathias 2002; Walsh 1988). These planters and merchants provided capital for the development of shipyard infrastructure. Shipwrights actively used these kinship ties which created ties of both residency and reciprocity within the community (McCann 2001). This model predicts that shipwrights located their shipyards within the geographic area of their kinship network. Conversely, shipwrights who did not use kinship-based relationships will evidence greater geographic mobility. The strength of these kinship ties was critical to the success or failure of the shipbuilding enterprise.

**Environmental**

The environmental model predicts that environmental variables were the major determinant of site distribution, site size and internal organization. A number of environmental variables affected the suitability of a particular site for a shipyard: the amount of shelter offered by a site location, the width and depth of the channel at the shipyard site, and the suitability of
local soils that promoted the growth of shipbuilding timber, the suitability of the soil to support structures necessary to support heavy vessels under construction, and the gradient slope of the shoreline for launching (Ford 2001).

**Geographic**

The geographic model predicts that physical and cultural geography played a critical role in the development of shipyard sites. Aspects of the physical such as topography often limit the initial size and subsequent expansion of the area of historic sites. Cultural variables that define the formation and development of the historic landscape affect the distances between shipyards, commercial centers, suppliers. These variables associated with the information network affected the speed of communication and the rapidity with which shipwrights could respond to changing market conditions, construction materials, and fill orders. This model predicts that larger, better organized shipbuilders located their shipyards in close proximity to, or on the periphery, of nucleated town sites.

**Technological**

The technological model predicts that the development of new technology and access to existing technology closely correlates with the development of new systems of organization at industrial archaeological sites. The introduction of new technologies or the inability to gain access to these new technologies influences the organization, development, and productivity of industrial sites. The introduction of mechanical aids and labor saving devices such as sawmills, new methods of steaming planks, and the introduction of cheap iron nails dramatically decreased the time required to construct a seafaring vessel. Shipbuilders also participated in a global exchange of ideas and information about new vessel design and new techniques for constructing these vessels. Technological changes also affected spatial organization, size and distribution of shipyard sites. The technological model predicts that technical changes will be reflected in the patterns of infrastructure development at shipyard sites.

**Economic**

The economic model predicts that economic cycles are important in the development of any industrial archaeological site. This model assesses the relative importance of access to affordable land, manufactured goods, and labor within an economy dominated by monocrop agricultural production. Ships require large quantities of goods and materials that are not
produced at most shipyard sites. Sails, rope, anchors and specialized metal fittings must be purchased from merchants and ship chandlers. Another scarce resource in the Colonial and Antebellum period was labor. A restricted labor system necessitated that shipwrights use both free and bound labor; slaves and indentured servants often composed a sizeable proportion of a shipyard’s labor force. Finally, access to markets dictated the economic success of industrial enterprise. This model predicts that shipyard sites will be located on inexpensive land of marginal quality for tobacco production. Furthermore, this model predicts that local economic conditions will determine the type of labor, and the seasonality of labor availability, required to construct vessels both synchronically and diachronically.

**Archaeology of Shipbuilding**

Among the many types of industrial sites studied by archaeologists, shipyards are one of the least often investigated (Gawronski 2000a:133; Pitt and Goodburn 2003:191; Wilson 2003:2). Because of the many difficulties associated with excavating these sites, few nautical archaeologists or terrestrial historical archaeologists research this type of site. The in-shore environment of shipyards requires a water-oriented research approach that combines the specific knowledge of maritime material culture with terrestrial historical archaeology (Gawronski 2003b:13). Gawronski (2003a:134) believes the optimal research method for investigating shipyards should employ a multi-disciplinary approach that synthesizes nautical, historical, and urban archaeology. Garth Wilson (2003:2) suggests further broadening the scope of the study of shipyards to investigate not just the "structure, [techniques], organization and economics" of shipyard sites, but also investigate the cultural aspects of shipbuilding (Wilson 2003:2).

“Moreover, to enact and cultivate these traditions and designs, as shipbuilders do, is to engage in more than just a manufacturing enterprise. It is also to participate in an age-old expression of ingenuity, creativity, and transcendent aspirations” (Wilson 2003:2). Wilson (2003) argues that shipbuilders directly participated in an Atlantic World system in which novel and traditional ideas clashed, producing innovation and responding to economic factors (Wilson 2003:2).

The majority of monographs, articles, and technical reports about Anglo-European shipbuilding and shipyards can generally be categorized as primarily historical or primarily archaeological. The historical literature about shipbuilding and shipyards is quite extensive. However, most of these studies focus on military ship production at large British dockyards such as Woolwich, Portsmouth, Deptford, Chatham and Sheerness (Coad 1983; Dodds and Moore...
1984; Goodwin 1987; Lavery 1989; Morriss 1983; Rodger 1986; Winklareth 2000). Other historical studies, which tend to focus on broader social, geographic, and economic patterns of shipbuilding, encompass a synthetic discussion of the topic. Many of these works include the topic of shipyards and shipbuilding as a part of a larger study. In addition to these major historical works on shipyard production, there are a considerable number of monographs that focus on local shipbuilding communities (Briggs 1889 [1970]; Grant, 2000; Peckham 2002; Peterson 1989; Rowe 1929; Story 1991; Welch 1993; Wood 1997). In general, these works are highly particularistic and focus almost exclusively on aspects of shipbuilding associated with one family of shipwrights, one shipyard, or the history of towns strongly tied to shipbuilding.

Historical works, which focus on military ship production, often focus on large British dockyards such as Deptford and Woolwich. Such studies typically lack context and their usefulness to archaeologists has been minimal. Archaeological investigations of these military shipyards are limited to just a few investigations (Courtney 1974; Courtney 1975). The number of archaeological and historical investigations of commercial shipyard sites continues to grow, but these analyses have suffered from a lack of contextual synthesis about shipyard development. Furthermore, the publications of these investigations are frequently only found within the technical “gray literature” of professional archaeologists. Often, these excavation reports are circulated only as technical reports or other forms of inaccessible literature within governmental agencies. The difficulty in acquiring reports describing archaeological investigations also has contributed to a lack of synthesis about shipyards.

Recently investigated shipyards include the Chickahominy shipyard in Virginia, the Stephen Steward shipyard in Maryland, the Hertz Lot shipyard in Philadelphia and several other sites in New England, and England (Adams 1991; Thompson 1993; Moser & Cox 1999; Morris 2001; Weber 2006). Part of the lack of publications about shipyard archaeology is the difficulty in studying such sites and the difficulty of establishing their importance as a topic of study. Many shipyard investigations have developed as an outgrowth of industrial archaeology rather than maritime archaeology. Industrial archaeology began in England in the 1950s as the study of "material remains of past industrial and commercial activity" (McCutcheon 1983:162). Initially, in the United States, historical archaeologists largely ignored the study of industrial sites. The documentation of these sites was left largely in the hands of amateur enthusiasts, technology buffs, engineers, historians, and architectural historians who were specifically interested in
documenting the material culture and processes of technology. This primarily descriptive approach to industrial archaeology largely characterized the discipline of industrial archaeology until the 1990s (Palmer and Neaverson 1998:3).

Only after the introduction of cultural resource management (CRM) legislation, did professional archaeologists become interested in investigating industrial sites. Even then, most archaeological literature of industrial sites focused almost exclusively on the archaeology of the working class. This form of "labor archaeology" has largely focused on issues of class, the dehumanizing effects of industrialization, conflicts created within society, and social control of the workforce (Hurry 1990; Knapp 1998:2; Shackel 1996). Within the past two decades, American historical archaeologists have expanded their studies and systematically investigated industrial sites. These investigations have resulted in the documentation of a wide variety of industrial sites and workshops. The most notable of these sites were iron furnaces and foundries, mills, pottery kilns, limekilns, and tanneries. Arguably, one of most interesting of these types of sites was the shipyard.

Among industrial sites, shipyards are perhaps one the least often investigated site type (Gawronski 2000a:133; Pitt and Goodburn 2003:191; Wilson 2003:2). There are a number of cultural, academic and practical reasons for this lack of investigations at shipyard sites. Many historical shipyards are located along urban waterfronts, which are still used, and largely inaccessible (Gums and Shorter 2000). Many of these sites have probably been destroyed, making those that do survive even more important. The present day urban land-use patterns within these areas functionally preclude the systematic investigation of most maritime historic resources along the waterfront.

Due to their intended purpose, shipyard sites are located along the shoreline and include components located on the land and in the water. In the case of many earlier shipyards, these sites are located in areas that are partially inundated by post-medieval sea-level rise, conditions that require the development of non-traditional methods and techniques for investigation. Naturally well suited for such investigations, underwater archaeologists have not taken the lead in the investigation of shipyards. Instead, they have chosen to focus on higher profile projects such as shipwrecks and harbors (Gawronski 2003b:13).

Terrestrially focused historical archaeologists have begun investigating these sites. However, historical archaeologists also have had difficulty in excavating and interpreting such
large, complex, industrial sites. Often, post-medieval shipyards are many acres in size and can extend along hundreds of meters of waterfront. Limited budgets have prevented the systematic excavation of shipyard sites. Most sites are so large that even a systematic program of testing is not feasible. In rural areas, shipyard sites are also easily confused with other types of common archaeological remains such as wharves. As a result, they are infrequently investigated because their ephemeral archaeological remains are often confused with other types of sites (Thompson 1993; Ford 2001).

Recently, the decline of heavy industry and commerce, and the redevelopment of many downtown seaport communities has resulted in an increasing number of archaeological investigations of waterfront sites. The number of archaeological and historical investigations of commercial shipyard sites is growing, but the analyses of these sites have suffered from a lack of contextual synthesis and a clear typology for understanding the context of shipyard development. Like the investigations of other industrial sites, historical particularism has affected the way that archaeologists have viewed shipyard sites. Most studies have viewed shipyards as totally unique site types, which are explicable only within the context of a unique event-driven history.

Reports generated by Cultural Resource Management (CRM) projects report diverse archaeological investigations throughout the United States. One report on the data recovery excavations at the Dubuque Boat and Boiler Works in Dubuque County, Iowa on the Mississippi River stands out for its excellent synthesis of previous shipyard investigations in the United States. Cynthia Peterson’s (2002) summary reported the results of searches of various online databases including Historic American Building Survey (HABS)/Historic American Engineering Record (HAER), National Historic Landmarks (NHL), and the National Register of Historic Places (NRHP). These searches identified elements of 14 shipyards recorded within the HABS/HEAR and NHL databases and elements of 13 shipyards listed on the NRHP. Peterson also contacted maritime researchers and State Historic Preservation Offices (SHPO) to identify archaeological sites and excavation reports in 34 states located along the coasts and along major inland waterways. Peterson documented 70 shipyards, boatyards, marine railways, and related shipyard components that had been assigned official archaeological site numbers. These figures represent a fraction of the thousands of shipyards that once operated in the United States. Unfortunately, few of these sites have ever been investigated beyond a simple archaeological reconnaissance or identification survey. The majority of these matches were listings of individual
standing structures from just seven late nineteenth and twentieth century shipyards and most are Federal Naval Yards. Little information exists about archaeological work completed at these sites. In addition to these structures, 15 shipyards and shipbuilding districts are currently listed on the National Register of Historic Places (NRHP). Of these listings only one is explicitly listed as an archaeological site. The scarcity of identified and recorded shipyards represents a major hurdle in the completion of a more thorough investigation of shipyard archaeology.

Published works about shipyards can generally be categorized as being primarily historical or archaeological. The historical literature about shipbuilding and shipyards is quite extensive. The majority of these studies focus on the large British dockyards and their role in establishing British naval superiority during the eighteenth and early nineteenth centuries (Coad 1983; Dodds and Moore 1984; Goodwin 1987; Lavery 1989; Morriss 1983; Rodger 1986; Winklerath 2000). In addition to these works on the naval shipyard production, there are a considerable number of monographs about local shipwrights, shipyards, shipbuilding communities (Briggs 1889[1970]; Grant, 2000; Peckham 2002; Peterson 1989; Rowe 1929; Story 1991; Welch 1993; Wood 1997). The most useful sources for understanding Anglo-European shipbuilding are described over the remainder of the chapter.

Richard Barker (1998) has published a very useful synopsis describing the practice of early European and Mediterranean shipbuilding traditions. The article is an excellent summary of many of the contemporary sources describing the process of Medieval and post-Medieval ship launching. His synthesis includes previous historical research and his own interpretations of primary sources, which indicate that the act of conveying vessels from land into the water was one of the most difficult and highly variable aspects of ship construction. Much of the research he presents in this article focuses on the details of substructures and cradles necessary for supporting a vessel during the launch process, how these structures differed across regions, and how they changed through time. This research also documents many of the cultural preferences of different nationalities and regions for particular ship launching techniques.

The other category of published works about shipyard sites is represented by archaeological investigations of these sites. Many of these works consist of primary archaeological reports not readily available to most researchers. The usefulness of many of these works is compromised by the lack of research design or the limited size and scope of the investigations that were conducted at particular sites. A review of a few of these archaeological
investigations summarizes the direction of shipyard research, and in some ways documents the major failings of these investigations.

T.W. Courtney (1974; 1975) was one of the first archaeologists to report investigations at a shipyard site. In many respects these investigations are among the most useful investigations that have been conducted in this area. In 1972 Courtney began excavations at the Royal Dockyard at Woolwich, which began operating in 1512 and was closed in 1869. These investigations were conducted in advance of efforts to redevelop the property. Because of the large area of the Woolwich Dockyard, Courtney focused on specific areas of the dockyard to gather a cross-section of the activities that were associated with the shipyard. These investigations focused on portions of a building slip, a masthouse, the surgeons' quarters, the central yard, the clock house, sawpits, pitch houses, roadways, a steaming kiln, a smithy, a double dock, and a steam and hammer-house (Courtney 1974:4). These investigations were useful for identifying particular structures at Woolwich, but less useful for understanding the context of specific features, their associations with particular periods of the dockyard operations, their functions and how they may have changed through time.

The Good Ship by Ian Friel includes a discussion of English shipbuilding and shipyards between the years 1200 to 1520. One of the most important revelations by Friel was his analysis of shipyard contracts and accounts that identified the catchment areas of shipyards during this period. Friel (1995:49-52) found that many shipyards did not purchase most of their supplies of timber from local sources. Instead, timber was shipped by road and water from sources located 10 miles or more from the shipyards. Other specialized building materials were also shipped over significant distances. Such a system suggests that timber availability did not tie early shipbuilders to specific building locations, nor did the availability of supplies diminish shipbuilding at rural locations. Shipbuilders may have been more constrained by unsophisticated transportation networks than resource availability. Such patterns probably also extended to other regions and periods. Instead of supplies, it was the presence of ship-owning merchants who provided the capital and the markets that stimulated the concentration of shipbuilding in urban areas (Friel 1995:53). Friel (1995) also suggests that most private Medieval Period shipyards were set up as expedient locations that were selected for ship launch and repair as needed. He argues that the limited capital available to most shipwrights of the period deterred investment in fixed shipyard infrastructure.
Joseph Goldenberg’s (1976) book *Shipbuilding in Colonial America*, examined the craft and industry of shipbuilding, and its expansion in North America during the Colonial Period. This study reviewed the shipbuilding activities within every American colony, quantifying the tonnage of vessels constructed within each colony and contextualizing these data within the global market for new vessels. His work is particularly useful for tracing the development of early shipbuilding in the colonies and quantifying the patterns of its expansion from the seventeenth to the eighteenth century. Data from his studies focused heavily on New England. His work suggests similar patterns of shipbuilding in the southern colonies, but without the benefit of comparable data and analysis.

Another useful synthetic historical study includes John Bradford Hunter’s (1999) dissertation documenting Boston’s transition from a peripheral to a core shipbuilding center. Hunter (1999) documents the expansion of the shipbuilding industry during the early nineteenth century and convincingly connects the rise of such centers to the local availability of inexpensive timber and low-cost labor. This work emphasizes the undercapitalization of the American shipbuilding industry which continued to make do with older technologies, methods, and vessel types that consequently created opportunities for significant development and capitalization of other sectors of the economy. By the nineteenth century both labor and capital (shipyards) of shipbuilding gravitated towards urban locations (Hunter 1999:82). Although Hunter’s study provides considerable insight based on an economic geography that models manufacturing in terms of weight-scale of volume, value and transportability of component inputs to manufacturing locations, he may under represent the skill and effort necessary to build a new vessel, especially before the introduction of steam-powered mechanical assistance.

Vessels needed very little infrastructure to be built-access to timber was more important, and almost secondarily, easy access to water. Many shipbuilding locations required considerable engineering expertise to extract vessels from the creek-side yard into the open ocean. Yards were on the outskirts of town, often on marshy land, ill-suited for wharves, warehouses and residential housing. Dozens of locations were used along the New England coast, and favored sites might be home for a dozen different yards in a several mile stretch of river or estuary (Hunter 1999:10).

Another useful source is a dissertation by William H. Thiesen (2000). In this study, Thiesen documents the influence of technology in American shipyards on both shipyards and ship design. While historical in focus, this study is particularly useful to those trying to
understand the transformation of ship production from a craft-based tradition to industrial-based production. Thiesen’s study is particularly useful to archaeologists for his descriptions of the variability of the physical structures associated with shipyards, and how such structures may have changed through time.

The second type of writing about shipyards uses material culture identified during archaeological investigations as the primary source material. These works consist of archaeological reports, theses, and dissertations that are not readily available to most researchers and a small number of more widely available articles. The usefulness of these works varies for comparative research since they are frequently compromised by a limited research design, and/or the limited size and scope of the investigations that were conducted. A review of a few of these archaeological investigations summarizes the direction of research and documents the major successes and failings of these investigations.

In 1994 Jonathan Adams and the University of Southampton reported on archaeological investigations at Bucklers Hard, a shipyard located on Beaulieu River, England (Adams 1994). Adams and his field crew identified portions of four slipways, including several that were disturbed by the development of the waterfront in later periods. Such large-scale disturbances are often a part of shipyard archaeology, and illustrate the difficulty of excavating and chronological interpretation of such environments. In particular, urban shipyards were often subjected to continuous disturbances from redevelopment and construction along the waterfront. The archaeological work at Bucklers Hard relied on mapping of extant timber features, topographic, and bathymetric surveys of the adjacent landforms in order to identify slipway features. Only limited areas of the shipyard have been excavated stratigraphically (Adams 1994:26). Consequently, the project provides reliable information about the horizontal extents of the slipways, but is more limited about the chronological sequence of the slipway construction and information about areas of the site located away from the slipways.

Goodburn (1999), in an examination of the post-medieval London waterfront, has demonstrated the quality of organic preservation at shipyard sites and thereby the quality of information that is preserved at these types of sites. During his investigations he found that portions of vessels that are infrequently recovered from shipwrecks are more often recovered at shipyards in freshwater environments. Portions of vessels such as the upper works including masts and spars, and even paint can be recovered at these shipyards. His studies also have
demonstrated that the tool marks left on wood recovered from shipyards indicate the types of tools and practices of shipwrights from a particular period. He found that axes and pit-saws were the principal tools that were used to transform timber into ship elements including stems, frames, knees, and beams. Furthermore, he found that the adze marks identified on most timber often overlay saw or axe marks. Goodburn deduced that adzes were mainly used for “secondary shaping, final trimming and smoothing, rather than conversion or gouging out” (Goodburn 1999:174). In addition, the detailed study of the timbers and refuse recovered from shipyard sites can be studied to determine the nature of the availability/scarcity of particular wood species used in shipbuilding and the size of timbers that were available to English shipwrights (Goodburn 1999:178-179). By studying groups of dendrochronologically dated timbers, it is possible to determine the size of timbers that were available to English shipwrights. The type of wood used for construction of vessels was instrumental in determining the types of technology, tools, and techniques that shipwrights used and how these techniques changed through time.

Investigations by Aldsworth (1989) are more typical of the nautical archaeological investigations of shipyard sites. Aldsworth (1989) investigated the archaeological remains of a large vessel that was used to house slaves at the Nelson dockyard in Bermuda. Instead of focusing on this site as a small component of the larger shipyard, or as an element of slave life at that shipyard, Aldsworth (1989) instead chose to focus on trying to identify the design of the vessel so that he could identify its particular origin and ultimately the name of the vessel. This type of archaeology uses questionable methods to arrive at a potential identification of the vessels name, shifting the research focus to the vessel origins rather than more relevant, realistic and useful research questions associated with the shipyard. Furthermore, Aldsworth (1989) failed to integrate his investigations within any form of theoretical framework.

The Pritchard’s Shipyard site (38CH1049) is a Colonial period shipyard located on Hobcaw Creek, South Carolina. Pritchard’s shipyard may represent the largest Colonial pre-Revolutionary War shipyard that has been discovered in the United States. Pritchard’s Shipyard was identified during a shoreline survey that identified eighteenth and nineteenth-century artifacts and ballast rock, brick, and “ship frames eroding out of the bank” (Amer and Naylor 1996) and two distinct areas along the shoreline containing wood cribbing and pilings. These two areas were the remains of two of the three slipways that were depicted on a historical plat of the plantation (Amer and Naylor 1996). Aside from these initial investigations, little archaeological
information about the slipways and other waterfront features were reported about the site. A series of investigations at Pritchard’s shipyard have identified three industrial structures on the property that were identified during excavations reported in an M.A. Thesis (Morby 2000). The most significant features at the site identified an approximately 7-x-7-m brick structure, and several related industrial features.

The Stephen Steward shipyard (18AN817) is one of the most intensively archaeologically investigated Colonial period shipyard sites in the United States. This site was intensively investigated during two periods between 1991 and 1993 (Siedel 1993; Thompson 1993) and again in 1998 and 1999 (Moser and Cox 1999; Gibb and Moser 1999). The Stephen Steward shipyard is an eighteenth-century colonial and Revolutionary War period shipyard located on an approximately 40-acre tract on the West River of Anne Arundel County, Maryland. This shipyard was destroyed by a British raid in 1781. These and subsequent excavations of the site resulted in the mapping and excavations of two timber launching/repair features and a wharf, and the recovery of a large timber “dog shore” (Thompson 1993). The 1993 terrestrial investigations resulted in the excavation of 101 1-x-1-m test units and the discovery of 15 cultural features (Seidel 1993; Thompson 1993). Subsequent work at this site included a comprehensive geophysical investigation of approximately 50 percent of the site, and the identification of features and evidence of additional structures and activity areas (Moser and Cox 1999). Although several features were identified during this investigation, none was excavated. Finally, in 1999, compliance archaeological investigations excavated 47 shovel test pits (STPs) and nine 1 x 1-m excavation units (Gibb and Moser 1999). These investigations identified additional structures and activity areas, including one intensely burned area containing large quantities of daub and charcoal.

During archaeological investigations of the Chickahominy shipyard in Virginia, archaeologist Jeffrey Morris (2000) identified a “slipway-like” feature approximately 3.37 m (11 ft) wide and built on a four degree slope (Morris 2000:103). Underwater test excavations conducted in the vicinity of a new pier located on the site suggested extensive disturbance and scour from the river current. Morris (2000:103) hypothesized that a large scatter of brick exposed at the end of the “slipway-like” feature suggested that the launching structure might have been built on a bed of brick or that the "space between the timbers could have been filled with brick."
In 2002, Satchell (2002) reported on an archaeological survey conducted in 1999 in England. This survey identified two Napoleonic-era shipyard sites at Bursledon Point (HAM016) and Warsash (HAM034) both located on the Hamble River. Historical research indicates that Bursledon Point shipyard (HAM016) was used by numerous shipbuilders between 1665 and 1812 (Satchell 2002:14). The Warsash shipyard was established in 1807 by George Parsons (Satchell 2002:23). The preliminary investigations at both sites indicate that the Bursledon shipyard remains are more substantial than those at Warsash. However, substantial timber remains are present at both sites. Satchell (2002:16) reports that a topographic survey of the Bursledon site identified two distinct slipways with timber elements consisting of upright timbers used to support the vessel and scaffolding and horizontal timbers.

Pitt and Goodburn (2003:181) summarize the results of their archaeological research undertaken on a shipyard site in Blackwall, London. The main goal of their research was to determine whether archaeological remains relating to a seventeenth-century shipyard were present within the project area (Pitt and Goodburn 2003:191). They present only limited information about their own shipyard excavations. However, they summarize much of the body of knowledge about seventeenth and early eighteenth century shipyard sites.

Gawronski has investigated two Dutch shipyards located at Oostenburg and Hogendijk in the Netherlands (Gawronski 2003a; Gawronski 2000b). At both shipyards he focused his investigations on the layout and construction of the slipways that were identified during the archaeological investigations. Construction of the Oostenburg shipyard began in 1660 and was completed by 1665 for the Vereenigde Oost-Indische Compagnie (VOC) (Gawronski 2003b:15). During the slipway excavations at the VOC shipyard at Oostenburg, Gawronski (2003b:18) identified plank floors supported by heavy pine beams resting on pilings (Gawronski 2003b:18). Gawronski (2003b) interpreted these pilings as a stable substructure constructed to support the pine beams and plank floors of the slipways. The scale of the effort necessary to construct the shipyard at Oostenburg was significant. These excavations documented hundreds of piles that were driven to carefully construct each slipway. The scale of effort in constructing VOC shipyard at Oostenburg, the longevity of its shipbuilding operations, and the efficiency of its design and layout suggest a high degree of engineering foresight and innovation in the organization of industrial production at this shipyard.
Archaeological excavations at the Hogendijk shipyard located northwest of Amsterdam suggest a marked difference in shipyard organization and design from the VOC Oostenburg facilities (Gawronski 2003a:132). The excavations at Hogendijk identified four slipways that operated between 1575 and 1650 (Gawronski 2003a:132). The first structure constructed on this site was built during the last quarter of the sixteenth century as part of a system of isolated houses built on a mound of clay sod (Gawronski 2003:136). Wood chips, and other shipyard refuse, were piled against the mound to create fill for working space. Over the next 75 years the areas between individual mounds were filled in, and raised, eventually creating a single working space. Archaeologists identified elements of four distinct slipways along the dyke spaced at intervals of 40 meters. Each of the slipways reflects identical construction principles (Gawronski 2003a:132).

The slipways were dated through dendrochronological samples collected from the slipway floors. The slipway floors were constructed from recycled ship elements. The timbers ranged between the late fifteenth and early seventeenth centuries. A total of seventy-one tree-ring samples were collected from the four slipways. Thirty-four of these were collected from slipway B (Gawronski 2003a:137). "Half the dates were felling dates (within a margin) and the remaining half were [terminus] post quem dating of the timber cutting" Gawronski 2003:137). These dates were relative, and were generally older than the periods of slipway construction. The most intensive analysis focused on slipway B, the most complete of the slipways that were investigated (Gawronski 2003a:136). Slipway B possessed a plank floor 8 meters wide and 18 meters long, but was originally 30 ms in length (Gawronski 2003a:136). The slope of the slipways was measured to approximately 10 degrees but increased to 23 degrees over the last 5 m of length of the slipway (Gawronski 2003a:136). The slipways were constructed of three distinct strata. Each stratum consisted of a layer of timber framing used to support a layer of planking, and then a thin layer of sand or clay. This sequence was repeated three times, approximately every 25 years. The frequent reconstruction of the slipways was a result of unstable subsoil that lacked the strength to support both a slipway and a heavy ship under construction (Gawronski 2003a:137). While the number and approximate sizes of the Hogendijk shipyard slipways were similar to those at Oostenburg, the quality of the construction and the financial cost of the construction investment in launching infrastructure were considerably less planned, and less expensive than at Oostenburg.
The methods used to construct the Hogendijk shipyard slipways suggest a more haphazard, shorter term, or economically restricted approach than those that were used at Oostenburg. As a result, the owners of the Hogendijk shipyard were forced to rebuild the slipways approximately every 25 years (Gawronski 2003a:137). While the number and approximate size of the Hogendijk shipyard slipways are similar to Oostenburg, the amount of investment that was made in infrastructure used to build and launch vessels at this site was considerably less well planned and less well executed than at Oostenburg.

In the United States several recent works have begun moving towards synthesizing the variable nature of shipyard archaeology by developing models and typologies of their development. Scott Emory (2000:36) was the first to develop a hierarchy of late nineteenth century shipyard sites. Based on his research of the Vinyard Shipbuilding Company in Milford Delaware, he proposed ranking these sites using shipyard size and the types of ships produced as the basis of a system of classification (Emory 2000:36). He suggests that the highest level of classification should be attributed to facilities that built the largest warships for the military (Emory 2000:36). This typology emphasizes the resources that were available to the military in a state level society. Emory’s focus on late nineteenth through twentieth-century shipbuilding also complicates the employment of a single typology for both wooden shipbuilding sites and later metal hulled vessels. By approximately 1888 the layout, organization and entrepreneurial direction of shipyards had shifted from earlier models of ship production. These changes embraced large-scale production, corporate ownership, external financial control, and a close association with iron foundries (Emory 2000:36).

One of the most useful synthetic studies of shipyards used Geographic Information Systems (GIS) based models to examine the locations of Chesapeake Bay shipyards (Ford 2001). Ford (2001, 2006) predicted the location of shipyards by using secondary historical sources to create a database to identify shipyard site locations. Ford’s analysis identified potential environmental and cultural variables that were associated with shipyard sites and modeled their locations. The model was based on “proximity of the yard to historic cities, the degree of shelter that the yard’s location offered, the width of the channel at the yard site, whether or not the shipyard overlaid soils suitable for either construction, growing tobacco, and the natural growth of white oak (*Quercus alba*), and for those yards that did not contain white oak promoting soils.
within their boundaries the proximity of the shipyard to white oak soils” as the major determinants of site location (Ford 2001:10).

Recently, a report describing the 1987 investigation of the Hertz Lot in Philadelphia, Pennsylvania was published (Weber 2006). This excavation consisted of a large salvage investigation of portions of a wharf and a shipyard believed to be part of a late eighteenth century urban shipyard. Unlike most other shipyard excavations in the United States this investigation focused on an urban shipyard. The most prominent feature identified during the Hertz Lot investigations was an 83-ft section of a wood timber slipway.

The slipway consisted of multiple timbers that were fastened end-to-end with common scarf joins and wrought iron spikes (Weber 2006:18). The slipway sloped toward the water at an inclined slope of 0.064 ft of fall per ft, or approximately one ft every 15.6 ft. This slope was not constant along the length of the slipway, however. Closer to the river the incline became shallower, to one ft every 25.6 ft In addition to these major slipway timbers, several support timbers (sleepers) were located on either side of the slipway every 6.25 to 6.38 ft apart. Also present were a series of ten vertical timbers that were attached with iron spikes at irregular intervals against an earlier eighteenth-century wharf (Weber 2006).

The tracks or running ways sat between 2.4 and 3.2 feet apart. They were attached to the bottom of the footways (Figure 52) and supported by transverse timbers, ranging up to three feet in diameter (Figure 53). Three support timbers were uncovered by the excavation. The rounded timbers composing the ways formed a base for some type of carriage or cradle, which supported a vessel while it came out of, or slid into the river…..Reuse of the running ways were evident in the unevenness in the grooved track and repair in one area (Weber 2006:19).

These sources represent some of the best examples of the diverse types of literature available for research about shipyards and shipbuilding. There are a considerable number of sources, which were not included as part of this literature review, that also contribute to this study. The types of information available in these sources indicate that there has been very little systematic extensive work to archaeologically investigate shipyard sites. Instead, most research has intensively focused on just a few sites. Overwhelmingly these investigations have focused on military, and large-scale commercial shipbuilding facilities. Although these large-scale sites represented more complex and better documented sites, their shipbuilding output represented a small fraction of the overall number of shipyards in the eighteenth and nineteenth century. These investigations
often focused on limited areas of the shipyard with very few including detailed study of the slipways. Finally, most of these intensive excavations have documented European rather than American shipyards.

The limited breadth and depth of the information available about physical nature of shipyards in the Americas topic largely dictated the nature of this investigation. This study seeks to fill many of these information gaps within the “gray literature.” Consequently, this study was initially designed as an archaeological survey to first identify the wide range of site variability present within a single region. Supplemental investigations were designed to focus more intensive studies on the nature of shipyard slipways and the launching areas. Finally, the region selected for investigation was specifically chosen to overcome biases and difficulties that shaped earlier studies. This focus on a rural region enhanced the possibility of identifying shipyard sites that were not destroyed or heavily modified by subsequent industrial and residential development. As a result, this investigation specifically focused on a rural area located on Maryland’s Lower Eastern Shore. The next chapter describes the physical and cultural setting of the selected study area.
CHAPTER 3: PHYSICAL AND CULTURAL SETTING

Introduction

The Chesapeake Bay is one of the largest distinct physical and cultural areas within the Mid-Atlantic region. The physical character of the region shaped the historical patterns of development until the modern period. The Chesapeake’s tributaries drain a large part of the Coastal Plain and provided direct links from the agricultural hinterlands to Caribbean and European markets. Initially, these links focused on the export of tobacco, and later, corn and wheat. Prior to the development of American manufacturing, trading vessels brought European manufactured goods directly to plantations located along the waterfront. Scattered among the coves and rivers were many ideal natural anchorages. These anchorages sheltered the vessels from storms and provided access to the tobacco plantations throughout the Tidewater.

Geography

The Chesapeake Bay is the largest estuary in the United States and is located in Delaware, Maryland and Virginia. The Chesapeake Bay was formed at the end of the last Ice Age as result of the inundation of the Susquehanna River valley by rising sea levels. The Chesapeake Bay covers an area over 2,500 miles\(^2\) and with over 8,100 miles (13,033 km) of shoreline (Lipson 1973; Winegar 2000). The average depth of the Chesapeake is approximately 22 ft while its deepest point is approximately 174 ft (Winegar 2000). The Chesapeake Bay is composed of over fifty navigable river systems and dozens of small rivers, creeks, inlets.
Figure 3-1. Satellite image of the Chesapeake Bay and project area (Adapted from NASA 2010).
Figure 3-2. Map showing Maryland Archaeological Research Units (MARU) (Adapted from Shaffer and Cole 1994).
In addition to providing access to commerce, trade, and communication, the geography of the Chesapeake region possessed a variety of natural resources that early colonists believed were useful in shipbuilding (Middleton 1981:101; Middleton 1984:243). Early shipwrights identified several native species of timber which they quickly adopted for shipbuilding. Other raw materials used in wooden shipbuilding such as tar and turpentine were also easily manufactured in the Chesapeake. Many of the items needed required relatively little infrastructure or specialized knowledge to transform them into usable forms. Despite this favorable geography and the wide availability of natural resources in the region, the Chesapeake Bay did not immediately become a shipbuilding center. Instead, major shipbuilding languished for over a century until the 1730s.

Although, many of the raw materials for constructing seafaring vessels were abundant in the Chesapeake Bay, shipbuilding in the region faced several major obstacles. These obstacles included the high expense of labor, a lack of investment capital, and a lack of manufacturing and transportation infrastructure that prevented the widespread manufacture of ship chandlery
The physical geography of the Chesapeake Bay was in many ways suited to shipbuilding and the development of a maritime-oriented economy. The Chesapeake Bay and its tributaries served as a gateway of commerce between the Old and New World. Despite the favorable geographic and environmental conditions in the region, historical evidence from the late seventeenth and early eighteenth centuries indicates that an indigenous shipbuilding industry was slow to develop. While a few large trans-Atlantic vessels were constructed in the seventeenth century Chesapeake, the increasing quantity of shipbuilding was probably related to the increased production of small vessels. These smaller vessels were adequate for conducting trade within the Chesapeake Bay and with other nearby colonies. Later, Chesapeake shipbuilders began building larger and more sophisticated vessels that were used in the trans-Atlantic trade in tobacco and wheat. Despite these humble beginnings, the Chesapeake Bay shipbuilding industry became the second most important region in North America for ship construction by the beginning of the War of Independence (Middleton 1981:98).

**Geology**

The study area lies within the Atlantic Coastal Plain Physiographic Province. The topography is generally flat with elevations ranging between sea level and approximately 100 m (326 ft). The oldest sediments within the project area are part of the Potomac Formation, which were transported to the region approximately 120 million years ago from the Appalachian Mountains during periods of higher sea levels. They formed as alluvial terraces and deltas. Later strata were formed by marine sediments during periods of marine transgression (Delaware Geological Society 2011). The present geography of the Eastern Shore and the Chesapeake Bay were largely formed during the late Tertiary and Quaternary Periods by changes in sea levels and river channels. During late Pliocene during maximum low sea level stands, the ancestral Potomac, Rappahannock, James, York and Susquehanna rivers drained southeast across the exposed continental shelf into the Atlantic Basin. During later low sea level stands these rivers excavated major channels. During the early Pleistocene older sediments of the Susquehanna River delta migrated seaward and began forming a major barrier spit that continued throughout the Quaternary. During periods of high sea levels during the interglacial periods, what would become the Delmarva Peninsula grew primarily by lengthening southward. During subsequent sea level falls the most northerly river systems (e.g. Susquehanna) were diverted southward.
around the head of the new Delmarva Peninsula (Hobbs 2004). At the end of the Pleistocene the sea level was approximately 100 m lower than current sea level (Newell et al. 2004). As temperatures warmed during the Holocene, glacial outwash from Pennsylvania and New York transported large volumes of sediment. The Delmarva peninsula was covered with wind-blown deposits of sand and loess that formed on low terraces and uplands formed from the glacio-fluvial sediments (Newell et al. 2004). Coastal erosion of the low terraces and bluffs of the Eastern Shore formed extensive shallows covered with sediment. The present geography of the study area is dominated by a north-south trending central ridge lying between the Susquehanna and Delaware Rivers (Kroes et al. 2007).

**Cultural History**

Initial settlement of the northern Chesapeake Bay region was inspired by the fur trade. In 1631, William Claiborne of Virginia and his financial backers set up a lucrative trading post on Kent Island, Maryland to trade for furs with the Susquehannocks (Fausz 1988). Three years later, in 1634, Lord Baltimore established a catholic colony at St. Mary’s City in southern Maryland. Today, the Eastern Shore includes portions of Delaware, Maryland, and Virginia and is often called the Delmarva (Del-Mar-Va) peninsula.

At the time of European contact, the lands surrounding the Chesapeake Bay were crossed by numerous rivers, streams, and marshes. These factors inhibited the development of a reliable road network. As a result of this geography the earliest settlers in the Chesapeake region used the water as highways for water-based transportation and communication. The basic pattern of road development "ran up each side of the Bay, cutting across from the head waters or the ferry of one river to the head waters or ferry of the next, with branch roads running off into each of the many necks of land between the more important streams...The multiplicity of creeks and rivers made necessary a vast number of roads, often short and unimportant and always crooked" (Gould 1915:124). For this reason, early Chesapeake settlements were most often located near navigable bodies of water and near some of the richest agricultural lands (Walsh 1988:200). These factors contributed to an initial settlement pattern in which the colonists and settlers were located close to the Chesapeake Bay, or first and second order tributaries.

The single most important agricultural crop produced in the Chesapeake Bay during the Colonial period was tobacco. Tobacco was first cultivated in Virginia in 1612, and within a few years of its introduction became the principal cash crop for the tidewater region until the end of
the century. In spite of many fluctuations in the price, quality, and marketability of tobacco, the estimated income from Chesapeake tobacco rose from about £4,000 Sterling in 1620 to over £100,000 Sterling by about 1700 (Menard 1977). By the 1670s, the increasing cost of land and labor drove up the cost of tobacco production and helped create a depression in the tobacco industry in the 1680s. This depression seriously damaged the reliability of tobacco as a stable source of income. The depression, lasting until 1710, was instrumental in stimulating a more diversified economy that was not wholly dependent upon a single cash crop. The planters began replacing tobacco with wheat in order to mitigate the effects of low tobacco prices, and exploit the growing market for grains in the West Indies (McCusker and Menard 1985).

The diversification of agricultural products stimulated the growth of local craft industries and produced a growth in self-sufficiency on plantations (McCusker and Menard 1985). Unlike the labor intensive tobacco crops, wheat production did not require a large year-round pool of labor. In addition, the introduction of large-scale wheat farming stimulated the production of plows and carts, creating employment for blacksmiths and woodworkers (Carr 1988). The growth of local craft industries enabled planters to procure more of their goods from local sources, further stimulating the growth of local craft industries. The shift from tobacco to wheat greatly reduced the labor required by individual planters.

The dominance of tobacco agriculture during the first half-century of settlement in the region created a tobacco cash-crop bubble, which hindered the development of all other economic interests in the Chesapeake Bay. Tobacco agriculture required a large investment in labor. Consequently a constricted pool of labor was available for the development of shipbuilding in the region. Beginning in the 1690s large numbers of enslaved Africans were introduced to tobacco farming to expand the constricted labor supply. Compared to other economic activities pursued by the early colonists, such as tobacco agriculture, shipbuilding in the Chesapeake Bay was a source of secondary economic activity.

Despite its limited economic role, shipbuilding and other maritime trades slowly developed into a small, but important, sector of the regional economy. It is difficult to assess the precise impact of maritime industries on the economy of the region. The economic importance of the Chesapeake Bay clearly shaped the cultural landscape of the region, and continues to influence its appearance today. The development of the local Chesapeake shipbuilding industry and marine trades helped support the growth and development of the import/export trade with
Europe. These trades began with the construction of small watercraft that transported bulk commodities such as tobacco, wheat, corn, and timber from inland to coastal landings and in repairing large trans-Atlantic vessels. Shipwrights helped to build and maintain the infrastructure that facilitated trade with Europe. Later, Chesapeake shipwrights began participating directly in this Atlantic World system by building larger trans-Atlantic vessels.

**Somerset County**

The area known as Somerset County was founded by European settlers in 1666. Somerset County originally encompassed an area of approximately 1,200 miles$^2$ between the Nanticoke River in the north, the border of Virginia on the south, the Atlantic Ocean to the east, and the Chesapeake Bay to the west (Russo 1999:7). This area included some disputed lands and territories that were later incorporated into Delaware and Virginia. The Lower Eastern Shore region is drained by three major river systems (the Nanticoke, Wicomico, and the Pocomoke) and numerous smaller rivers and creeks (Barren Creek, Rewastico Creek, Wetipquin Creek, Manokin River, and Monie River) that generally flow southwest into the Chesapeake Bay (Figure 3-5). The eastern side of the Bay was actually a series of shallow sounds such as Tangier and Pocomoke Sounds (Russo 1999:7).
The majority of the study area is located in rural areas with rapidly expanding residential developments adjacent to the water. Land use throughout the three counties of the study area is dominated by agricultural properties and commercially harvested woodlands. Today, the commercial woodlands largely consist of planted loblolly pine. However, the historic woodlands or the region consisted of temperate deciduous forests with mixed hardwoods and pines. The most dominant aspect of the study area was the expanses of large areas of marshes that were present along the waterways of the study area. These consisted of Estuarine River Marshes, Fresh Estuarine Bay Marshes, Brackish Bay Marshes, Salt Estuarine Bay Marshes, and Coastal Embayed Marshes (Lippson 1973). These marshes and wetlands comprise approximately 16 percent of Wicomico, 38 percent of Somerset and 19 percent of the area of Worcester counties.
Figure 3-5. GIS map showing the major waterways of old Somerset County.
Figure 3-6. Portion of navigation chart showing water depths of major waterways in the study area (Adapted from NOAA 2010).
The documentary research for this study focused on the area within the boundaries of present day Somerset, Wicomico, and Worcester counties, Maryland. Portions of the original boundary of Somerset County, which are now located within Sussex County, Delaware and Accomack County, Virginia were not included within the study area. Later, Somerset was divided into two additional counties; Wicomico and Worcester. Additional areas of Somerset County were found to be located in Delaware after the survey of the Transpeninsular Line in 1751 and later the Mason and Dixon line between Maryland and Pennsylvania.

The term “old Somerset County” is used to refer to the original boundaries of the county prior to its division. The initial area encompassing old Somerset County was divided into two additional counties. In 1742, the southeastern portion was divided to become Worcester County. Today, Worcester County encompasses an area of approximately 473 mi$^2$ of land (U.S. Census Bureau 2000). In 1867, the northernmost portion of the county was partitioned into a new county named Wicomico County. Today, Wicomico County encompasses approximately 377 mi$^2$ of land (U.S. Census Bureau 2000). The remaining portion of Somerset County is located in the southwest corner of the original area of Somerset County. Today, Somerset County encompasses approximately 327 mi$^2$ of land (U.S. Census Bureau 2000).

The three counties of the study area are very low and possess large areas covered by tidal marsh. The area of Wicomico County has much higher elevation than the others within the study area; approximately 98 ft above mean sea level (AMSL). The areas of both Worcester and Somerset Counties are considerably lower and the highest elevations within these counties are located at 49 ft AMSL and 36 ft AMSL, respectively. The different elevations produced distinctly different economic focuses during the Colonial Period. The higher elevations in Wicomico County, and correspondingly greater hydraulic fall, resulted in the establishment of a substantially larger number of mill seats along the tributaries of the Nanticoke River. Within the boundaries of present day Somerset County, approximately 26 percent of the land is classified as tidal marsh, with an additional 30 percent classified as Othello silt loam, which is a poorly drained soil that is generally unsuited to tobacco agriculture (Carr 1988:344). Carr (1988:345) estimates that only 33 percent of the soils in the study area contained soils that were suitable for tobacco.

During the Colonial and Early Republic periods there were relatively few major population centers located within the study area. The majority of the initial settlers took up lands
located along the navigable waterways of the region. Later settlers were forced to take up lands in more interior locations. Most of the earliest towns located in Somerset County were created by a series’ of legislation from the Provincial Assembly. The majority of these legislatively mandated towns were poorly sited for the purposes of trade, and although several of these towns were surveyed, few lots were ever purchased by the local inhabitants. As a result, few of these Lower Eastern Shore towns survived more than a decade or two. Among the most important Colonial towns in the region were Snow Hill, Princess Anne, and Salisbury (Thomas 1994). Later, during the nineteenth century, non-legislatively created towns formed at Pocomoke City, Whitehaven, Sharptown, and Crisfield.

Figure 3-7. Old Somerset County, study area.
Figure 3-8. Urban centers and transportation network within Old Somerset County.
CHAPTER 4: CHESAPEAKE BAY SHIPBUILDING

Most early Chesapeake shipbuilders left little direct documentary evidence of their industry, and as a result, there are few historical records of early Chesapeake shipbuilders. Most records relating to shipbuilding during the seventeenth and early eighteenth centuries were indirect references to the names of vessels that were constructed and also occasionally provided the names of their builders. Additional details about shipbuilding can be indirectly derived from surviving probate inventories, wills, and other estate documents that list accounts of tools, buildings, and sometimes workers and debts of the decedent. These are among some of the only written documents providing information about the activities and businesses of early Chesapeake shipwrights. Documentary evidence suggests that many of these early shipbuilders were not primarily employed as full-time craft specialists. Instead, land records and court documents frequently list the occupations of individuals who that were known shipbuilders with occupations other than those trades that were related to shipbuilding. Like many individuals within in the Chesapeake, they were often listed as planters. Shipwrights from later periods also often possessed multiple occupations; many were often described as merchants.

An inventory of a seventeenth century Maryland shipbuilder named Thomas Todd indicated that his estate was far more diversified than might be expected from a typical craft specialist. Todd’s estate contained substantial livestock as well as the craft tools that were necessary to pursue a woodworking craft such as shipbuilding (MSA, Inventories & Accounts, Liber 4, folio 149-151). This was not unusual for many of the residents of this period. In a study of Anne Arundel County’s population between 1655 and 1775, historian Jean Russo (1983:12-13) found that approximately 90 percent of the County’s population were planters and that approximately 34 percent of these planters also practiced at least one additional occupation. Of the remaining population, only 10 percent were full-time craft specialists, and only a very small minority of these pursued crafts and trades associated with supporting maritime industries.

One likely reason for this lack of full-time maritime craftsmen was the nature of the Chesapeake Bay economy. Tobacco agriculture dominated the seventeenth and eighteenth-century economy of the region. Most early colonists settled on areas of good soils, near navigable waterways, a pattern which persisted into the eighteenth century. This dispersed pattern of plantation settlement stunted the growth of towns and centralized commercial markets.
throughout the tidewater. A decentralized market system encouraged English and Dutch merchants to trade directly with individual planters. This practice initially resulted in the development of a merchant fleet in which English and Dutch vessels carried manufactured goods to the Chesapeake and returned home with cargoes of tobacco. In this simplified core-periphery economic system, the European merchants utilized European-built cargo hulls to carry their merchandise across the Atlantic Ocean. This arrangement began to change after the 1660s and the second Anglo-Dutch War with the increasing enforcement of the Navigation Acts. The enforcement of these acts resulted in English and Scottish merchants’ control over the trans-Atlantic tobacco trade.

**Seventeenth Century**

On the Chesapeake Bay, shipbuilding began in the early seventeenth century on the Lower Eastern Shore of the Delmarva Peninsula. The earliest records of Chesapeake boatbuilding and shipbuilding indicate that in 1625, Captain John Wilcocks built a shallop for William Clairbourne at Kecoughtan located near present day Hampton, Virginia (Aimes 1940:140). A shallop is a term usually referring to a small open (un-decked), work boat popular in the seventeenth century. They were equipped with two masts and also propelled by oarsmen. John Smith’s shallop was approximately 30 ft long and drew less than two ft of water (Smith’s Voyages 2011). By the 1630s, many small vessels were constructed on Virginia’s Eastern Shore (Aimes 1940:140-143). As early as the 1630s and 1640s, approximately a half dozen shipwrights were known to have built boats and small sailing vessels on the Eastern Shore of Virginia. The records describe most of these vessels as shallops and pinnaces (see Appendix I) (Goldenberg 1969:55). By the 1660s, local shipwrights had begun building small sloops. In 1697, Virginia’s Governor Andros ordered a survey of Virginia shipbuilding. At that time only eight ships, 11 brigantines, and 15 sloops were recently constructed in Virginia (Aimes 1940:145). Furthermore, Andros also reported that most of the supplies for their construction such as rope, sails, and metalwork necessary for outfitting vessels had to be imported from England.

The first known Maryland shipyard constructed vessels on Kent Island for William Claiborne. Here, shipwright William Paine constructed pinnaces and shallops as early as 1631 (Brewington 1954:10; Tilp 1982:78). Beyond these few early citations there is little direct evidence about the types of vessels that early Chesapeake shipwrights constructed. Instead, the earliest documentary evidence of shipbuilding during this period is indirect evidence describing
the occupations of individuals who were described as shipwrights within court records. Land and Probate documents from the early Colonial period often referred to shipwrights, boatwrights, ship carpenters, and ship joiners but rarely described the locations where these individuals practiced their professions.

During most of the seventeenth century, neither Maryland nor Virginia constructed many merchant vessels for the trans-Atlantic trade. Both colonies faced similar difficulties in fostering the development of an indigenous shipbuilding industry. In 1662, Virginia passed a law that exempted vessels owned by Virginians from paying any export duties, which was followed in 1669 by an act that exempted them from castle duties (Aimes 1940:141). In 1662, Virginia passed an act to subsidize the colony’s shipbuilding industry by offering 50 pounds of tobacco per ton of newly constructed vessels that exceeded 20 tons but were below 50 tons in burden (Goldenberg 1968:57). This subsidy increased to 100 pounds of tobacco for vessels between 50 and 100 tons; if above 100 tons, then the subsidy increased to 200 pounds of tobacco per ton (Aimes 1940:142). This law was clearly an attempt to stimulate the construction of larger rather than smaller vessels. These ad hoc attempts to subsidize the creation of a local shipbuilding industry in the southern Chesapeake Bay had only limited success, since only one individual was recorded as having been awarded this subsidy.

Maryland’s General Assembly also attempted to encourage shipbuilding within the colony. In September 1694, the General Assembly passed an act to encourage the shipbuilding industry.

For the encouragement of all such persons as have built any shipps or vessels since the Assembly held at St. Mary’s the 21st of September 1694 within this province, as also for all such persons as shall from hence forward build any ships or vessels within the province afd. Shall be free and clear from paying any duty impost or custome for any liquors imported into this province liquors from Pensilvania East & West Jersey only excepted (Archives of Maryland, Vol. 19, page 248).

The effect of this legislation is unclear. Prior to its passage Maryland officials reported that shipbuilding was insubstantial in the Colony. In 1678, Governor Charles Calvert reported that no large vessels and few small vessels were built in Maryland (Brewington 1956:231). Despite this statement about the quantity of shipbuilding in the region, the number of archival references to shipbuilders continued to increase throughout the seventeenth and eighteenth centuries. In Anne Arundel County, Maryland the increased number of shipbuilders was reflected by an
increasing number of references to shipwrights within public records of the period (Figure 4-1). This increase in the number of references was the result of better record keeping; but also represents a clear indication of increased shipbuilding throughout the Chesapeake Bay during this period. The Anne Arundel County records are unique because they are fully indexed by occupation (Figure 4-1). A similar examination of Eastern Shore records does not yield the same results.

Figure 4-1. References to Anne Arundel County shipwrights identified in public records, by year (Including Apprentices, Indentured Servants, Slaves and Shipyard Owners).

Less than 20 years after Governor Charles Calvert reported on the lack of shipbuilding in Maryland, and five years after the passage of the act to encourage shipbuilding, a census of vessels constructed in Maryland indicated a changing industry. In 1697, the county sheriffs of Maryland were ordered to conduct a survey of the number and types of vessels that were constructed in Maryland since 1689 (Archives of MD online Vol.25, page 595). Together they
reported 13 ships, six pinks, 12 brigantines, 70 sloops, 51 shallops, and nine vessels of unknown design were owned and built in Maryland (Middleton 1984:250-251) (Table 4-1). This survey also indicated the importance of Somerset County shipbuilders to the shipbuilding output of Maryland during this brief period. Approximately 16 percent of Maryland’s shipbuilding output recorded in this survey was built in Somerset County.

Table 4-1. Summary of ships built in Maryland between 1689 and 1697.

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</tbody>
</table>

In Worcester County, Maryland shipbuilding was focused along the banks of the Pocomoke River. The largest concentrations of seventeenth-century shipbuilding were focused in Snow Hill. Construction of large seagoing vessels along the Pocomoke began by at least the 1690s and probably much earlier. A 1692 contract between shipwright Ralph Milbourne and Andreas Dickinson, William Swetam, Peter Lewis and Peter Rayman stipulated that Milbourne was to complete a vessel that was then on the stocks in the town of Snow Hill for 15 Shillings per ton (Somerset Judicial Records 1692, folio 218 [MSA C 1774-10, Loc. 1/48/2/36]). Other than this single case there are few other documents that provide such specific information about shipbuilding in the rest of Somerset County during the seventeenth century.

**Eighteenth Century**

By the second quarter of the eighteenth century, direct and indirect documentary records indicate an increase in non-agricultural production throughout the Chesapeake Bay and especially on the Eastern Shore. The number of mills in Somerset County increased from a small handful with the addition of more than a dozen new mills after the 1720s (Russo 1999). At least several of these mills were saw mills and several others were probably combined saw and grist mills. The
majority of these were located in Worcester County which divided from Somerset in 1742. Despite the mill concentration in Worcester counties, Somerset County possessed at least ten mills after the split (Russo 1999). Other businesses also began to increase during this period. Beginning in the 1720s there were approximately 13 active blacksmiths in the county but, by the 1750s there were approximately 30 individuals involved with this business (Russo 1999:75).

It is during this period that the shipbuilding industry rapidly expanded in the Chesapeake Bay region. One of the largest and most important sectors of the British export trade from the Americas was the tobacco trade. By 1740, the Chesapeake trade employed 280 English vessels, more British shipping than any other colony. Altogether, British and colonial built vessels represented an investment of approximately £371,000 Sterling and employed an estimated 3,780 sailors in 1743 (Middleton 1953:268). By the end of the colonial period the tobacco merchant fleet had increased to approximately 330 British vessels, totaling between 30,000 and 35,000 tons. The fleet represented an investment estimated at £400,000 sterlign and employed 3,960 mariners on the routes between the Chesapeake Bay and Great Britain (Middleton 1953:268). As the size of the British merchant fleet increased in the eighteenth century, a greater proportion of the vessels were constructed in Britain’s colonies. By the eve of the American War of Independence an estimated 1/3 of British merchant hulls had been constructed in the American Colonies (Goldberg 1976). The number of vessels built in the Chesapeake Bay continued to rise throughout the eighteenth century (Figure 4-2).
By the end of the Colonial period the Chesapeake Bay was second only to New England as the largest center of shipbuilding in the American colonies (Middleton 1953:264). Shipbuilding was conducted throughout the Bay; however, shipbuilding activities tended to cluster geographically. Between 1730 and 1750, approximately 53 percent of shipbuilding was located on Maryland’s Eastern Shore and additional 11 percent was constructed in Cecil County, which straddles both the Eastern and Western shores (Figure 4-3). Shipbuilding on the Western Shore during this period was mainly confined to Anne Arundel and Baltimore counties with limited shipbuilding in Prince Georges County (Figure 4-3). With the exception of Anne Arundel and Baltimore Counties most of the Western Shore counties possessed limited or no recorded shipbuilding. Prince Georges, St. Mary’s, Charles, Calvert, and Anne Arundel counties were strongly associated with the monocrop tobacco agriculture of the region. Anne Arundel County was unique due to the proximity of the capital at Annapolis beginning in the late seventeenth century. Anne Arundel County shipbuilding represents a unique anomaly.
The area with largest quantity of new vessel construction was the Lower Eastern Shore consisting of Somerset and Worcester counties. Between 1725 and 1750, 95 sea-faring vessels were built in Somerset and Worcester Counties (Commission Book 82). This figure considerably exceeded the 46 that were built in the next largest production center of Anne Arundel County, Maryland. Comparisons between shipbuilding in Anne Arundel County and Somerset are interesting because of the similarities and differences between the two areas. Anne Arundel and Somerset Counties were founded at approximately the same time (1649 and 1660 respectively) with some similarities in geographical circumstances. Both counties bordered the Chesapeake Bay and both had extensive tributaries and river systems. Despite these similarities there were also considerable cultural and geographic differences between the two areas. Somerset County is located on the Lower Coastal Plain and was considerably lower and less well drained than Anne Arundel County. Lois Carr (1988) estimates that only approximately 33–38 percent of the soils in Somerset County were suitable for growing tobacco; and most of that was low in quality. As a result of the inability of local residents to participate in the monocrop economic system employed by most of the region, Somerset County diversified into other export commodities. Somerset County exports included timber products such as staves for tobacco.
hogsheads, Madeira pipes, and barrel staves and shingles. Russo (1999) also documents extensive export of livestock (mainly pork) between Somerset County and the West Indies.

Between 1730 and 1750 Lower Eastern Shore shipbuilders focused on the construction of smaller vessels. Somerset and Worcester shipwrights predominately built sloops (55 in all) ranging between 6–80 tons, and averaging approximately 41 tons burden. Sloops represented almost half the total tonnage of vessels constructed in this 20-year period. Sloops were single-masted fore-and-aft rigged sailing vessels introduced in the seventeenth century. They were used to carry a variety of general cargo in the coastwise and Caribbean trade. In the early eighteenth century the design of a new vessel called a schooner was introduced to the region. The schooner was a two-masted fore-and-aft rigged sailing vessel that was more manageable for a smaller crew (Gilbert 1984:315). With fewer crew members they were less expensive to operate and consequently began replacing the sloop as the trading vessel of choice in the Chesapeake Bay.

![Figure 4-4. Sloop and Schooner construction in Somerset and Worcester Counties 1730–1750 (in tons burden).](image)

By the period after the War of Independence, Somerset County shipwrights constructed very few sloops. Between 1782 and 1874 only 10 sloops were recorded as having been built and registered in Maryland (Earle n.d.; Brewington 1957). Since many of these sloops were less than the 20-ton burden size and were not required to be registered—it is likely that many others were never registered. Like other shipwrights in the Chesapeake region, Somerset and Worcester
County shipwrights began constructing large numbers of schooners. Between 1730 and 1750 Somerset County shipwrights built 21 schooners—averaging approximately 70 tons burden. Although the shipbuilders of Somerset and Worcester Counties continued to excel in the construction of schooners they also built some larger vessels. Other small vessels built during this period included 10 brigantines and one shallop. A brigantine is a two-masted vessel with the foremast square rigged while the mainmast was fore-and-aft rigged. Between 1730 and 1750, Somerset and Worcester county brigantines ranged in size between 40 and 80 tons burden and averaged approximately 56 tons burden (Commission Book 82). Finally, they also constructed several large vessels including six ships and one snow. A ship is a three-masted square rigged vessel and a snow was two-masted square rigged vessels. Both types were regularly used in the trans-Atlantic trade.

![Figure 4-5. Comparison of ship production regions by tons burden (Commission Book 82).](image)

Documentary references to shipyards became more pronounced by the mid eighteenth century. One 1740s court deposition reconstructing the boundaries of Glanville’s Lott described a property marker that was located “about one hundred and fifty four yards from and below a
place usually made use of [by] Capt. Jno. Tunstall to build vessels at” (Russo 1999:73). Another Somerset County shipyard was operated on the Wicomico River by Day Scott under the direction of shipwright Hance Brustrum. In 1752, Somerset merchant Thomas Sloss contracted Brustrum to construct a vessel at Day Scott’s shipyard. The contracted vessel was to be 56 ft in length (keel) by 23 ft in beam with a 10 ½ ft in the hold for 40 shillings current money for every ton burden (Russo 1999:74). Numerous other court cases describing the work conducted by skilled ship carpenters for merchants in the area offers a hint of the type of work that was conducted and its widespread nature.

Figure 4-6. Value of vessels recorded in Anne Arundel and Somerset County probate inventories. (Vessels recorded in estate inventories were valued in Maryland Currency £ and deflated to comparable values based on conversions provided by P.G.M. Harris).

Probated estate data collected by the St. Mary’s Historical Commission for the period between 1666 and 1777 indicate that 18 percent (n=376) of estate inventories recorded in Somerset and Worcester County contained small boats that were typically not registered (these included canoes, flats, periaugers, sloops, shallops, or other boats with sails) (St. Mary’s Historical Commission Files).

Only a very small percentage of County residents were recorded as owning interests in larger vessels at the time of their deaths (n=20). These 20 shares were valued at £848.50. The
total value of boats and ships recorded in Somerset County and Worcester county inventories during this period was £4,454.02 (in deflated Maryland currency).

![Bar chart comparing vessels recorded in Anne Arundel and Somerset County inventories.](image)  

**Figure 4.7.** Graph comparing vessels recorded in Anne Arundel and Somerset County inventories (St. Mary’s Historical Commission).

Similarly, the total value of tobacco found in Somerset County inventories during this same period was approximately £5,915.31 (deflated Maryland currency value). These values indicate the relative importance of boats to the residents of Somerset County compared to the value of tobacco, one of their principal export crops.

An analysis of the aggregate value of boats and ships that were owned by Somerset and Anne Arundel County residents indicates large fluctuations in their valuations throughout the Colonial period. These fluctuations in boat valuation persisted even after smoothing the variability. The only trend detected during this analysis was a correlation between both counties in the value of boats recorded in the inventories through time. The number of boats and their valuations increased and decreased at roughly the same time. In periods in which greater numbers of inventories were recorded, boat valuations tended to rise and in periods in which
fewer inventories were recorded boat values declined. This pattern suggests that the valuation of boats in inventories was more directly associated with the pattern of mortality or the rate of inventory reporting for each county. Colony-wide epidemics and/or increased inventory reporting rates might have caused these demographic trends.

Other data suggest that shipwrights began to build increasingly larger vessels during the eighteenth century. Various documents and newspaper advertisements present a snapshot of increasing shipbuilding activities and sophistication. Seven newspaper advertisements from the mid-eighteenth century describe vessels under construction on the stocks indicating the increasing size of Somerset County built vessels. These advertisements further illustrate that many of the shipyards described by these articles were located along rural creeks and plantations rather than within the nucleated settlements on the Lower Eastern Shore. Only one advertisement during this period describes a vessel under construction in a town setting. This may reflect the lack of need for urban shipwrights to advertise their activities because they were located in areas directly associated with wealthy merchants and planters residing in towns. These urban locations probably provided shipbuilders with closer access to their markets and the capital necessary to invest in large expensive projects such as ships.

To be sold by Joshua Edmondson living in Vienna, The hull of a vessel now on the stocks and neatly finished, of about 85 tons built of exceeding good well seasoned white oak timber, and very much after the Bermudas Mould (Maryland Gazette, September 3, 1761).

This 1761 advertisement specifically mentions a particular designed vessel known as a Bermuda Mould vessel. Bermudas Mould refers to a design characteristic of a narrow hull and sharp lines that were designed for speed and maneuverability rather than for cargo capacity. Such vessels may have been built first in Bermuda and began entering the Chesapeake Bay region during the 1740s to become widely used in the West India trade (Middleton 1984:241). Such vessels may have inspired the sharp hull lines of the early nineteenth century design of the “Baltimore Clipper.” This indicates that the shipwright was sufficiently familiar with the design of Bermuda Mould vessels that he could build similar vessels. This advertisement suggests the diffusion of shipbuilding technology (e.g., designs) between various ports during this period. Other advertisements describe the general locations of particular shipyards and the types of vessels under construction.
Somerset County, July 5, 1766, to be sold or chartered, A Snow burthen 184 tons, now on the stocks, will be launched and completely fitted in 5 weeks from the date hereof. Any person inclined to purchase, or charter, may view the vessel, and know the terms of sale, or charter, by applying to Henry Lowes and Company (Maryland Gazette, July 10, 1766).

Each of these advertisements indicates that these vessels were not constructed to the specifications of an individual merchant; rather they were built on speculation. An alternative to this interpretation is that such advertisements reflect the number of shipbuilding contracts that may not have been completed. Such an advertisement could have reflected an attempt to recoup the investments by a shipwright or merchant. Henry Lowes, a Somerset County merchant, operated several merchant vessels during the middle part of the eighteenth century.

To be sold, by the subscriber, on Pocomoke River, in Worcester county, a Brig, now on the stocks, about one hundred and ten tons, all complete, except the inside joiners work. Also a Snow, about one hundred and fifty tons, which will be finished in four months, in the same manner that the Brig is: Both vessels to be furnished with masts and yards….James Houston (Maryland Gazette, September 1, 1768).

The advertisement describing the shipyard on the Pocomoke River suggests that it was larger than typically described in most of the shipbuilding advertisements. It is unlikely that a 150 ton Snow could be constructed on the same stocks that the Brig was constructed within a four month period. Consequently, this advertisement suggests that it was likely that this shipyard was capable of constructing two vessels simultaneously and implies that two slipways were in operation. James Houston was a merchant residing on the Lower Eastern Shore (Green 1989:118).

A fine vessel; now on the stocks, in Somerset County, on Wycomico Creek, and will be launched in six weeks 44 feet keel, 19 beam 7 1/2 in the hold, 3 feet 7 inches between decks compleatly built, new frame all of mulberry and red cedar, except her floor runners and lower futtox. Any person inclinable to purchase the said vessel may know the terms, by applying to the subscriber John Adams, August 21, 1777. (Maryland Gazette and Baltimore General Advertiser August 21, 1777).

Several advertisements indicate the continuation of ship construction after the War of Independence. There were several shipyards located on or around Wicomico Creek, a large
tributary of the Wicomico River and the boundary between Somerset and Wicomico Counties. One shipbuilding site at Chatham was described in two newspaper advertisements in 1778 and 1807. In addition, Chatham may have been the location of the shipyard described in a 1766 advertisement belonging to Henry Lowes and Company (see above).

Somerset, Chatham, August 24, 1778. Now on the stocks, and to be Sold, a vessel of the following dimensions, viz. 57 feet 4 inches extreme length of the keel; 22 feet beam; 8 and a half feet hold; 2 feet waist; 15 feet rake forward; 7 and a half feet rake aft; long quarterdeck; 22 inches dead rising. The above vessel will be completely finished with spars, boat, and joiner's work, and launched in October, or sooner, if weather permits.--Any person inclined to purchase may view the vessel, and know the terms, by applying to Mr. Thomas Brereton, at Baltimore; or to Henry Lowes. N.B. The above vessel is intended for a schooner but the purchaser may have the spars prepared for a brigantine, if he chooses. H.L. (Maryland Journal and Baltimore General Advertiser, Sept 1. 1778).

Was launched on Thursday the 10th instant, from the ship yard of Tubman Lowes, Esq. at Chatham on Wicomico Creek, the ship John Guest, burthen five hundred tons, the largest ship ever built on the eastern shore of Maryland, and is said by judges to be as handsome a ship as was ever built in the state. Somerset county, December 12, 1807 (Eastern Shore General Advertiser, or Republican Star, Easton, MD., 15 December 1807, 3-4).

**Snow Hill**

Snow Hill is one of the few urban centers on the Lower Eastern Shore that developed during the Colonial period (Van Truitt and Les Callette 1977:146). The town is located on the Pocomoke River approximately 30 miles (48.3 km) from the mouth of the river and the Chesapeake Bay. As a result, this port was sometimes difficult to reach by sailing vessels. Despite the difficulties associated with this location, the Pocomoke River near Snow Hill was lined by extensive cypress forests often used for shipbuilding. One of the earliest detailed accounts of shipbuilding in Maryland was a contract for a ship in Snow Hill. In 1692, a shipbuilding contract of Ralph Milbourne described a vessel under construction on the stocks in Snow Hill. Later documents indicate that Snow Hill remained a center for ship production into the nineteenth century. In 1781, Captain Zedekiah Walley built a barge at Snow Hill. The barge named the *Protector* was to be 50-ft long at the keel, carry a 24-pound gun, and carry sixty men (Smith and Earle 1981). Following the War, a number of vessels were registered in Snow Hill.
Snow Hill was an official Port of Entry where newly constructed vessels could be registered on the Lower Eastern Shore. The only Colonial period shipbuilding center on the Pocomoke River was located at the town of Rehoboth. This small town may have constructed small, lighters for use on the river and the Chesapeake (Van Truitt and Les Callette 1977:146). During and after the Civil War, Snow Hill was noted for building at least two “large” vessels. In 1864, Snow Hill shipyards built a 139 ton, 7 ½ ft draft, propeller-driven vessel *Eureka* (Van Truitt and Les Callette 1977:148). In 1877, a Snow Hill shipyard constructed the two-masted schooner *John R. P. Moore*. The *Moore* was 99 tons burden, 86 7/10 ft in length, 27 ft in the beam and 6 ½ ft in draft (Van Truitt and Les Callette 1977:148).

**Salisbury**

Salisbury is the largest city on Maryland’s Eastern Shore located in the center of the Delmarva Peninsula in Wicomico County. Salisbury began as a small settlement near the head of the Wicomico River and was officially declared a port in 1732. The city continued to grow as a freshwater port throughout the eighteenth century. As early as 1779, ships were constructed in Salisbury and at a site on the Wicomico River just below the city. In 1779, the Ship *Marquis La Fayette* and in 1780 the Ship *Intrepid* were built in Salisbury (Pre-Federal Customhouse Records). Records for shipbuilding are sporadic for the remainder of the eighteenth and early nineteenth century. Many records indicate that ships were built on the Wicomico River. These records seldom indicate any other place names associated with the shipyard. Several of these vessels may have been built in or near Salisbury. The next record of a ship built in Salisbury was the 20.4 ton schooner-pungy named the *Arintha Landon* built in 1841 (Earle 1976). By the early twentieth century Salisbury shipyards were primarily building small gasoline powered vessels, although they occasionally produced a larger schooner (USDC 1920). By the mid-nineteenth century any shipbuilding activities in Salisbury were eclipsed as it became a railroad hub for the Eastern Shore.

In 1901 Otis S. Lloyd purchased the Salisbury Marine Railway from A.F. Parsons (Jacob 1981). Lloyd operated the Salisbury Marine Railway with his partner W.W. Smith (MD Bureau of Statistics and Information 1908). Prior to this Lloyd operated a shipyard in Whitehaven. In 1908, the Salisbury Marine Railway employed 20 men and produced a product valued at $40,000 annually. The capital investment for the shipyard was valued at $14,000 and the annual wages were valued at $10,000 (MD Bureau of Statistics and Information 1908). By 1920 three

Wm W. Smith’s shipyard was located at Shad Point just south of town (Aldridge 1920). The facilities at the yard included a single marine railway, which was not described in greater detail.

![Figure 4-8. Location of marine railway on Shad Point (Lake et al. 1877).](image)

The Smith and Williams company shipyard also had a single marine railway that was approximately 150 ft long and a capacity of hauling 100 tons (Aldridge 1920:111). The Smith and Williams Co. was owned by John Smith and Normal L. Williams who also bought the Salisbury Marine Railway in 1916 (Jacob 1981:158). By World War II the shipyard was owned and operated by H. Brittingham Roberts (Jacob 1981). Currently, the site of the former H. Brittingham Roberts yard is the location of the Chesapeake Shipbuilding Co. (Figure 4-8). Chesapeake Shipbuilding Co. is located on north side of the Wicomico River on a tract approximately 13 acres in size. Today, the site consists of two construction basins and three side launch systems (Chesapeake Shipbuilding 2010). Several of the construction basins appear to reuse the slipways that were associated with the Salisbury Shipbuilding and Yacht Co. (Figures 4-9 and 4-10).
Figure 4-9. 1943 Portion of plat of Salisbury Shipbuilding and Yacht (e.g. Roberts Shipyard) (MSA C2331-93-p.1).

Figure 4-10. Aerial photo of Chesapeake Shipbuilding circa 2007 (Chesapeake Shipbuilding Corporation 2007).
Nineteenth Century

In the early nineteenth century and continuing into the mid-nineteenth century, documentary evidence indicates that the trend of decentralized shipbuilding activities continued. Although the number of newspaper references to ships built on plantations generally declined, the carpenter’s certificates that clearly identify the location in which a vessel was built indicate a wide variety of shipbuilding locations. Ships were built at unspecified locations on Monie Creek, Little Annemessex River, Wicomico River, Barron Creek, Quantico Creek, Honga River, East Creek, Wetipquin Creek, and Potato Neck to name a few. Ships were also built at a number of towns including Snow Hill, Green Hill, Salisbury, and Annemessex (later Crisfield). As the nineteenth century continued, fewer indications of shipbuilding at rural yards appear in the records. In 1850 five small shipyards were identified in Somerset County (US Agricultural and Manufacturing Census 1850). Only the location of one shipyard owned by Emory Riggin was located within Somerset County and was located in Brinkley’s 1st District. A second shipyard owned by Benjamin Stephenson was also most likely located in Brinkley’s 1st District (US Census 1850).

Table 4-2. Shipyards identified in Somerset County in 1850 (US Agricultural and Manufacturing Census 1850).

<table>
<thead>
<tr>
<th>Shipyard Owner</th>
<th>Capital Investment</th>
<th>Avg # Hands</th>
<th>Ave. Monthly Labor Cost</th>
<th>Quantity</th>
<th>Product Value</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benjamin Stephenson</td>
<td>$500</td>
<td>3</td>
<td>$30</td>
<td>2</td>
<td>$1,600</td>
<td>Probably Brinkley’s 1st District</td>
</tr>
<tr>
<td>Thomas Dixon</td>
<td>$800</td>
<td>4</td>
<td>$100</td>
<td>2</td>
<td>$1,600</td>
<td>Brinkley’s 1st District</td>
</tr>
<tr>
<td>Thomas E. Ballard</td>
<td>$400</td>
<td>2</td>
<td>$50</td>
<td>1</td>
<td>$800</td>
<td>Brinkley’s 1st District</td>
</tr>
<tr>
<td>Emory Riggin</td>
<td>$2,000</td>
<td>8</td>
<td>$160</td>
<td>4</td>
<td>$4,000</td>
<td>Brinkley’s 1st District</td>
</tr>
<tr>
<td>John Scott</td>
<td>$500</td>
<td>2</td>
<td>$40</td>
<td>1</td>
<td>$1,200</td>
<td>Brinkley’s 1st District</td>
</tr>
</tbody>
</table>

In 1850 a total of four caulkers and 80 ship carpenters were enumerated in Somerset County (US Census 1850). Seventy-six percent of them were located in just two census districts—Barren Creek and Brinkley’s. All four caulkers were located in the Barren Creek district. Curiously, the names of most of the shipyard owners were not enumerated in the general population census. Only Benjamin Stephenson was listed as a resident of Brinkley’s 1st District. In addition to the concentrated numbers of most ship carpenters in Somerset County, their wealth was also was highly concentrated. The household value of Barren Creek ship carpenters totaled $9,100.00
while the value of Brinkley’s ship carpenters was $30,100.00. The average wealth of Brinkley’s ship carpenters was approximately 2 ½ times the wealth of Barren Creek households. The household value of the remaining ship carpenters in the count was between $366.00 and zero. The concentration of shipbuilders in these two areas is probably the result of the presence of shipbuilding centers in Sharptown and Mardela Springs in the Barren Creek District and the town of Annemessex (later Crisfield) in Brinkley’s District. In addition to the shipyards at Crisfield another shipyard operated by William C. Coulbourn was located at the head of Jones Creek (Lake et al. 1877).

Figure 4-11. Location of Somerset ship carpenters and caulkers by census district (US Census 1850).
In the middle of the nineteenth century, larger more permanent shipyards were required to build and repair ever larger more complicated vessels. Between the 1780s and the 1820s schooners were the most commonly built vessel on the Lower Eastern Shore. These schooners were highly variable in size. Some were as small as 11 tons (gross measure) others as large as 292 tons in size. Between 1795 and 1815 Somerset County shipwrights also began building schooners with sharp bows, and V-shaped hulls after a design called the Baltimore Clipper. This short-lived design was ideally suited to privateers and small coastal trading vessels capable of avoiding capture during the Quasi-War with France (1798–1800) and the War of 1812 (1812–1815) with Great Britain. After the conclusion of these conflicts the limited cargo space of these vessels made them a liability in the shipping industry. As a result, shipbuilding returned to more established patterns which maximized capacity rather than speed.

Several vernacular boat designs also developed in the Chesapeake Bay during the early nineteenth century. Beginning in the 1840s a vessel called a pungy or a pungy schooner was developed. The name is based on the area of the Chesapeake where it is believed to have developed called Pungoteague located on Virginia’s Eastern Shore. They were two-masted vernacular watercraft developed in the Chesapeake Bay for oyster dredging and shipment of general cargo. Pungies were also V-hulled schooners adapted from the design of the Baltimore Clipper. Pungies ranged in size between 30 and 80 ft long and operated in the Chesapeake Bay between the 1840s and 1940 (Chesapeake Gateways 2010). Bugeyes were another vernacular vessel form developed in the Chesapeake Bay. Bugeyes were decked canoes constructed from sections of logs built up with planking. These vessels were shallow draft and stable work vessels, which made them superior for use as oyster and fishing vessels. Bugeyes were introduced in the 1870s and continued in use until the 1960s (Chesapeake Gateways 2010).

Finally, the most well-known Chesapeake vernacular vessel was the skipjack or the deadrise. These vessels usually consisted of a single masted bateau approximately 25–60 ft in length. They were built beginning in the 1890s and continue in use to the present day. Most of these vessels were built between 1896 and 1915 for use in oyster dredging (Chesapeake Gateways 2010). The development of the skipjack represented the end to much of the small boatbuilding industry in the Chesapeake Bay. The skipjack was both less expensive and required less skill to build. As a result a new skipjack cost only about $600 to construct compared to a bugeye of equal size (Lesher 2002). In the 1880s one shipbuilder built a new bugeye including
the costs of sails and rigging for $1,141.06 (Lesher 2010). This made skilled shipwrights less competitive than their less skilled brethren. During this period only a few builders successfully transitioned to the new vessel forms. This factor in conjunction with the widespread introduction of power vessels, eliminated the need for sailing vessels. As a result of these changes many of the older shipbuilders converted their shipyards into maintenance and repair yards (Lesher 2002). Only the largest yards continued to build new vessels.

The introduction of the steam engine and iron hulled vessels greatly impacted the business of shipbuilding. By the 1860s, old shipbuilding locations such as Snow Hill, Rehobeth and Princess Anne were eclipsed as newer shipbuilding became more centralized. Among the shipbuilding towns was New Town, which was later renamed to Pocomoke City.

**New Town/Pocomoke City**

Pocomoke City is a small town located on the south bank of the Pocomoke River. It is located approximately 8.7 miles (14 km) north of where the mouth of the river flows into Pocomoke Sound. Pocomoke City is also located approximately 11.9 miles (19.2 km) southeast of the town of Snow Hill. The town’s origins began in the late seventeenth century when it was a small hamlet called Stevens Landing or Stevens Ferry located at a ferry crossing over the river. The settlement slowly expanded in the eighteenth and early-nineteenth century. In 1865 the town was incorporated under the name of Newtown. In 1878, the town was renamed Pocomoke City.

![Figure 4-12. Map of Pocomoke City showing Wm. J.S. Clarke and Hall Brothers Shipyard (Lake et al. 1877).](image)
Between 1860 and 1920 three shipyards and two marine railways operated in the town. They employed a total of 160 hands annually, and conducted an annual business of $166,000 (Murray 1883). Several of these shipyards continued in operation until the early twentieth century. Along the Pocomoke River the shipbuilding industry was strongly tied to the timber milling business. The first steam mill in New Town was opened in 1839 by Hutchinson (Murray 1883:111). The mill operated to manufacture shingles, but later became a steam-powered saw mill. Hutchinson also engaged in shipbuilding, and built several large sea-going vessels. They operated the shipyard for approximately twenty years, and are estimated to have made about $150,000 and then retired (Murray 1883:113).

In 1864 William J. S. Clarke (sometimes spelled Clark) and his brother John H. Clarke established a shipyard and the first marine railway on the Lower Eastern Shore operating under the name W.J.S. Clarke and Company (Murray 1883:117). In 1869, they built a steam saw, plane and grist mill in New Town. Their shipyard became well-known throughout the region for shipbuilding and repair services. During its operations the W.J.S.Clarke and Co. yards doubled in size and by 1875 employed over 100 mechanics and other skilled workers (Van Truitt and Callette 1977:132-133). Primary evidence suggests that fewer workers were employed at the shipyard during this period. The 1880 US Census Schedule of Agriculture and Manufacturing described the yard as employing 15 individuals at one time. Twelve of these workers were full-time employees. The work load appears to have been distributed evenly throughout the year. Ten workers were employed between May and November and 10 workers were employed between November and May. Skilled workers were paid an average of $2.00 and an average laborer was paid $1.25 per day (U.S. Census 1880, Agricultural and Manufacturing Census, Worcester County). The census data also illustrates the size and scope of the J.S. Clark and Company shipyard stating that the business had $4,000.00 in capital investment, $5,000.00 in annual wages, and a product valued at $12,000 (U.S. Census 1880, Agricultural and Manufacturing Census, Worcester County). Among the Clarke-built vessels the *Florence Franklin* was of considerable note. The *Florence Franklin* was one of the first steamboats constructed at Pocomoke City in 1866 (Van Truitt and Les Callette 1977:222).

In 1862, Major T. and Jerome B. Hall began operating as merchants in New Town. In 1863, they added a steam saw mill business and in 1868 they began ship building. Four years later in 1872, they began operating a Marine railway and in 1878 they became Hall, Bro. & Co.
(Murray 1883:71). This firm annually employed sixty men repairing about seventy-five vessels each year. Hall, Bro. & Co. was also estimated to have constructed about twenty-five new vessels (Murray 1883). Their annual business was estimated to be approximately $30,000. In addition to their shipbuilding, they are also known to have owned two steam powered saw mills, and a marine railway.

Both the W. J.S. Clark and Company and Hall Brothers and Company operated in Pocomoke City during the same period. Both shipyards were similar in terms of capital investments in infrastructure. The 1880 Census of Manufactures for Worcester County indicates that the Hall shipyard had invested approximately $6,000 in capital into the facilities and infrastructure (1880 Manufacturing Census). The 1880 data for J.S. Clark indicates that only $4,000 in capital was invested into the facilities. The 1880 census information also provides a snapshot of shipbuilding at both companies during the previous year. An examination of the Census records of the J.S. Clark yard indicates that the greatest number of individuals who were employed in that year was 15. Twelve of these individuals were full time employees of the yard, most of whom were over 16 years old (n=14). Another large shipbuilding firm in Pocomoke City was owned by Elisha James Tull. Tull began working as a shipcarpenter at W.J.S. Clarke in 1868 (Lesher 2007). For six years Tull learned the skills and gained experience in building watercraft. After that period he formed a partnership with the nearby Hall Brother’s shipyard. Tull remained in partnership with the Hall Brothers until 1893, at which time Tull purchased W.J.S. Clarke’s shipyard. At the Tull Yard, the steamer “Bertie E. Tull was considered with such enthusiasm that she was christened for the daughter of the builder. But it appears that Mr. Tull’s greatest pride in accomplishment was his sailing craft, especially the four-masters, including the Keer and the Struven, ships of 800 tons and lengths up to 170 feet” (Van Truitt and Callette 1977:132-133). Over the course of the year the greatest number of hands employed at the Tull shipyard was 30 individuals. Approximately half of these individuals were older than 16 years of age (n=14) and of these only 12 were full-time employees of the shipyard. The remaining workers were part-time or seasonal workers. The size of the vessels is impressive considering that in 1910, Tull’s yard was described as 125 ft on the blocks and had a capacity of 500-ton vessels (Penton 1910:322).

The 1877 Atlas of Wicomico, Somerset and Worcester counties shows the W. J. S. Clarke shipyard consisted of a single marine railway located at the end of Oak Street and a steam
powered saw mill located on the property just west of the marine railway. The Hall Brother’s shipyard was located on a much larger lot and possessed eight other structures that appear to be associated with the yard in addition to the marine railway.

**Crisfield**

Crisfield is a town formerly known as Annemessex and Somers Cove located at the mouth of the Little Annemessex River, near Tangier Sound. A railroad was constructed to the small hamlet around 1866. With the introduction of the railroad, large numbers of seafood canneries sprang up around the town. By the early nineteenth-century Crisfield was the largest seafood center on the Chesapeake Bay and the second largest town in Maryland. Records indicate that shipbuilding began in the area of Crisfield in the late-eighteenth century. In 1799 shipwright John Thomas built the schooner *Patsy Nathaniel Ineth Jr.* (Brewington 1957). In 1805, Hans Cromwell built the 19.67 ton schooner *Little John* in Annemessex. Over the next four years James Montgomery and John Patterson each completed schooners named the *Hornet* and the *Anything* (Brewington 1957). Also during this period, shipcarpenter Dennis Montgomery completed the sloop *Nonparial* in 1807 (Brewington 1957). The next record of a ship built in Crisfield was in 1852 with the construction of a schooner rigged pungy named the *Addie Ulrichs* (Earle Collection No. 4308). She was 54 ft in length and 20.5 ft in beam, drew 6.6 ft of water and had a gross weight of 70 tons.

Throughout the nineteenth and early twentieth-century, shipbuilding continued in the town of Crisfield. Vessels registered during this period included sloops, skipjacks, and pungy schooners. Most of the vessels registered in this period were small and never exceeded 52 tons gross weight. These vessels were probably predominately involved in the fishing, crabbing, and oyster businesses. By 1905 several shipyards were listed in Crisfield including Wm. H. Dougherty, David Byrd, S.W. Dana, and J. B. Nelson & Son (MD Bureau of Statistics and Information 1905:136).

In 1902, S.W. Dana was listed as the owner of a ship repair yard in Crisfield, Maryland (Marine Review 1902). In 1910 a single marine railway called Crisfield Marine was owned by C. A. Dana (Penton 1910). The railway infrastructure had an extreme length of 225 ft, a length on the blocks of 100 ft, and a depth of water over the sill of 15 ft. The single railway had a maximum capacity of 150 tons. A second marine railway owned and operated by John B. Nicholson was in operation by the early twentieth century (Figure 4-13). Rhodes (2006:27)
reports that at the time of the photograph “the gears in the picture were powered by horses, later they were replaced with motors for powering the cradle.” This site later became the location for George A. Christy and Son Seafood (Rhodes 2006:27).

![Figure 4-13. 1904 Photograph of a skipjack on the railway. The slipway gears (arrow) were horse powered until the early twentieth century at the John B. Nelson marine railway (Adapted from Rhodes 2006:27).]

In 1918, the Crisfield Shipbuilding Company was organized. The new company was created from two already existing companies called the J.B. Nelson shipyard and Tawes and Gibson (Wilcox et al. 1918b). The new company immediately received a $1,000,000 government contract to build two 130-ft river steamers and ten 64-ft tug boats for the War Department (Wilcox et al. 1918a). The contract called for at least six of these vessels to be built simultaneously. The new company was intended to transition from wooden boat building and repair to steel. The company may have been temporarily re-organized for the war effort. Just two years later in 1920, the railway was reportedly owned and operated by J.B. Nelson & Co. (Aldridge 1920). J.B. Nelson and Co., also called the Crisfield Marine Railways, had a single railway with a capacity of hauling vessels of up to 150 tons (Aldridge 1920:110).
Mardela Springs

Barren Creek was the center of a small, but active shipbuilding and repair center until at least the late-nineteenth century. In addition to the shipyard(s) located on Barren Creek, shipyards were also present in the nearby town of Sharptown, and along Rewastico Creek, which forms the southern boundary of the Barren Creek Election District. Most of the historic records associated with Barren Creek are difficult to distinguish from other sites within the Barren Creek Election District.
During the middle of the nineteenth century several ships and barges were built near the location of the residence of Mr. Edgar Bacon (Wilson 1928). Later, in 1850, vessels were reported constructed at Moore’s Landing on the south side of Barren Creek (Wilson 1928). A local resident stated that the last vessels that were built near the bridge in Mardela Springs (a.k.a. Barren Creek Springs) were built between 1870 and 1875 (Wilson 1928). These vessels were said to be six barges that were built by Train Ackworth Bounds. Despite this report of the “last” vessels constructed on Barren Creek, several vessel registries indicate that shipbuilding and repair work continued along Barren Creek after this date.

The *Julia Hamilton* was built in Barren Creek Springs in 1884 (USDC 1920). The *Julia Hamilton* was a small sloop, eight tons (gross), 36 ft in length, 14.2 ft beam, and 3.4 ft draft. She had a crew of three and her registry indicated that her home port was Baltimore, Maryland. At least two other vessels built during this period are suspected of being constructed in Barren Creek. These included a sloop named *Train A. Bounds* and a Schooner named the *Train Ackworth*. Both vessels may have been built by shipwright Train A. Bounds. The *Train A. Bounds* was 9.41 tons, and the *Train Ackworth* was 47.25 tons in size (USBS 1875). In 1884, two 160 ton barges named the *Admiral* and the *E.E. Jackson & Company Barge No. 3* (Merchant Vessels of the United States 1920) was listed as constructed on Barren Creek. Barren Creek shipyards also began building small powered vessels during this period. In 1884, two gas powered schooners named the *Bartie Bennett* and the *Admiral* were built at Barren Creek Springs. In 1886, the *Etta*, a 45-ton schooner, was built at Barren Creek Springs. Collectively, this is the total number of vessels that were definitively built along this meandering creek.

Nineteenth-century census records indicate that numerous individuals involved with shipbuilding were located throughout the Barren Creek District. This district included several other creeks and small areas of open waterfront along the Nanticoke River; however, most are probably associated with shipbuilding on Barren Creek and the north shore of Rewastico Creek. The 1850 census indicates that 27 individuals identified themselves as involved in the shipbuilding trades in the Barren Creek Census District. They included 23 ship carpenters and four caulkers. Twelve of these men possessed valuations with household enumeration. These values ranged between $300 and $2,000 per man. Those highest valued individuals were Noah Phillips, Joseph Weatherly and Walter Walker.
The 1880 census indicates a decline in the number of shipwrights operating in the area. In 1880 seven individuals identified themselves as ship carpenters residing in the Barren Creek District at that time of the census. They included Hiram Venables (Age 80), Ct. Shockley (Age 31), Nathaniel J. Walker (Age 44), Morsilus Wetherly (age 57), his son Marion Wetherly (age 18), and Ralph L. Lloyd (age 43) and Otis L. Lloyd (age 19) (US Census 1880).

Whitehaven

Whitehaven is a town located on the Wicomico River. The town is sited approximately 4.7 miles (7.6 km) above the mouth of the Wicomico River and 11.5 miles (18.6 km) below the town of Salisbury. Shipbuilding has been a part of the economy of Whitehaven since the early nineteenth century. Today the town is the location of one of two ferry crossings operating on the Wicomico River. The town is located at “Wicomico Ferry,” or the “Lower Ferry,” which has been in operation in one form or another since the 1680s. Initially, the town developed as a land transportation hub, and later, after the Wicomico River was dredged, the area became an official port. Both the deep water location of the town and the presence of several roads made it an ideal location for a town. The first references to the town occur in the first decades of the nineteenth century. This town was named after the Colonial town of Whitehaven which was located on the south side of the Wicomico River. Although the initial town failed, the name was later given to the second town located on the opposite side of the river. After the Civil War, an African-American community called Capitola formed near Whitehaven. Residents from Capitola worked in the shipyards at Whitehaven (Childester 2010). Several vessels were built at Whitehaven in the early part of the nineteenth century.

The earliest evidence suggesting large-scale shipbuilding in Whitehaven is documented in 1808. That year shipwright Daniel Whitney built a vessel named the Charles N. Bancker at the “Lower Ferry” (Brewington 1957). This vessel may have been named for Charles Nicoll Bancker (1778-1869), a New York merchant and financier with ties to the Teackle family (APS 2010). The Teackle family was a prominent Somerset County family that moved to Princess Anne in 1801. The family was heavily involved in the trans-Atlantic and Caribbean trade.

In 1812, ship carpenter Chaplin Conway constructed a 105-ton schooner named the Osprey in Whitehaven (Brewington 1957). Occasional shipbuilding probably continued throughout the nineteenth century. The earliest reference to a permanent shipbuilding establishment was documented by the Lake, Griffing, and Stevenson Atlas in 1877 and the
Wicomico County, Maryland directory of 1878 (New River 1878). The Atlas and directory both listed a marine railway owned by William A. Billingham. A William A. Billingham was listed as a 36 year-old farmer in Tyaskin District in the 1870 Census (Bennett 2010). This railway was located on the property of Walter A. and Amanda Billingham who acquired the property in 1869. The property was conveyed to George H. Robertson, George W. Robertson, and James W.T. Robertson in 1879 (MHT 1994). An 1891 deed described the property as the “Billingham or marine railway property and bounded on the North and West by the property of Mrs. Elizabeth Catlin on the East by the property of Brennus Palmer…and all the improvements thereon consisting of a dwelling house, store house, oyster house, the marine railway, and all the tools, machinery, appliances, and materials thereto belonging…” (MHT 1994). The property was convened from George and Charlotte Robertson to Granville M. Catlin in 1895 for the price of $1500.00 (MHT 1994).

Figure 4-15. Tax map of Whitehaven showing the location of the Billingham property (Adapted from MHT 1994).
Corddry (1981:46) indicates that a marine railway and the Whitehaven Shipyard were located on the west side of the town in the vicinity of a marine railway documented during the 2005 survey (Moser 2007). The property was part of a three acre tract called “Ben Robbins Marine Railway” (Stump 2000:58). At least one other shipbuilder named Otis S. Lloyd, Sr. operated a shipyard in Whitehaven until circa 1901, when he moved to Salisbury and purchased the Salisbury Marine Railway Co. (Jacob 1981:73). A ship carpenter, aged 19, was named Otis Lloyd in the 1880 Census of Wicomico County. His father was listed as the son of Ralph L. Lloyd and both enumerated in the Barren Creek Census district a few miles north of the town of Whitehaven. The Census records list Lloyd as Otis L. Lloyd rather than Otis S. Lloyd, which may represent a mistake in the transcription of the census records.

Regardless of whether he was the same Otis S. Lloyd, Sr., while he worked at Whitehaven he specialized “in the construction of round-sterned bugeyes” (Burgess 2005:54). A bugeye is a type of vernacular sailing vessel developed in the Chesapeake Bay for oyster dredging in the 1870s. These two-masted vessels typically possessed a shallow draft, wide beam and low freeboard. Lloyd is known to have constructed the Bugeye *Sallie L. Bramble* in 1890 and the round-sterned, single masted *Hattie Lloyd* in 1898 (Burgess 2005:54).

In 1908, two shipbuilding/repair firms were listed in Whitehaven. These firms were W.J. Catlin & Brother and Catlin and Elliott (MD Bureau of Statistics and Information 1908:186). Granville M. Catlin was born January 9, 1860 and died on July 8, 1916. He was the shipyard foreman in Whitehaven (Pevear 2004). His brother was Dr. William G. Catlin. While very little public information is available about these businesses, recently, a private account book called the Catlin Ledger was discovered in the attic of the Catlin-Scott house near Whitehaven (Boyer, Personal Communication, 2006). The ledger documents some of the business activities of Dr. William J. Catlin and Granville Moore Catlin between 1905 and 1915. Between 1911 and 1913 the ledger was primarily used to document work at the shipyard. Analysis of the account book suggests that approximately 150 boats were repaired in 1912; however, the analysis is complicated by the absence of clear chronological ordering and dates within the account book. The types of vessels repaired at the shipyard represent a wide cross section of the types of boats that operated on the Wicomico River and throughout the Eastern Shore during the early-twentieth century. They included bugeyes, schooners, scows, skiffs, launches, bateau, flattie, boats, canoes, yachts, pungy, and skipjacks (Catlin Ledger). The transactions described within
the ledger indicate that the shipyard was predominantly involved in repair work rather than the construction of new vessels.

It is not clear which of these two firms were the Whitehaven Marine Railway. In 1908, the White Haven Marine Railway was listed as a boat repair company. It had 14 employees, an investment of approximately $6,500 in capital; and annual wages totaling $8,500. The gross production value of the shipyard was $17,000 (Maryland Bureau of Statistics and Information 1908:185).

During World War I, the Whitehaven Shipbuilding Co. was contracted to construct of 3,000 tons of wooden tugs and barges for the Emergency Fleet Corporation (United States Shipping Board 1918:126). In 1918 Hilton W. Robinson was called before congress to clarify contract differences between the Emergency Fleet Corporation and Whitehaven Shipbuilding Co. His testimony before Congress provided significant details about the operation of the Whitehaven Shipbuilding Company. At that time, Mr. Robinson served as 50 percent owner and general manager of the company. He described the White Haven Shipbuilding Co. as a chartered company with the other charter members including W.A. Anders and George H. Larimore of White Haven, MD (US Congress House 1920:3407). The contract stipulated that the yard was to construct 2,500 ton wooden schooner barges for the price of $190,000. The hearings on the establishment reported that the Whitehaven Ship Building Co. had a total of 156 employees on the pay roll in 1918. Of these, three were office employees while 153 were shipbuilders on E.F.C. work and none was on repair work. The average attendance of shipbuilders on E.F.C work was 107 shipbuilders (US Congress 1919).
Sharptown

Sharptown is located in present day Wicomico County on the east bank of the Nanticoke River. The town is approximately seven miles (11.2 km) upstream from the town of Vienna, Maryland and 8.7 miles (14.1 km) downstream from Seaford, Delaware. The town began as a small settlement in the eighteenth century. By 1818 shipbuilder Mathew Marine had established one of the first shipyards along the waterfront (Sharptown 2010). Throughout the nineteenth century the town continued to grow and by 1845 had a post office. The town was incorporated in 1874 and again in 1888. By 1877, a shipyard called the Sharptown Marine Railway operated in town and it was owned by R.M. Elzey and brothers (Figure 4-17). In addition to the railway, the town also supported two ship carpenter shops owned by John W. Robinson and W.I.J. Phillips.

Several other businesses supporting the shipyard included a blacksmith/ship smith shop and a ship carpenter/sail maker also operated near the shipyard (Sharptown 2010). The 1880 Census Schedule of Manufactures in Sharptown records a single shipyard called the Walter J. Wood Marine Railway. The railway had a capital investment of $4,000.00, paid a total of $3,000.00 in wages during that year, $1500.00 in material costs and only produced $5,000.00
worth of product (U.S. Agricultural and Manufacturing Census 1880). On average the shipyard employed five full time workers, one ¾ time worker, two 2/3 time workers, three ½ time workers, and one idle worker. At its busiest the shipyard employed 34 hands, 33 of whom were older than 16 years of age. Average daily wages for skilled workers were $1.50 and unskilled workers were paid $0.75 per day.

By the beginning of the twentieth century, 18 sailing vessels registered as U.S. merchant ships were built in Sharptown (Sharptown 2010). In 1917, one of the last and largest sailing vessels built in Sharptown was the *Purnell T. White*. The *Purnell T. White* was a four-masted schooner with a gross tonnage of 751 tons. She represented one of the largest types of wooden sailing vessels built the United States. She was 184.5 ft in length, 37.5 ft in beam, and drew 14 ft of water (Department of Commerce 1920:49). Other large vessels built in Sharptown included the *Severn* (780 tons) built in 1907, *Anna R. Heidritter* (694 tons) built in 1910, *Albert W. Robinson* (498 tons) built in 1907, *Pittston* (496 tons) built in 1906, and *T.J. Hooper* (722 tons) built in 1908 (Dept. of Commerce 1920). Only a few Eastern Shore shipyards had the depth of water and the facilities necessary to build such large vessels.

The 1910 *Blue Book of American Shipping* identified two marine railways at the Sharptown Marine Railway Company. One slipway was described as having an extreme length of 560 ft, a cradle length of 173 ft, 48 ft width at the top, 12 ft of depth over the sill forward and
18 ft aft, and a capacity of 1,000 tons (Penton 1910:323). The second slipway was smaller with an extreme railway length of 308 ft, 108 ft on the blocks, and a depth over the sill of 6 ft forward and 13 ft aft, and a capacity of 200 tons (Penton 1910:323). This infrastructure was in place at the shipyard by at least 1902 (Marine Review 1902). The larger of the two slipways was one of the largest in the region. By 1916 the Sharptown Marine Railway Company had received a contract to build a 1,000-ton, four masted schooner (Brown 1916:305). Shortly after the Purnell T. White was built, the Sharptown Marine Railway went bankrupt. By 1919 the successor of the Sharptown Marine Railway, which was known as the Eastern Shore Shipbuilding Corporation, also went bankrupt (New York Times, Sept. 25, 1919). At that time all assets and property were offered at auction.

**Miscellaneous**

Many local histories indicate the ubiquity of boatbuilding yards throughout the various coves and rivers of the Eastern Shore. They also indicate the difficulties associated with locating their archaeological remains. Several historical documents indicate that multiple boats were built in the community of Oriole located on St. Peters Creek, a tributary of the Manokin River. A local history of Oriole indicates that there were at least four shipyards located in and around the town. Shipbuilder Sylvester Muir built a bateau named R. L. Webster (Hall 1964). Another Oriole boat-builder, named George Smith, built an unidentified boat named the Gladwin. There were four launching sites in the vicinity of Oriole. The first was located at the head of St. Peters Creek, in Oriole, the second located at the nearby town of Champ, the third was located at Fender's Point, and the fourth was located near St. Stephen, near Monie (Hall 1964). Ironically, even though St. Stephen was located only 3 km from the town, Oriole vessels launched at St. Stephen were launched into Little Monie Creek, a tributary of the Monie River rather than St. Peters Creek, a tributary of the Manokin River. The boatyard at Champ Point was said to be operated by boat builder Rufus Miles who reportedly built three of the largest budgeyes built in the Chesapeake Bay. Miles was also reported to have constructed the Nivingham and R.J. Miles (Hall 1964).

In the early twentieth century, wooden boatbuilding and repair were still conducted in relatively isolated locations by relatively obscure shipbuilders. These include the firms of W.A. Meredith and W.S. Smith in Fairmount district, and the firm of W.H. Muir, John Branford at Fishing Island in the Upper Fairmount district (Maryland Bureau of Statistics and Information
These shipbuilders specialized in building and repairing the small fishing and oyster boats that plied the Chesapeake.

Figure 4-18. Location of shipyard at Fishing Island later operated by John Branford (Lake et al. 1977).

John Branford’s small shipyard operated between 1883 and 1911 at Fishing Island on the south side of the Manokin River (Wennersten 1981). During his career he built more than 24 bugeyes and approximately 25 skipjacks and bateaus (Mountford 2004). Branford operated at a time of rapid change in the boatbuilding industry in the Chesapeake Bay. His career spanned the transition from more complicated watercraft, such as the bugeye, to the less complicated skipjacks (Lesher 2010). Branford’s shipyard was located on low ground along the waterfront. Site infrastructure consisted of an 8-x-12-ft tool shed and an unroofed 10-x-20-ft platform approximately two ft high which was used as a scrive board (Lesher 2010). Branford’s small shipyard possessed no powered equipment. In 1900 the shipyard property was valued at $200 and the buildings were valued at $800 (Lesher 2010). In addition to the expenses of fixed infrastructure “the cash, accounts payable, and raw materials on hand amounted to another $300, for a total investment of $1,300 at the height of his career” (Lesher 2010). In the 1880s Branford could construct a new bugeye, including the sails, for $1,141.06 in 1407 hours of work. Branford paid himself 25 cents an hour, and he paid the carpenter 10 cents and another man 15
cents per hour (Mountford 2004). After the costs of labor and materials Branford’s profit was $350.00 (Wennersten 1981:100).

Figure 4-19. The approximate location of John Branford’s Fishing Island shipyard (Moser 2007).

Summary

Shipbuilding has been a part of the culture of the Lower Eastern Shore for 350 years. The earliest vessels were small boats for fishing, trade and communication with other areas of the Colony. By the late seventeenth century large numbers of small vessels and a few larger vessels were constructed at Somerset County shipyards. Despite attempts to identify these shipbuilding locations, early Colonial records were vague in describing shipyard location. Archaeological survey of the area also failed to identify any early examples of shipbuilding locations on the Chesapeake. By the eighteenth and early nineteenth century Somerset County reached the zenith of shipyard production. During this period numerous moderately sized vessels were constructed for the Caribbean and the trans-Atlantic trade. This production was widely dispersed at small and medium shipyards throughout the region. Beginning in the mid nineteenth century the rise of
large urban seaports, and the development of new technology such as the marine railway bifurcated the shipbuilding industry into two divergent sectors—the small boat building and repair industry and the large shipbuilding and repair yards. Many of the small boat building and repair yards were distributed in the rural portions of the study area and remained in business by building and repairing smaller less expensive boats for the fishing and oyster fleets; however, all of the remaining large shipyards became concentrated in urban areas where they competed for a declining share of the statewide shipbuilding market. In the twentieth century these large shipyard produced some of their largest and most appealing sailing vessels including five masted schooners. Shortly thereafter many of these shipyards went bankrupt as metal hulls and steam and gas powered vessels began replacing the sail powered vessels that were traditionally built in the area. Although most of the large shipyards were closed before World War II, several large yards remained in business until late in the twentieth century. Many of the small shipyards began declining as soon as the oyster harvest began declining. By the late twentieth century most small boats had to travel a considerable distance to find repairs at a shipyard in the region.
CHAPTER 5: SHIPYARD ORGANIZATION

Background

The three general functions of pre-industrial shipyard sites were the construction, repair, and breaking (dismantling) of sailing vessels. Each of these activities was probably performed at every shipyard; however, some shipyards specialized in just one or two of these activities. The activity that was most often associated with shipyards was the construction of new vessels. Of the three activities, new construction required the greatest investment of time, labor, and materials on the part of the shipwright and shipyard owner. During this process, natural resources, such as timber and planking, were delivered to the shipyard and shaped to the specifications of the shipwright. Manufactured materials such as nails, blocks, anchors, fittings, glass, and cordage were either fabricated on site or purchased from local craft specialists or merchants. These materials were transported to the shipyard and stored until they were needed. Finally, the individual components were assembled through the efforts of the shipwrights and laborers to create a final product, a new watercraft.

A second type of work that was performed at shipyard sites was maintenance, repair, and modification of already existing vessels. Captains and crews often made repairs and carried out day-to-day maintenance onboard their vessels. In many instances shipyard facilities were required to complete major repairs or maintenance. Repair and maintenance activities probably comprised the largest proportion of the work activities that occurred at many shipyards. In addition to repair and maintenance activities, shipwrights sometimes undertook major structural modification to improve a vessel. Such modifications included lengthening a vessel or modifying the mast positions. These changes often improved sailing characteristics of the original vessel design.

The final activity performed at most shipyards was ship breaking, or the process of breaking older vessels into their component parts. In ship breaking, timber and fittings were salvaged from old vessels and sold for scrap and firewood, while reusable timbers were sold for the construction of new vessels. Archaeological evidence from some shipwrecks indicates that timbers from older vessels were often reused (Milne 2001). The breakup of ships provided quantities of usable timber and ironwork that a shipwright could reuse or could sell to either
merchants or other shipwrights. Investigations at a mid-nineteenth-century ship breaking yard in San Francisco, California suggest that the salvage yard was organized to efficiently salvage many of the hulks abandoned along the waterfront after the California gold rush (Pastron and Delgado 1991). Salvaged ship elements were identified at the Dutch shipyard at Hogendijk, Bellamy’s Wharf and several other shipyards where they were reused as part of the site infrastructure (Gawronski 2003a; Saxby and Goodburn 1998). Despite this evidence of ship breaking, these operations were not required to occur at shipyards. The de-construction of such vessels may have required substantial skilled labor, but does not seem to have required the same infrastructure that was required to build them (Pastron and Delgado 1991). After the usable shipbuilding timber was sold, the shipwrights could sell quality wood to carpenters and other woodworking specialists. Similarly, the “chips,” or the remaining scraps of wood from the construction process were also sold or used as firewood (Linebaugh 1992a).

Each of these functional differences would be expected to produce a distinct archaeological pattern at a shipyard site. Because new construction, repair, and ship breaking were probably performed at all shipyards, to greater or lesser degrees, it is difficult to distinguish between these activities solely on the presence or absence of specific archaeological infrastructure. Overall, the variations in the size and scope of day-to-day operations at shipyards produced different manifestations of material culture. In general, smaller shipyards produced fewer, smaller, less complex, vessels using a smaller work force than did larger shipyards. While, in general, larger shipyards were capable of launching more, larger, more complex, vessels with a larger work force. Consequently, while the shipyard functions may have been similar, the intensity of site use is expected to produce a more definitively unique pattern than the general function of the site.

Despite the fact that shipyard sites functioned similarly, they should not be viewed simply as scaled versions of one another. Smaller shipyards possessed smaller labor forces, more general-purpose infrastructure, and fewer craft specialists than larger shipyards. Small shipyards relied more heavily on local craft specialists and merchants to provide ship chandlery and other basic materials while constructing their vessels. Smaller shipyards purchased these specialized materials and contracted skilled craftsmen when it was necessary. Larger shipyards were more diverse and self-sufficient than were smaller shipyards. They possessed a greater
quantity of specialized infrastructure and craftsmen necessary for building vessels (Gawronski 2003a; Gawronski 2003b; Courtney 1974; Courtney 1975).

The frequency (e.g., intensity) of construction, repair, and demolition of vessels was the most important variable that affected the patterns of material culture at shipyard sites. The archaeological and historical records show three general patterns of site-use intensity at shipyards. The first pattern occurred at sites used to build a single new vessel. The second pattern occurred at sites used to construct more than one vessel on site, but construction was either intermittent or seasonal. The third pattern occurred at shipbuilding sites and was associated with shipyards that operated full time, year-round. The only universal constraints at the larger production sites were adverse weather conditions during the winter months. Shipyards that were located in tropical and temperate regions had the capability to maintain continued production throughout the winter (Jarvis 1998). This categorization of site-utilization intensity represents the general synchronic pattern of most shipyards; although, this pattern may differ considerably diachronically.

Shipyards operating at different intensities produced different patterns of utilization and site formation. Sites that were intensively used over short durations probably represented expedient solutions to temporary historical and economic conditions and relationships. For example, it is unlikely that shipwrights working at expedient shipyard sites purchased the property on which it was built. Some researchers suggest that Colonial period craftsmen were unlikely to own the property on which their establishments operated, especially when property prices were high (Daniels 1990:74; Moser 1998). Additionally, shipwrights were unlikely to undertake substantial improvements to shipyards that were intended to construct a single vessel. Small, expedient, shipyard sites probably consisted of a single temporary launching slipway, a possible small smith’s forge, and some form of residence for housing the shipwright and his assistant(s) (Hunter 1999:84, 134). Even though such sites are considered expedient and are generally intended to produce a single vessel, they sometimes produced small numbers of vessels over longer time periods.

Overall, the lack of permanent fixed shipyards in the Medieval period may have reflected the smaller scale of trade, and a general lack of capital that was available to the artisan classes at that time (Friel 1995). This scarcity of capital and the fluctuation of shipbuilding work in a particular location may have forced shipwrights to be itinerant and probably discouraged the
development of permanent shipyards. An example of an expedient shipbuilding site was a shipyard established during the American Revolution at Skenesborough, New York. This shipyard constructed a small squadron of American vessels in 1776. Among the most famous of these was the gondola *Philadelphia* (Bratten 1997).

![Gondola Philadelphia on display at the Smithsonian Institution (Adapted from HNSA 2010).](image)

The rapid speed in which the squadron was constructed and the nature of the small vessels that were constructed, minimized the equipment and the fixed installations that were necessary to construct these vessels. Instead, the site infrastructure was most likely limited to the bare necessities. Later, the shipbuilding that continued on the site after the War of Independence and during the War of 1812 may have resulted in the construction of a more formal shipyard.

Anecdotal evidence suggests that another form of expedient shipyard was one that operated seasonally (Hunter 1999:84). Seasonal or period shipyards were shipyards that did not constantly construct vessels. Seasonal shipbuilding was the result of two principal factors—the weather and the agricultural cycle. Some New England shipyards are unlikely to have operated
through the winter due to inclement weather and the freezing of many small creeks and rivers. In other cases this seasonal cycle of shipbuilding was based on the availability of local labor during the slack periods in the local seasonal agricultural cycle. In New England, professional shipwrights would have served as master shipwrights at seasonal shipyards while the unskilled and semi-skilled labor pool of the agricultural work force provided the labor (Hunter 1999:84).

Shipyards that constructed more than one vessel at a site probably possessed substantially greater fixed improvements and the infrastructure necessary for constructing and repairing vessels. Larger shipyard sites were located on property owned or leased for long terms by the shipyard operator(s) or their partners. Because these operator(s) often also owned their property, they were frequently willing to add infrastructure necessary for the operation of the shipyard. As a result, these shipyards possessed greater quantities of permanent and specialized infrastructure that included workshops, cranes, storage sheds, sawpits, multiple forges, lumber storage areas, steam boxes, worker housing, two or more sets of slipways and a wharf (Amer and Naylor 1996; Thiesen 2000:32; Thompson 1993). These larger shipyards were capable of constructing and repairing multiple vessels at the same time.

Descriptions of the Stephen Steward Shipyard (18AN817) in Anne Arundel County, Maryland suggest such a shipyard in which a larger investment in fixed infrastructure necessary for shipbuilding was made over the course of its long running partnership. Between 1753 and 1772 the shipyard, operated by shipwright Stephen Steward and co-owned by merchant Samuel Galloway may have built as many as 24 vessels (Thompson 1993). The shipyard probably built some of the largest vessels in the Chesapeake Bay during this period. At least two of the vessels described in the Galloway Papers include descriptions of vessels 560 tons and 450 tons burden (Thompson 1993:11).

With the onset of the American Revolution, this shipyard began building and outfitting vessels for the Maryland Council of Safety (Thompson 1993). In this capacity, Stephen Steward designed and built the row-galley *Conqueror*. The row-galley was a small military sailing vessel capable of engaging and capturing small warships and outrunning the larger more powerful vessels. They were classed as twenty-gun vessels, but usually carried two to four eighteen-pounders and eight to fourteen lesser guns (Middleton 1981). Steward’s unique design was used by other Chesapeake shipwrights building row-galleys to help defend the Chesapeake and Delaware Bay from more powerful British naval forces (Middleton 1981).
On March 31, 1781, the shipyard was destroyed by British marines from the *HMS Hope* and *Monk* in landward assault on the defended shipyard. A week later a description of the attack in the *Maryland Gazette* identified several of the buildings that were destroyed.

A party of the enemy, estimated at about 100 men from two British ships, the Monk and the Hope, disembarked at Chalk Point. They began to make their way to Steward’s shipyard, led by one of Steward’s slaves who had recently run away. American militia on the shore, numbering about 20, managed to get off a few shots before the British drove them back with a hail of fire from swivel guns and muskets. As the British marched on Steward’s, only six or seven men could be mustered to defend the installation. Seeing they were greatly outnumbered the remaining militia retreated to “Mr. Harrison’s,” where they expected the British to go next. Unopposed the British proceeded to destroy everything of value that could be found.

A ship of 20 guns, that in a few days would have been launched, the dwelling house with most of the furniture, two or three storehouses, etc., filled with articles of every kind for conducting the business of building ships as well as for private purposes, provisions, tools, timber, everything was lost; the houses though not elegant were for the purpose they were intended equal to the most superb... Their malice seemed leveled alone at Mr. Steward, they having passed through Mr. Harrison’s house without injuring it. And in their way up and returning they passed several others without molesting them (Flanagan et al. 1989).

Samuel Galloway’s interest at the shipyard continued after its destruction by the British. Galloway’s 1785 probate inventory listed nine slaves valued at £435 who were located at the shipyard approximately four years after it was burned (MSA, Anne Arundel County Inventories Liber TG1, folio 280).

![Figure 5-2. Circa 1760s panel from Kent County, Maryland showing a shipyard (Adapted from Middleton 1981).](image-url)
The very largest shipyards of the eighteenth and nineteenth centuries, such as the British dockyards, also possessed additional infrastructure such as dry docks, wet docks, larger cranes, ropewalks, sail lofts, and other infrastructure that distinguishes them from smaller commercial shipyards. It is the non-arbitrary spatial relationship of these activity areas that reflect the organizing principles of the shipyard and underlying social, economic, and technological rules of the communities of individuals who owned and worked at shipyards (Keller and Keller 1996:61).
Like any archaeological site, the overall form of the shipyard was also directly dictated by the general constraints of the site location (e.g., topography, water depth, and land availability) and the specific function of individual marine structures at the site. The refinements and modifications of these marine structures were achieved through efficiencies in the organization of capital, labor, supplies, and processes. A summary of some of the key physical structures that have been identified provides a context for interpreting these sites.

Shipyards were commonly located in sheltered coves, harbors and rivers with water that was sufficiently deep to launch large vessels at high tide (Stammers 1999:256; Thiessen 2000:31-32). Besides shipbuilding, shipyards performed routine maintenance and repaired damaged vessels, and broke up older vessels. Although ship repair has been a less frequently investigated aspect of shipyard activities, it was the “bread and butter” of many shipyards (Stammers 1999:254). The number of vessels under construction and repair was limited by the amount of space available to build or repair the vessel and to store the timber. Urban shipyards may have been particularly limited due to the constraints of space.

Space to store timber and to work it into a useable form seems to have been an important aspect of the organization of the urban shipyard and its design. Shipyards required a continuous supply of timber for construction and repair. To build a sloop in the eighteenth century required approximately 225 loads (11,250 cu. ft) of timber to complete, while large eighteenth-century
warships required over 3700 loads (185,000 cu. ft) of timber (Dodds and Moore 1984). In his study of English shipyards, Michael Stammers observed that "plentiful space was critical to success because it reduced the handling of timber” (Stammers 1999:259). Stammers’ (1999) study examined nine shipbuilders who claimed that their existing yards were so small they had to stack timber 8 to 10-ft (2.43 to 3-m) high. Stammers (1999:258) found that shipyards ranged from as little as 423 m$^2$ to as large as 24,280 m$^2$. Shipyards with inadequate space were forced to stack timber and re-arrange timber to keep it accessible. Discussing a nineteenth-century shipyard in Essex, Peckham (2002:49) states that space was always "premium at the James & Tar yard. Three vessels were the most that could be constructed simultaneously." Additional labor expenses were incurred to continually move timber. Historian, Joseph Goldenberg suggests a contradictory opinion of the importance of space at urban shipyards. He states that shipwrights Richard Hollingsworth and William Stevens were granted only 1/3 an acre (1335m$^2$) of land for their shipyard approximately one mile from the village of Salem, Massachusetts (Goldenberg 1968:29). Despite any possible disadvantages of limited space, urban shipyards possessed greater access to specialized laborers, investment capital, market information, and customers (Hunter 1999:138).

One noted Maryland urban shipyard was operated by David Stodder and is depicted on the 1792 Plan of the Town of Baltimore (Papenfuse et al. 1979:96; Figure 5-5). The plan shows Mr. Stodder’s yard located near Fell’s Point on the periphery of the Town of Baltimore. The eastern and southern sides of the shipyard property fronted Harris’s Creek and Northeastern Branch respectively. When the map was completed, the shipyard was located outside of the core urban area of the town. Later, this area of the waterfront was filled and extended southward.

Stodder probably began using the property for shipbuilding sometime after 1782 when he leased or purchased the property from Benjamin Rogers (Robinson 1957). Stodder was known to have built the schooner Voluptus in 1793 and the schooner Active in 1794 (Footner 1998:73). His most famous vessel built at this shipyard was the USS Constellation constructed between 1796 and 1797, and launched in 1798 (Wegner 1991). The Constellation was a smaller 36-gun version of the 44-gun frigates Constitution, President, and United States. During the construction of the Constellation, David Stodder served as the Naval Constructor, Joshua Humphreys was designer, and Samuel and Joseph Sterrett were the builders and naval agents.
(Wegner 1991). Stodder probably continued shipbuilding at this location until 1804 when he died (Footner 1998:97).

The map identifies several details about the Stodder shipyard. First, it was located in relatively close proximity to a ropewalk located just to the north. Second, the map shows a possible fence surrounding the entire shipyard. Many larger shipyards were surrounded by fences. These fences limited access to the site providing a measure of control over the materials stored at the shipyard and the work force (Linebaugh 1992a). It is possible that the fence that surrounded Stodder’s yard was required during the construction of naval vessels. The fenced area of the shipyard measured approximately 5.31 ha (13.124 acres). This area was more than sufficient for most typical shipyards. Finally, the map shows several structures that were located on the property. These structures may relate to shipbuilding or they may be related to an earlier plantation that was located in the vicinity of the shipyard.

Figure 5-5. 1792 A.P. Folie Map of Baltimore identifies the fence (arrows) surrounding Stodder’s shipyard (Adapted from Papenfuse and Coale 1982:96).

**Workforce**

The workforce at any particular shipyard varied depending upon the type of work that was performed at the yard, the size of the shipyard, local demographic conditions, and labor
price and availability. Throughout the seventeenth and eighteenth centuries shipbuilding was largely a craft based on an apprenticeship system. In Great Britain the quality and quantity of instruction received by a shipwright’s apprentice depended upon the “skill and interest of his master and, the specific terms in his articles of apprenticeship” (Goldenberg 1968:127). After completing an apprenticeship ranging from five to seven years, he was a journeyman shipwright (Goldenberg 1968). The length of service of apprentices in the Colonies varied between three to eight years with apprentices often receiving clothing and sometimes tools (Goldenberg 1968:130).

**Slaves and Indentured Servants**

In the late seventeenth century major demographic shifts radically changed the composition of the population. The most significant change began around 1690 with the importation of large numbers of African slaves. Skilled slave artisans also were used in virtually all colonies as shipwrights. These skilled slaves have left few documentary records to help us understand the role they played in Chesapeake shipbuilding and ancillary trades. Skilled slaves were present in the Chesapeake Bay region as early as the seventeenth century. In other regions, such as Bermuda, slave artisans were almost entirely responsible for the construction of Bermuda’s merchant fleet (Jarvis 1998). Colonial shipwrights in South Carolina regularly used slaves, who were a permanent, cheap source of labor (Harris 2002:138). Harris (2002:139) reports that at least 13 out of 20 known shipwrights used slave carpenters in shipbuilding in the 1730s and 1740s. In South Carolina, the wages of free white ship carpenters were about 1/3 more than a slave’s, while in New England, slave owners charged the same prices (Harris 2002:140). In her study of Baltimore artisans, Tina Hirsch Sheller notes that, “eleven craftsmen in the shipbuilding and ship fitting trades owned a total of six slaves in 1776, by 1783, eighteen artisans in these trades owned a total of 119 black bondsmen” (Sheller1990:178). In addition to the skilled shipcarpenters, many slaves probably participated in unskilled positions and in industries that supported shipbuilding.

Shipwright Ashbury Sutton was hired to construct a sloop for a Prince George’s County merchant named Richard Barrett (Kulikoff 1986:414). The construction of this vessel required 25 man months of labor. Sutton used a combination of free white labor and hired slave labor to complete the vessel. The lead shipwright Sutton, received £7 10s, white workers £3 to £5, and slaves as £2 to £3 for their work on the project (Kulikoff 1984:414). Without further details
about this project, it is impossible to determine the skill levels of the different individuals. It is entirely possible that the higher rate paid to white workers may indicate that they possessed more skills than the slaves.

**Working Conditions**

Shipyards were dangerous places to work and accidents happened often. Lower leg and foot lacerations were the most common types of injuries at wood shipyards (Harris 2002:29). James Stewart, who was the nephew of the noted eighteenth-century shipwright Mungo Murray, reported that he had his leg injured in an "adzing accident" (Harris 2002:131). Shipbuilders mainly worked with hand tools that were regularly kept razor sharp. Other common dangers at shipyards included falls from heights and the possibility of being crushed below falling timber(s). In 1748, the *Maryland Gazette* announced:

> Yesterday, Mr. William Hood, a ship carpenter, being employed in building a vessel at West River, fell from the scaffolding, by which accident he was so much bruised, that he expired upon the spot (Thompson 1993:9).

In 1767, the *Maryland Gazette* described another incident in Annapolis, in which the scaffolding that had been erected around a vessel under construction collapsed.

> Monday last, by the breaking down of a Scaffold, at the Stern of a Ship on the Stocks, on the Dock, several persons below very narrowly escaped with their lives, and Mr. Wright-Mills, ship-joiner, who fell with it, got most terribly hurt. The accident was occasioned by a boatman making fast to it. (*Maryland Gazette* March 5, 1767).

The death of a young slave in Annapolis, who was who was hit on the head at the Shipcarpenter’s Lot, illustrates some of the dangers that were inherent in working at a shipyard (Baltz 1975:24). Timbers could shift, ropes and chains could break, and sheerlegs could collapse due to mechanical fatigue, or improper engineering.

Other shipyard injuries were less fatal, yet still significant. One type of injury was unique to shipyard workers and was common among caulkers. Caulkers used a specialized mallet called a beetle to hammer caulking irons to place oakum caulking into the seams of a vessel. Beetles were made of a hard wood that was banded with steel rings for reinforcement. The high pitched ring of the beetle on the caulking iron often caused caulkers to suffer deafness (Thiesen 2000:31).
**Infrastructure**

The act of launching new vessels and retrieving older watercraft for repair were among the most difficult activities at shipyards. These activities resulted in an evolution of technology and practices and culminated in development of substructures and cradles necessary for supporting a vessel during the construction and launching process. There are relatively few early historical accounts specifically describing the practical aspects of constructing slipways and of launching a vessel into the water. Every shipyard required at least one set of slipways, or shipways, for each vessel that was under construction. A larger shipyard also sometimes used drydocks for the same purpose. Slipways and drydocks were two of the largest and most durable features present at a shipyard. They were at the center of all construction activities at a shipyard, and at least two were required to maintain continuous production. All of the materials and labor involved in constructing a vessel were assembled at the slipway or drydock.

Some shipyards, such as the Royal Dockyards, possessed multiple slipways and were capable of constructing or repairing many vessels simultaneously. Multiple slipways also assisted in seasoning timber on the stocks (Stammers 1999:259). Many smaller shipyards also possessed multiple slipways. Pritchard’s Shipyard (38CH1049) located in South Carolina possessed three slipways (Amer and Naylor 1996). Peckham (2002:37) suggests that shipyards that built multiple vessels simultaneously usually built them in different stages. Once one vessel was launched and was being fitted and rigged, another vessel was reaching completion on the stocks, while a third vessel was just beginning on the stocks (Peckham 2002). In the nineteenth century new engineering technology resulted in the development of the Patent Slipway or marine railway. Initially, this new technology enabled both the launch and the repair of small and moderate sized vessels. The marine railway was rapidly adopted for the repair of vessels since it was a far less expensive infrastructure improvement than the technology required to construct a drydock. It was also less costly to operate than the drydock.

In addition to the slipways, drydocks, and marine railways, a number of other substantial features and activity areas have been identified during shipyard excavations. These have included timber careening frames (e.g., gridirons), launching ways, wharves, shores, scaffolding, blacksmith's shops, storage sheds, saw houses, saw pits, utility buildings, worker housing, and slave quarters (Amer and Naylor 1996; Eddins 2000; Friel 1995; Pitt and Goodburn 2003; Stammers 1999; Thompson 1993).
Early Ship Launching

The earliest boatbuilding sites probably constructed small watercraft directly on the shoreline above the high tide line with little required infrastructure. Late Viking Age (ca. 950–1100 A.D.) vessels were launched and drawn from the water on a wooden slipway called a hlunnr (Jesch 2001:170). Later, as the boats grew larger, they were probably launched using rollers to assist with pushing/pulling them into the water. In later periods most vessels were also built adjacent to the water. Interestingly, several historically documented occurrences demonstrate that vessels were also built at some distance from the water and then transported to the water’s edge through the use of rollers. Friel (1995:57) describes a 1519 document indicating that a stable was demolished in order to facilitate the transport of the vessel Katerine Pleasaunce from its construction location to the water for launching. The construction of vessels at a distance from the water was also undertaken in later periods. A shipyard at Duxbury, Massachusetts, that was reportedly located a mile from the launching site required 100 oxen to haul vessels to the shore for launching (Huffington and Clifford 1939). Specific information about the size and the type of vessels that were constructed at this shipyard is unknown. It is likely that these were not as large as vessels that were constructed along the shoreline. Such smaller vessels and boats could easily have been constructed away from the water and easily rolled or dragged into the water.

By the thirteenth century evidence suggests that trenches or launching channels were excavated from the site of the ship construction to the shoreline (Barker 1998). In 1295, a launching technique using a trench from the construction site to the shoreline was constructed and the vessel was pulled through the trench on rollers (Friel 1995:55). Documents suggest that the trench was excavated after the vessel was completed. The description of this form of launching suggests that although the launching sites were prepared prior to construction of the vessels that they did not consist of permanent fixed facilities. The descriptions of the launchings and the expenses associated with digging the slipway into the bank instead suggests that these were expedient launchings at a site that had not previously been used for such activities. There is no information as to whether these sites could then be reused during subsequent launches.
Other variations on this theme included the *fossum* (Latin for trench or channel) described in 1337 as the earliest form of English dock in which a dock was excavated into the shoreline (Friel 1995:55). After a vessel entered the dock at high tide, the entrance was sealed at low tide, and the vessel was repaired. Similar techniques also were used to launch new vessels. Another variation was the *delf*, described as ditch in which a ship is built and/or floated (Friel 1995:55; Online Middle English Compendium). Early boat repairs also were completed haphazardly by beaching a vessel on shore, or in a wet dock at low tide.
By the fifteenth century, royal vessels were regularly repaired in tidal docks (Friel 1995:56-57). The development of this method of launching may have corresponded with increasing vessel sizes and ultimately spurred the development of the first English drydock in 1495.

**Docks**

Several types of docks were traditionally used in shipbuilding and ship repair. Falconer’s Marine Dictionary (1780) defines the term dock as a “sort of broad and deep trench, formed on the side of a harbor, or on the banks of a river; and commodiously fitted either to build ships, or receive them to be repaired and breamed therein.” He divided docks into two distinct types. The first type of dock was the drydock, which had strong flood-gates to prevent the tide from entering the dock while the ship was under repair (Falconer 1780). The second type of dock was called a wet-dock. A wet-dock was a place where a vessel could only be cleaned during low tide, or in a period between high tides.
The drydock was a major technological development and the culmination of 200 years of refinement in the repair and launching of vessels. It is an installation "used for repairing and sometimes for building ships, which can be emptied of water and refilled as required" (Trinder 1992:216). It is also sometimes referred to as a graving dock. They were a technological improvement over careening or hauling vessels up a slipway, the prior methods used in repairing a vessel (Barker 1998). Careening was an uneconomical, sometimes dangerous technique for repairing vessels (Goelet 1986:1). Careening was a process exposing the sides and bottoms of a vessel for cleaning or repairs (Goelet 1986). It was “commonly applied to smaller vessels hauled into shallow water at high tide and laid on one side leaving the other accessible for cleaning or repair when the tide receded“(Goelet 1986:8). It also could be completed on a grid of timber framing placed in the water near shore. These frames, sometimes also referred to as a gridiron, are not well-documented in the archaeological record. The remains of a probable mid-eighteenth-century careening frame were identified at the Stephen Steward shipyard near Annapolis, Maryland (Thompson 1993) (Figure 5-8).

![Figure 5-8. Probable gridiron identified at the Steward Shipyard (Thompson 1993:22).](image)

Although careening was the most common method used in repairing a sailing vessel, there were considerable difficulties associated with the process. Careening was potentially
hazardous to the structural integrity of the hull of the vessel. During the repair process the vessel could be completely destroyed, and it is debatable whether careening could be used to make certain repairs to larger vessels. A 1609 account describes the loss of a 1200-ton East Indiaman called the *Trade’s Increase*. The account indicates that the vessel was lost in Java as a result of the careening process and illustrates the dangers of this method for repairing and maintaining sailing vessels (Goelet 1986:14).

The repairs most readily performed on the bottoms of vessels during the careening process involved the replacement of planking, and repairs to the keel, the shoe, rudder, and some elements of deadwood. However, the replacement of major structural members (e.g., frames, beams, cant timbers) would have required a great deal of care and effort during careening. The replacement of these larger timbers would also require considerable planning and the facilities for removing large timbers that often weighed several tons and then replacing them.

There was considerable variability in the methods to careen a vessel. One method for careening was known as the “parliamentary heel.” This process involved shifting ballast and ordnance within the vessel from one side of the vessel to the other. This process shifted the center of gravity of the vessel causing it to heel over on one side, thereby exposing the opposite portion of the hull. The dangers of this process included overly stressing the internal structure of the vessel. Records indicate that in 1782, the *Royal George*, a 100-gun warship, was lost during an attempt to affect repairs using a parliamentary heel (Goelet 1986:14).

As a result of the potential to damage a vessel (see Goelet 1986:14 for example), drydocks were often preferred for completing major repairs. Drydocks also were also more commonly preferred for building first rate naval vessels that were too large to be built on ordinary slips (Falconer 1780; Dodds and Moore 1984:30). Drydocks also were preferred by British shipwrights at the Royal Dockyards to avoid difficulties associated with the launch of the vessel. This use of drydocks was considered wasteful use of an expensive asset that was designed to repair vessels (Coad 1983:41).
Over time, drydock designs were refined to improve efficiency and reduce the maintenance and labor costs necessary to operate them. By the seventeenth century, most drydocks continued to be built for the navies of the world, but private drydocks also could be found in several of the major ports. By 1660, 16 privately owned drydocks were in operation in London (Barker 1991). In the 1690s, Edward Dummer, the Surveyor of Naval Works, redesigned the drydock gates so that only four to six men were required to operate them (Coad 1983:50). Dummer also was responsible for the introduction of the stone drydock at the Plymouth dockyard (Coad 1983:50). Prior to this, dry docks were made from earth, timber, and brick (Pitt and Goodburn 2003:200). By the early nineteenth century, multiple drydocks were present at each major British Dockyard. Over time drydocks were constructed or rebuilt to accommodate larger vessels and vessels of newer design. The British Portsmouth Naval Dockyard Dry-Dock No. 1, which was opened in 1801, was 277 ft in length, 92 ft in width, and approximately 27.16 ft in depth (Portsmouth 2010).

The United States General Court of Massachusetts encouraged the construction of a drydock in Boston or Charlestown, Massachusetts as early as 1667. They promised a 15 year monopoly to any person who built a drydock capable of holding a three hundred-ton vessel (Goldenburg 1968:34). In the United States, the earliest known drydock was constructed in
Boston by a private group of Charlestown residents circa 1677 (Seasholes 2003:387). This drydock may have been constructed in response to encouragement by the general court to build such a structure. The archaeological remains of a timber wall on the northeast side of this drydock were identified by excavations in 1986–1987 (Seasholes 2003:389). American naval drydocks were not constructed until after the War of 1812, as the government began construction of a conventional navy. The Charlestown Navy Yard in Boston and the Gosport Naval Shipyard in Norfolk were the first to construct drydocks. Completed in 1833, these stone and timber drydocks were instrumental in the development and maintenance of the new American Navy. By the mid-nineteenth century the introduction of large floating drydocks had superseded and replaced some of the former terrestrial drydocks.

![Figure 5-10. Rotherhithe Floating Dock circa. 1829 (Marcil 1995:163).](image)

**Traditional Slipways**

Prior to the mid-nineteenth century and the proliferation of commercial drydocks, most large European merchant vessels were constructed on slipways. Slipway is a generic term referring to the place that a ship is constructed and launched. Falconer (1780:270) defines a slip as a “place lying with a gradual descent on the banks of a river convenient for shipbuilding.” The strength and complexity of the slipway was generally determined by the type of soils that
were present on a site, the types of vessels that were constructed on the slipway, and the intended life-cycle of the slipway structure.

Figure 5-11. Launch of the schooner *Telegram* at the Charles Mallory & Sons Shipyard in 1875 (Peterson 1989:52).

Most shipyards used natural or artificial slopes along the shoreline to launch newly constructed vessels easily into the water using gravity. Too shallow of an angle could result in a vessel becoming stuck fast on the launching ways. Conversely, too great a slope could mean loss of control during the launch and damage to the vessel. One notable example of such an occurrence was the overly severe launching slope that caused the 60-gun frigate *L'Original* to break her back and sink at her launch in Quebec in 1750 (Marcil 1995:101). The slopes of slipways varied greatly and in some cases were cambered, but they were generally greater than three degrees and less than eleven degrees of angle (Thiessen 2000:31-32). French engineer Blaise Ollivier (1701–1747) recommended a launching slope of 1:12 for the slipway pads (Loewen and Cloutier 2003). Two French engineers of the eighteenth century, Diderot and d'Alembert, recommended slopes of 1:18 or 1:24. The difference between the two may have represented differences in launching techniques, one by the force of gravity, the other using capstans (Loewen and Cloutier 2003). A 1:12 slope (approximately 9 degrees), caused a vessel to slide down the slipway under its own weight after the wedges were removed, whereas vessels
on a slope of 1:24 (approximately 5 degrees) would have required mechanical assistance from capstans to move down the slipway (Loewen and Cloutier 2003). British shipwright David Steel recommended that “the declivity of blocks to build upon is generally from three-fourths of an inch to one inch in a ft [(1:18–1:12)]. The upper sides of them are made straight fore and aft, and level athwartships; sometimes the after blocks are raised above a straight, as the great weight of the stern and overhanging generally settles in building” (Steel 1822:373). Steel (1822) also emphasized the importance of the keel blocks on the slipway. The blocks served as the foundation for the vessel while it was under construction and he recommended that they be laid on the ground-ways in the middle of the slip, and the lower tier of the keel blocks should be fixed to the groundways (Steel 1823). The specific height of the blocks and their angle on the groundways were based on the size of the vessel and the depth of water at the end of the slipway. Steel (1822) insisted that care be taken to prevent any damage to the joint between the stem timbers and the keel (fore-foot) by the after groundways during the launching process.
Figure 5-12. Cross-section illustrations of the shoreline preparation required to construct some slipways (Carmichael 1919:149).
Figure 5-13. Common difficulties associated with slipway launches (Carmichael 1919:149).
At established shipyards, the shipwrights constructed new vessels at facilities with permanent infrastructure specifically designed to facilitate vessel construction and to assist with the launch of vessels. At locations where shipbuilders constructed a single vessel it is likely that expedient infrastructure was used to launch new vessels. The best-known fixed structure at a shipyard was the slipway. Most slipways can be divided into multiple components that include the substructure, groundways, launching ways, and cradle, as well as supporting shoring, and scaffolding. The substructure provided the structural support for the subsequent components of the slipway and also supported the vessel during its construction.

The first essential is that the foundations be sufficiently solid to bear the maximum load that will have to be carried, and this solidity must be alike for the entire length and width of building slip and ways. The universally adopted and most practical method of getting the necessary solidity of foundation in a small shipyard is to drive a sufficient number of rows of piles into the ground at proper locations to support keel blocking, ways and staging, spacing them as close as necessary to attain the desired end. The tops of the piles are then cut off at proper height and capped with timbers placed at right angles to launching direction, extending sufficiently far out each side of keel position to cover keel and launching way piles and allow all bilge, bottom, and staging supports to be placed on them….slip filled in with cinders, or other suitable material, to a proper height to make a good platform for the men working under the vessel during construction….From the low-water level the slip extends into water a sufficient distance to give the required launching depth of water over ends of launching ways (Desmond 1919 [1984]:66).
Slipways that were constructed on stable subsoil required the construction of only a limited substructure to support the weight of the vessel.

The lower line of support, or ways, forms nothing more than a kind of railroad, serving to conduct the ship into the water. They are laid perfectly smooth, even, parallel, and continuous, down the shore into the water; but as they have heavy weight to carry, and may have great pressure to endure, they have to be laid on good foundation, and have to be carefully maintained there by cross-pieces, which
keep them perfectly parallel to one another. If the bottom be rock, or even good gravel, the ways, of themselves, being stout logs of 18 inches to 2 feet square, will sufficiently carry the weight; but, if not, the ways must rest on transverse logs of timber, to embrace a large surface of ground, and great precaution must be taken to lay the ways straight, to keep them in their place true, and to carry them up strong and sound (Russell 1865:395-396).

In some instances this may have been achieved through cutting down the shoreline along the bank. Excavations at the Woolwich Dockyard indicate that the earliest slipways (circa 1680–1750) were constructed of transverse oak beams, bolted to the bedrock and in-filled with rubbish (Courtney 1974:24).

![Figure 5-17. Building slip No. 1 at Chatham Dockyard, ca. 1788 (Lavery 1991:73).](image)

Excavations at the VOC shipyard in Amsterdam have demonstrated the extent of the preparations that went into creating a suitable substructure on which to build a vessel. The archaeological remains of the 1660s slipway consisted of a slipway constructed perpendicular to the shoreline. This slipway was a structure with wooden floors covering an area measuring approximately 12 x 50-m (Gawronski 2003:18). The substructure consisted of piles that were tenoned into the notched underside of unfinished pine beams, which were fixed horizontally to the pilings. The central axis of the substructure was reinforced with additional support and heavier timbers, most likely to support the keel blocks (Figure 5-18).
Excavations at the eighteenth-century Stephen Steward Shipyard near Annapolis, Maryland recorded a large feature complex consisting of an area of brick and oyster shell approximately 15-x-7 m (48.9-x-22.8 ft) located along the shoreline (Thompson 1993). Three worked timber “poles” approximately 6 m in length were identified on the eastern side of the brick and oyster bed (Thompson 1993:48). In addition to the three in situ timbers, there was space for two more timbers on the west side of the brick bed suggesting that some timbers had been removed. Two other shipbuilding elements were associated with this feature including five scaffolding poles and a large timber dogshore that was identified two meters from the bed. This feature complex is the remains of a shipyard slipway that was most likely designed for side launching (Thompson 1993). The history of side launching is not well documented. Photographs of shipyards employing side-launching techniques suggest that it was utilized in locations where the channel was narrow or the water depth was relatively shallow. Both of these conditions were present at the Steward Shipyard. Unlike the other examples previously
discussed, the slipway substructure at the Steward Shipyard was constructed from brick and shell. It is unclear whether the further elements of the substructure, such as pilings, were present below the debris field since the brick and oyster were not excavated (Thompson 1993).

Excavations at the Hogendijk Shipyard (circa 1550–1650) on the Zaan River approximately 20 km northwest of Amsterdam, identified four slipways in which no substructure was identified. Slipway B, the most complete, possessed a remaining plank floor 8-x-18-m (26.1-x-58.7-ft) in size, but was originally approximately 30 m (97.8 ft) in length (Gawronski 2000:136). It consisted of three distinct episodes of construction and/or reconstruction. Each episode consisted of a layer of timber framing supporting a layer of planking, and a thin layer of sand or clay. This sequence was repeated approximately every 25 years. The slipways that did not contain any substructure were constructed on subsoil lacking the stability required to support a slipway with a heavy ship (Gawronski 2003b:137). As a result, the slipways began settling into the subsoil, and had to be replaced periodically.
The second component of slipways was the groundways. These were often large permanent timbers fixed, and/or fastened, to the pilings of the substructure. The groundways formed the platform supporting the blocks and later supported the launching ways (Desmond 1919 [1998]:205). Archaeological evidence of groundways suggests a great degree of variability in their construction. Excavations of a slipway at the royal shipyard at Saint Charles, Quebec identified a timber grid with a 1:24 slope towards the water (Loewen and Cloutier 2003:32). Blaise Ollivier described such a structure as a “grillage” or “bed,” and Diderot and d'Alembert called it a “ladder” (Loewen and Cloutier 2003:32). Dendrochronology of timbers from this slipway indicates that the grillage dated to circa 1663, and was repaired in the 1690s with a wharf and flooring added in 1739 (Loewen 2009).
The excavation of portions of the frame seemed to identify a hybrid system in which the frame actually served as the substructure and the groundways. The lack of pilings or other substructure may not have been necessary due to the clay subsoil at the site. Two layers of white pine (*Pinus strobus*) “cross pieces” oriented perpendicular to the slope of the slipway and five longitudinal timbers oriented along the longitudinal axis of the slipway formed the frame. The lower tier of transverse timbers rested either directly on the ground surface or in shallow trenches. The outermost longitudinal timbers supported the runners of the cradle, while the three innermost longitudinal timbers supported the keel of the vessel along the central axis of slipway (Loewen and Cloutier 2003:33).
The shoring, standards, and scaffolding were erected as the vessel was assembled on the keel blocks. The term “on-the-stocks” was often used to describe a vessel that was under construction.

Once the slipways were constructed, a series of large blocks were installed along the centerline of the slipway that were level and oriented in a straight line. These blocks were called keel blocks and were designed to support the weight of the keel and the vessel as it was constructed. The keel blocks elevated the keel of the vessel several ft off of the slipway, or
drydock floor, and allowed workers access to the bottom of the vessel from the garboard strakes to the turn of the bilge. The keel blocks had to be of sufficient height to allow a shipwright to easily work on the underside of a ship during construction. As construction of the vessel proceeded, shipwrights added shores to prevent a vessel from falling over or from moving. After the framing of the vessel was completed, shipwrights added scaffolding and catwalks to the slipways. These allowed the shipwrights to easily access the sides of a vessel that was under construction.

The shoring usually consisted of several large heavy timbers that kept the vessel in place while it was under construction, and a series of smaller timbers that propped the vessel to prevent it from tipping while on the keel blocks. Evidence from Dutch shipyards suggests that the height of the keel blocks from the surface of the slipway was directly proportional to the method that was used to construct the vessel. The bottom-first construction method may have used shorter keel blocks while a frame-first construction method may have required higher keel blocks that allowed shipwrights to fasten the garboard and adjacent planks (Barker 1998:68). In Chapman’s (in Barker 1998) description of the construction and launch of a small eighteenth-century vessel, the vessel was supported at points at the turn of the bilges during the launch. These bilgeways consisted of inclined planking located on the floor of the slipway directly below the vessel being launched. The scaffolding was often used to allow shipwrights and caulkers access to the sides of the vessels as it was being planked. The scaffolding frequently rose as the vessels was planked up.
After the construction of the hull was completed, the vessel was raised and the keel blocks were removed. After the keel blocks were removed the vessel was lowered into place. Vertical supports were secured between the vessel and the bilgeways. The transfer of the entire weight of the vessel to these bilgeways required that they were securely fastened to the slipway and strongly anchored to pilings and posts along the slipway.

The third component of slipways, the launching or sliding ways, consisted of a large timber or plank, or several pieces that were bolted together and installed on the slipway parallel to the orientation of the slipway to carry a vessel from the building slip into the water (Stalkartt 1787:212; Desmond 1919 [1998]). These timbers could be temporary or they could be fixed in place, but they do not often survive archaeologically.

The launching ways served as a smooth platform on which the fourth and final component, the cradle, rested. The upper portion of the cradle conformed to the shape of the ship’s bottom to which it was securely attached (Falconer 1780). The lower surface of the cradle consisted of two runners that sat directly upon the launching ways. The runners of the cradle sat on opposite sides of the ship’s bottom at the turn of the bilge (Stalkartt 1787). As a result, this type of launching way is sometimes called bulgeways or bilgeways. Together the cradle and the launching ways carried the weight of the vessel as it slid down the launching ways. To further enhance a smooth launch, the launching ways were often coated with soap or tallow for lubrication (Falconer 1780).
Barker (1998) has documented the relatively recent development of the shipyard cradle and its intricacies. In general, the cradle was a wooden framework that was custom fitted to each ship under construction. The cradle, bilgeways, poppets, and standing ways had to be very stable and strong to support the force of gravity as the weight of the vessel pushed downwards. Transverse forces pushed the bilgeways apart, while buoyancy lifted the vessel during the final moments of the launch. This buoyancy momentarily placed dynamic stresses on the hull of the vessel as part of the vessel was supported by the water, and the unsupported portion was still on the slipways. At the end of the construction process, the cradle was constructed to transfer the weight of the vessel to a temporary structure designed to facilitate its launch. When it was ready for launch, the final restraints were removed and both the cradle and the vessel traversed down the slope of the slipways into the water. If the launch was successful, most of the cradle ended up in the water at the base of the slipway as a tangled mass of wood. From historical documents, it appears that there were large differences between specific methods of launching and the construction of cradles based on differences between regional traditions of shipbuilding and ship launching. Some techniques may not have even required a cradle for the launch. Peckham (2002:26) described the side launch of the *Emerald* at Essex, Connecticut during the early twentieth century. He stated that the completed *Emerald* was lowered onto its starboard side and that she slid down the ways on one bilge. This method of launch was considerably less expensive than building a cradle.

All of these developments, however, did not guarantee success. Historical documents clearly indicate that difficulties arose when some vessels became stuck fast on the launching ways. This often meant delays to the launch, which required that the vessel be pulled into the water using block and tackles, crabs, capstans, or other mechanical aids.

**Shiphouse**

The design and construction of the shiphouse was a major technological development that further enhanced shipyard technology and influenced patterns of work organization. A shiphouse, also called a covered slip, was a slipway or a dry dock covered by a roof. Other nationalities adopted covered slip technology soon after its introduction in Sweden and Great Britain. The roof protected vessels from adverse weather conditions during the often lengthy repair or construction process. The technology necessary to construct the roofs required to span a large warship was at the limit of what could be accomplished with timber technology (Coad
1983:46). Some covered slips were 300 ft long and over 60 ft in width (Coad 1983:46). Admiral Bentham introduced covered slips to the Royal Dockyards between 1807 and 1814, after seeing similar structures during his visit to Sweden (Coad 1983:46).

Historical and archaeological data recovered during excavations at the Washington Naval Yard indicate that a shiphouse was added to the west slip during the mid 1820s (Eddins 2000:100). This shiphouse was probably a wood-framed building measuring approximately 238 x 99 ft, and was approximately seven stories in height (Eddins 2000:101-108). An 1834 illustration of the shiphouse indicates that it possessed both windows and skylights to provide lighting and possibly ventilation to the interior of building (Eddins 2000:101).

Figure 5-25. Washington Naval Yard and with ship house circa 1862 (Adapted from Eddins 2000:106).
After 1853, the west shiphouse was expanded to approximately 309 ft in length (Eddins 2000:110). Throughout this period of development at the Washington Naval Yard, British dockyards continued to improve the design of shiphouses.

Within two decades after the introduction of the shiphouse in Great Britain, British dockyards shifted from wood components to metal components in the construction of covered slips (Coad 1983:46) and were some of the largest structures built there at that time. These dockyard structures were built well before the large metal train sheds at Kings Cross and Paddington, which were considered the most revolutionary examples of engineering for spanning wide spaces during this period (Coad 1983:48). The introduction of shiphouses at Swedish, British, and American shipyards within an approximate 15 year period indicates a rapid widespread adoption of similar technological improvements.

Ironically, the introduction of iron hulled vessels made these improvements to the shiphouses obsolete. Iron hulled vessels, unlike wooden hulled vessels, did not require significant protection from the elements during the construction process. Gradually the shiphouses of the Royal Dockyards were demolished with the ascendancy of the iron vessels
The adoption of iron hull construction and steam-propulsion in ship design caused a major restructuring of the British royal dockyards. These innovations "demanded a whole new technology to build and maintain them. Foundries and machine shops superseded sawmills and sail lofts; the scale changed and the pace quickened. If it did nothing else, the all-metal warship ushered in the age of accelerating obsolescence" (Coad 1983:39). This accelerating obsolescence caused officials to close obsolete dockyards and to add, "what amounted to new dockyards on to the main existing ones" (Coad 1983:39). British merchant shipyards also adopted iron steamship technology. By 1870, over half of the vessels produced by British merchant shipyards were iron steamships (Heinrich 1997:30).

**Patent Slipways & Marine Railways**

One of the most notable examples of the adoption of innovative technology that smaller shipyards used to circumvent the substantial capital resources that were more readily available to larger shipbuilding establishments was the invention of the Patent slipway. The Patent Slipway was invented by Thomas Morton in 1818 to haul vessels out of the water in order to make repairs on the bottoms of their hulls (Morton 1819). A drydock was ten times as expensive to construct and was also more costly to operate.

First developed in Great Britain, the Patent Slipway consisted of two components; a set of inclined parallel iron rails, and a carriage. The rails formed the ground ways of the slipway and were laid from below the water and extended well beyond the high water mark. The rails were inclined and generally oriented perpendicular to the direction of the shoreline. They could also be offset at angle to the shoreline. The carriage consisted of a well-constructed cradle with wheels that traversed the iron rails of the slipway. The carriage was pulled up the slipway by a system of chains or cables that were powered by winches. Initially, these systems were driven by horses, but were later powered by steam engines (George 1873). The final advantage of the marine railway was that the carriage was re-usable.
Figure 5-27. Morton’s Patent Slip (Rumm 1978).
A similar innovation in the United States resulted in the development of a technique for pulling a vessel out of the water called an “Inclined Plane,” and later a marine railway. There are conflicting accounts of when the first marine railways were built in the United States, but the earliest documented example was constructed for the U.S. Navy at the Washington Naval Yard. The railway was first proposed and designed by Commodore John Rodgers in 1821 and completed in 1823 (Adams and Christian 1975; Morrison 1909; Rumm 1978). The first civilian marine railway was probably built in 1824 in Salem, Massachusetts by the Salem Marine Railway Company (Rumm 1978; Theisen 2000). Three years later The Franklin Journal and American Mechanics’ Magazine produced an in depth description of the Rail-way Dock, built by Mr. John Thomas in New York City (Sullivan 1827). The New York marine railway was described as 300 ft (90 m) long, and was initially powered by horses (Morrison 1909). The construction of this railway may also have used the first diving bell in the United States for
cutting pilings placed at the end of the railways for supporting the rails extending underwater (Sullivan 1827; Morrison 1909).

Investigations of the merits of drydocks and marine railways by several committees of The Franklin Institute reported that the marine rail-way was more practical than a drydock and more economical than the custom of “heaving down” (Sullivan 1827:84-85). It was reportedly “convenient, expeditious and economical, for the smaller class of ships of war” (Sullivan 1927:84-85). Dry docks were also believed to be too humid, dark, and confining for proper repair work. Marine railways appear to have been better adapted to the Mid-Atlantic and Southeastern United States. The committee also stated that the marine railway was “peculiarly adapted to alluvial soils, such as the shores of most of our southern harbors” (Sullivan 1827:84-85).

The Creque Marine Railway is a marine railway on Hassel Island, located just off of the island of St. Thomas in the Virgin Islands. The railway was originally built in the 1840s and is the oldest steam-operated marine railway in existence. The steam engine, gears, boilers and power house structure remains are deteriorated but relatively intact. The original marine railway could haul vessels of approximately 200-300 tons, while by 1870s the railway had been modified to accommodate vessels of up to 1200 tons (STHT 2010).

Figure 5-29. Postcard of the Creque Marine Railway circa 1900 (STHT 2010).
A patent for an 1843 marine railway may represent an example of a local Chesapeake Bay shipbuilding design innovation. Well-known Baltimore shipwright, Andrew Flannigan, patented a marine railway design. While this design was patented it is not known whether this design was ever constructed.

**Ship Construction Process**

In the eighteenth and nineteenth centuries, merchant vessels were constructed both speculatively and on contract. When building a ship on contract, customer(s) selected a shipwright to design and build the vessel. In the Chesapeake Bay the customer was often a merchant, planter, or a ship captain. Building a sailing vessel was an expensive undertaking, and an investment in shipbuilding was risky since ships routinely sank or were captured as prizes during the numerous conflicts of the period. One strategy for moderating the expense and the risk involved in ownership or loss, was for multiple individuals to purchase shares in a vessel. In the Chesapeake Bay, Maryland-built vessels were owned by as many as a half dozen individuals.

Once a customer selected a shipwright, the customer and the shipwright probably discussed the routes and cargoes in which the vessel was likely to be employed. This discussion of the trade routes helped to define the hull size and the rigging plan of the vessel that would be built. These also helped to define the commercial and environmental conditions in which the
vessel would operate and eventually determined the amount of profit of a particular vessel. In an operating environment filled with shoals and shallow reefs, a small shallow draft vessel with less cargo capacity may have made more sense than a larger vessel with a greater cargo capacity.

Another variable that shaped the design of a vessel were the economic conditions that existed during the period in which the vessel was designed. Large square rigged vessels often were more economically feasible when they carried large bulk commodities, such as tobacco, in regions with reliable wind and currents. Fore-and-aft rigged vessels were more economical on trade routes that required an ability to sail closer to the wind. In addition, some vessel types such as the “Bermudas Mould” sloop may have developed in response to piracy and privateering in the Caribbean. Several ship designs developed during the eighteenth century stressed the importance of speed rather than the size of the cargo space. These fast, V-shaped hull designs were often useful at avoiding privateers during wartime and were highly uneconomical during peacetime.

After the general vessel type and design were selected, the shipwright and merchant sometimes signed a contract that specifically described the way in which the shipwright was to build the vessel. Surviving examples of contracts are generally rare from the Chesapeake region; however, several provide a general outline of the construction process in this region. The contract usually specified various benchmarks in the construction process and how the merchant was supposed to pay the shipwright. When the vessel was partially complete, the shipwright would receive a partial payment that was agreed upon in the contract. When the vessel was completed, the shipwright received the last installment of the payment before turning ownership of the vessel over to the merchant.

After the contract between a shipbuilder and a customer was signed, the shipwright began planning more specific details about the construction of the vessel. These construction details determined speed, sailing qualities, seaworthiness, and cargo capacity of the vessel. Colonial shipwrights relied heavily upon their own personal experiences and knowledge of their craft to build a ship. Although a number of shipbuilding treatises and dictionaries had been introduced in the seventeenth century, most shipwrights probably did not use them. Instead, shipbuilders were influenced by their own shipbuilding experiences and also by the designs of other vessels built in foreign ports. Because shipbuilders were a part of this larger trans-Atlantic system, they frequently came into contact with new types of vessels and new construction
techniques. The mobility of sailing vessels throughout the Atlantic World meant that the dissemination of shipbuilding knowledge was both rapid and continuous. This knowledge was gained from first-hand experience with new types of vessels rather than from formally acquired knowledge from books or construction plans.

Colonial and early nineteenth-century shipwrights were unlikely to construct vessels that were based on purely theoretical designs (McKay 1940:7 [1839]). Theoretical designs probably required a substantial amount of formal education. In a preliminary examination of a group of Somerset County, Maryland shipwrights, four out of eleven (30 percent) signed their own name using a mark instead of a signature. Other shipwrights within this group may have possessed sufficient skill to sign their own names, but few would have mastered the mathematics necessary to utilize such shipbuilding texts. This lack of formal education probably played a significant role in limiting adoption of theoretical shipbuilding by many American shipwrights. In *The Practical Shipbuilder*, master shipbuilder Richard McKay (1940:7 [1839]), stated that shipbuilding "publications of other countries have been large and expensive, full of intricacy, scientific rather than practical, and consequently of little use to the uneducated mechanic."

Toward the end of the eighteenth century, British shipwrights were increasingly disassociated from the craft aspects of shipbuilding, and instead became associated with the science of naval architecture. The British began replacing the old apprentice system in the early nineteenth century and opened their first School of Naval Architecture at Portsmouth in 1811 (Lavery 1989:58).

Thiesen (2000:23) and Hunter (1999:13) link traditional methods of shipbuilding to kinship oriented, craft-based societies. Kinship was an important aspect of financing capital-intensive crafts, trades, or businesses such as shipbuilding (Grassby 1995:84, 307). Kinship also played an important role in the transfer of specialized knowledge and information between different groups. In America, individuals who practiced certain trades were more likely to have been apprenticed in their father's trade than not. Artisans using a "dedicated shop site, such as a smithy, a brewery, a tannery" or a shipyard, tended to follow in the family trade and thus inspired multi-generation family dynasties (Daniels 1995:4). Several prominent English shipwrights including Mathew Baker, William Sutherland and Phineas Pett had family members who were also skilled shipwrights (Thiesen 2000:23). Several Anne Arundel County residents also appear to have formed craft dynasties, although it was rare that they lasted more than two
generations. In other parts of Colonial America, shipbuilding dynasties were present in Philadelphia, Salem, Portsmouth, Boston, and Norfolk (Goldenberg 1981:116).

One way in which the master shipwright could visualize his intended design was by creating a half model. A half model was a scaled three-dimensional model that was made out of a block or blocks of wood. The intricately carved model represented an exact scaled down version of half of the hull shape of a vessel that the shipwright intended to build (Greenhill 1988:90). By creating a model, the shipbuilder visually recorded more information than was available in most sheer, body, and half-breadth construction plans. From this half-model the shipwrights could transfer the model measurements to the mould loft floor. Here the shipwright could sketch the tapering change of the hull shape at each body station. He used chalk or a scribing knife to mark the size of the timber necessary at approximately ten key frame locations. After he had marked the size of the frames at each station, the shipbuilder could cut and shape the timber to the correct size, or they could create templates to help shape the timber to the correct sizes.

The following discussion of ship construction is highly generalized and is mostly intended to describe ocean-going, Anglo-European, frame first, carvel shipbuilding techniques. It should be noted that the sources that describe ship construction vary considerably from source to source. Specific shipbuilding practices differed case-by-case based on the period, nationality, location, design, and personal knowledge of individual shipwrights.

Most sources agree that the first timber(s) usually installed in a new vessel was the keel. However, not every vessel possessed a keel. The Brown’s Ferry vessel recovered from the Black River, South Carolina, was a locally designed vernacular watercraft and example of a vessel without a keel (Steffy 1988:119-120). In most vessels, the keel served as the main longitudinal support and also supported the addition of the frames, deadwood and the stem and stern of the hull (Steffy 1994:273). The 50-ft long Brown’s Ferry vessel did not possess a keel but instead, its construction relied on three 4-in thick planks for longitudinal support. Larger sea-going vessels usually possessed a keel. The keel was usually composed of several timbers that were scarphed together and then were bolted together by large trunnels and iron bolts. To prevent the vessel from inadvertently moving during construction, and to prevent the keel from warping during the construction process, the keel was sometimes bolted to the keel blocks (Greenhill 1988:98).
After the keel was installed, the stempost, sternpost, and the aprons were installed by scarphing them and then and bolting them to the keel. Next, the key frames were bolted to the keel as individual components (floors, futtocks, and top timbers) or as pre-assembled frame units. The key frames were installed to rest on top of the keel and to fit predetermined locations. These locations helped to define changes in hull-shape between the bow and the stern. The key frames were placed in the location of every third or fourth frame. After they were installed and braced, the shipbuilders would attach temporary ribbands or battens to these key frames to determine the exact shape of the remaining intermediate hull frames (Steffy 1994:278). After the remaining frames were shaped and fitted, some temporary shoring was added to stabilize the framing to keep it in place, and to keep it from twisting. In many vessels a keelson was installed along the centerline of the vessel to provide additional longitudinal support. Once these portions of the vessel were constructed, the keel, stempost, sternpost, frames, apron and keelson were bound together at the sheer line to prevent the vessel from warping or wracking during the planking process (Greenhill 1988:132). After the frame was bound together, the knees, deck beams, stringers and other timbers were installed. Once the general framework of the hull was completed and stable, the exterior of the vessel could be planked and the ceiling planks added.

In the Colonial period planks were usually sawn by hand at the shipyard. Some shipyards also had access to mill cut lumber and planking. Planks were individually fastened to the frames to accommodate the changing shape along the length of the hull. Shipwrights usually classified plank as between 1 1/4 and 4 inches in thickness, while anything of lesser thickness was generally considered as board (Jarvis 1998). The planks were fitted by heating them to make them pliable and more easily bent to fit the curvatures of the hull. They were then fastened to the frames with wooden trunnels.

One method for heating plank was called ‘stoving.’ Stoving was a process in which planks were placed in wet sand and heated until they were pliable (Dodds and Moore 1984:81). In 1737 a Scots shipbuilder working at Woolwich wrote his father describing how his shoes became worn while stoving, "since they are planking a 90-gun ship where we kiln the plank in hot wet sand over a large furnace where we go in to shovel on and off the sand which is sometimes so hot that we stay in five minutes” (Harris 2002:131). In 1736 a steam kiln was introduced as a new method to heat planks (Dodds and Moore 1984:81). The steam kiln is still employed by wooden boat builders for heating planks. After the planking was complete,
caulking made of oakum was driven into the seams between the planks. Both the caulk and
the planks swelled when immersed in water, thus waterproofing the vessel. Finally, pitch, tar,
tallow, and turpentine were used to treat planking both above and below the waterline. Some
vessels were also elaborately painted (Jarvis 1998:395). After the late eighteenth century, hull
bottoms of many vessels were covered with copper sheeting to prevent damage from shipworms.

After the hull was complete, the shipwrights slightly lifted the vessel off of the keel
blocks by driving wedges between the vessel and the keel blocks. The weight of the vessel was
then transferred to launching ways located to the sides of the vessel. These launching ways
carried the weight of the vessel until it was completed and ready to launch. Just before
launching, the ways were usually coated with grease or tallow to decrease the friction during
launch. With high tide and a signal from the master shipwright, the last blocks, shores, and
wedges that held the vessel in place were removed. If the master shipwright’s calculations were
correct, the vessel slid dramatically into the water. After the vessel was launched, a large
number of tasks remained to be completed. These tasks included stepping the masts, installation
of spars, standing rigging, and running rigging (Harris 2002:137). These tasks were all known as
"finishing" (Harris 2002:138). After it was finished, a vessel was ballasted and victualled and
prepared for service with the customer.

The research presented in this chapter documents some of the variability in site
infrastructure and shipbuilding and repair processes at shipyards from around the globe. This
research also suggests that shipyards and dockyards were centers of engineering and
organizational innovation. Despite the assertions that some historians have presented—that
shipyards could be simple affairs that were established on an ad hoc basis at any convenient
place for shipbuilding—this chapter illustrates the types of required and desired facilities
necessary for shipbuilders to engage in successful shipbuilding and repair activities. The next
chapter describes the methodology employed in the GIS model and field studies.
CHAPTER 6: FIELDWORK METHODS

The study area of for this project consisted of Somerset, Worcester, and Wicomico counties on the Lower Eastern Shore of Maryland. It was selected for study because the area possessed a substantial shipbuilding industry during the Colonial and Early Republic periods and also because the rural nature of this area was judged to have limited shoreline development and disturbances. These factors enhanced the potential for identifying the maximum number of archaeological sites associated with shipbuilding sites. The first phase of this project used the direct historical approach, a model developed by Julian Steward (1942). For this study the historical record was queried to identify shipwrights and merchants operating shipyards in the area of old Somerset County, Maryland between 1660 and 1900. This information was used in conjunction with environmental data to create a GIS-based predictive model of site location.

Methodology

This study uses historical documents, maps and secondary historical research to ascertain the probable locations of shipyards and to identify individual shipwrights, merchants, and planters who owned or operated these sites. While this method was originally employed in the study of prehistoric cultures, the modification of this methodology has since been adopted for the study of historic cultures. It has been successfully used to identify the archaeological remains of numerous Spanish Missions in northern Florida (Weisman 2003:214). The information gathered during this preliminary investigation was incorporated into a Geographic Information System (GIS) model of environmental and cultural variables considered likely associated with shipyard sites.

Primary and secondary historical research identified an initial sample of 167 merchants, shipwrights, ship carpenters, and apprentice shipwrights who worked or resided within the area of old Somerset County, Maryland between 1660 and 1860. Information about these individuals was compiled into a database to help identify the locations of the shipyards in which they worked. This list of individuals involved with shipbuilding was then compared with a database of seventeenth and eighteenth-century patent and tract boundaries compiled by John Lyon (2004). Mr. Lyon then created and provided tract maps of properties associated with individuals who may have been involved with shipbuilding. These maps were next digitized in ArcGIS as a
data layer to target specific areas of the study area possessing a higher potential for containing shipyard archaeological resources. Mr. Lyon’s data were then combined with other environmental data to supplement a comprehensive GIS-based predictive model of site location.

**Geographic Information Systems Model**

The Geographic Information Systems (GIS)-based predictive model used four environmental variables and one cultural variable to predict areas in old Somerset County, Maryland possessing a high probability of containing shipyard archaeological sites. The primary variables that were used to predict shipyard locations were proximity to navigable water, slope, and the capacity of soils to support heavy structures. These variables were selected based on Ford's (2001) GIS study that modeled environmental conditions to predict shipyard locations. Previous work by Ford (2001) predicted the location of shipyard sites using historical data but the model he created was tested through only limited ground truthing. Each variable of this model was derived from other sources of GIS data. This information was supplemented with a systematic examination of historical maps and property research to identify specific shipyards in the region.

Soil data were downloaded for the area of Somerset, Wicomico, and Worcester Counties, Maryland (USDA 2004 and 2005). These soil data consisted of 1:12000 Soil Survey Geographic (SSURGO) database for Somerset, Wicomico, and Worcester County, Maryland. SSURGO data contains the most detailed information about the spatial extent of particular types of soils and the properties of those soils. The tabular data and spatial data were downloaded in a UTM Zone 18, Northern Hemisphere (NAD 83) coordinate system.

These data were used to derive particular soil types with specific engineering characteristics to serve as a proxy measurement of the potential for soil to support shipbuilding operations. Specifically, this expression was based on the capabilities of soils tostructurally support the foundations for homes of two stories or less. The soils that were selected all possessed only a slight to moderate degree of limitation for supporting the foundations. Any additional variables, such as the tendency for these areas to have a high water table, severe seasonal flooding, and extreme slope, were discounted for the purposes of this archaeological model. The model was designed to be as inclusive as possible at the level of each individual variable.
The digital stream and shoreline data were downloaded as coverage named Md047stm.e00 from the University of Delaware web site. These files consist of TIGER/Line files that were extracted from selected information in the Census TIGER database. The 1:100,000 scale TIGER/Line data were not formatted into a particular map projection but instead the data matched the base maps from which they were scanned. This data layer was used to create a 50-m buffer around all shorelines and streams in the area comprising old Somerset County, Maryland.

The final data layers of this project were derived from Digital Elevation (DEM) data that were downloaded from the U.S. Geological Survey's NED (National Elevation Dataset) (USGS 1999). This mosaic of 1:24,000 scale elevation data was downloaded as a unit for an area encompassing 53-USGS 7.5-minute quadrangles that comprise the study area. This downloaded data set includes the adjacent areas of Wicomico and Somerset counties, Maryland, as well as portions of Delaware and Virginia. The data was downloaded in the NAD83 datum from http://seamless.usgs.gov/website/seamless/viewer.php. From the DEM data a new layer was created to identify locations within the project area with slopes that were greater than 2 percent and less than 12 percent. This calculation was based on the slopes identified by research that were the most likely to represent the range of historic launching angles. The correct angle was required for a new vessel to slide down the launching ways without damaging the vessel or injuring the personnel at the shipyard (Ford 2001).

All data sets were projected into the North American Datum 1983 (NAD 83) datum and the UTM coordinate system (Zone 18). After the data were converted into the same format they were imported into ArcGIS and these data were used to generate new data layers. From these collective layers a predictive model of shipyard locations was developed. This GIS project created a predictive model that considered well-drained soils located within a 50 m distance of navigable creeks, and with slopes ranging between 3 and 11 percent as having a high archaeological potential of containing shipyards. The results of this project created a GIS based model that identified locations that met the criteria of the specified environmental data layers that were described above (Figure 6-1). These locations were then examined during a shoreline archaeological survey to identify actual shipbuilding sites.

A single cultural variable in the model consisted of spatial information for identifying the locations of shipyards. This information was identified from a variety of primary and secondary
historical sources. These sources included consultations with historians and researchers who have conducted research in the three counties that encompass the project area (Somerset, Wicomico, and Worcester). These consultations helped develop a preliminary list of the names of shipwrights and merchants associated with shipbuilding who were known to have operated within the study area. This list was continuously expanded over the course of the project. The list of names was cross-referenced with a proprietary database of land records compiled by genealogical researcher John Lyon (Lyon 2004). His database included reconstructions of seventeenth and eighteenth-century land and tract boundaries for Somerset County property owners and leaseholders between 1660 and 1785 (Lyon 2004). This property database was queried to identify potential shipbuilders who owned or leased property that was located adjacent to navigable waterways. The tract boundaries of properties that were identified were then digitized and incorporated into an ArcGIS data layer.

This ArcGIS data layer containing tract boundaries was one of several data layers used to develop a GIS predictive model designed to identify specific geographical areas considered to possess a high potential for containing the archaeological remains of shipyard sites. This predictive model was comprised of publically available environmental and cartographic data layers to create the predictive model of shipyard locations.

![GIS-based map showing areas of archaeological probability.](image)
Field Methods

The fieldwork for this study focused on areas that were modeled as having a moderate to high potential for containing shipyard resources. Since the most extensive and easily identifiable remains of shipyard sites are the facilities used to repair and launch vessels, this survey used a water-based approach to identify shipyard infrastructure located along the shoreline(s). The most substantial features that have been identified during previous archaeological excavations at shipyard sites have included timber careening frames (called gridirons), drydocks, slipways (constructed of earth, timber, brick or stone) launching ways, wharves, miscellaneous timber pilings and scaffolding, as well as industrial and domestic archaeological assemblages (Amer and Naylor 1996; Eddins 2000; Pitt and Goodburn 2003; Stammers 1999; Thompson 1993).

To identify these types of infrastructure, an archaeological survey was conducted along the shoreline of the various rivers and creeks within the project area that were determined to have a high probability of containing shipyards. This survey relied on the visual inspection of the shoreline from a boat at low and intermediate tides. The survey was assisted by unusually low winter tides and a strong northwesterly wind.

The archaeological shoreline survey was conducted between December 5, 2005 and December 21, 2005. Fieldwork was conducted from a 19-ft Carolina Skiff that was launched from public boat ramps within the project area (Figure 6-2). All survey fieldwork at this phase was completed by Jason D. Moser and Maryland Historical Trust archaeologist Steve Bilicki.

Figure 6-2. MHT survey vessel used to complete the shoreline survey (Moser 2007).
When historic sites or shipwrecks were identified along the shoreline, their position was mapped using a handheld GPS unit. Sites were photographed and brief notes were completed that described the artifacts and any features at the sites. In some cases, sites were videotaped for a more complete record of the site. When shipyard sites were identified, a more intensive investigation of the site was conducted. This more intensive investigation included a preliminary pedestrian survey of the shoreline and a handheld metal detector survey of the site.

The third phase of this project collected additional data about some of the sites that were identified during the initial shoreline survey. Prior to undertaking the third phase of this project, the property owners of the shipyards were contacted and permission sought to gain access to these sites from the land. Between June 17 and June 30, 2006, additional investigations were conducted at four shipyard sites (18WC3, 18WC155, 18WC164 and 18SO364). During this phase of the project, the exposed timbers and other structural remains were measured and mapped using tapes and compass. These investigations were greatly assisted by volunteers Sherri Marsh, Jennifer Gardiner, Paul Baker Touart, Dr. Mark Staniforth, Pete Lesher, Amanda Indra, Dr. James Gibb, Dionysius K. Kavadias, and Troy Nowak. Following several days of investigations at each site, additional mapping of the sites was completed using a Total Station to produce a scaled map showing the major components of each shipyard investigated. At site 18WC155, a controlled surface collection was completed in a plowed field directly behind the shoreline.

Following the fieldwork, a Side Scan Sonar investigation was conducted at each shipyard site. The Side Scan Sonar survey was performed under contract by BRS Consultants on June 31 and July 1, 2006. The survey platform was a 25-ft Parker with Sport Cabin and a MerCruiser inboard and stern drive. The sonar used during this project was a Klein 595 (Klein 590) Side Scan Sonar mounted to the side and just below the survey vessel (Figure 6-3). Data were collected real-time using GeoDas Software from Oceanic Imaging Consultants (OIC). Post-processing converted the files into *.Xtf files. Navigational data were recorded via a Raymarine shipboard navigation system. The sonar was towed at a speed of 2.5 to 3.5 knots. Sonar interpretation was completed by Steve Bilicki in consultation with Jeff Morris (GeoMarine Inc).
In October 2006, with funding provided by the Society for Industrial Archaeology (SIA) and matching funds contributed from the 2005 MHT non-capital grant, a limited dendrochronological study of timber remains at several shipyards was conducted. The Oxford Dendrochronology Laboratory was contracted to collect and analyze in situ timbers at three of the shipyards. Field specimens were collected by dendrochronologist Michael Worthington, assisted by Jason D. Moser and volunteers Steve Bilicki and Jennifer Gardner (Figure 6-4). Each sample was collected to maximize the return of information and minimize potential damage to the timbers. These samples were then returned to the lab where they were prepared, measured and analyzed. The Oxford Dendrochronology Laboratory attempted to match these samples to each other and against existing master chronologies in an effort to determine the year and season in which trees were felled for the various construction/repair phases of timbers and features of each shipyard.
CHAPTER 7: FIELDWORK

Barren Creek Marine Railway (18WC3)

The site of the Barren Creek Marine Railway is located within the boundary of site 18WC3, a Woodland period prehistoric site (Figure 7-1). Barren Creek is a tidal creek located on the east side of the Nanticoke River. Today, the entrance to Barren Creek from the Nanticoke River is dominated by a wide band of tidal marsh with shifting channels that frequently fluctuate due to siltation and currents. The mouth of the Barren Creek contains a substantial sandbar that presents navigational difficulties for vessels that stray from the channel. Once past the sandbar the main channel is readily navigable with some areas exceeding 25 ft in depth. Information about the Barren Creek Marine Railway was collected during two shoreline field visits; a side
scan sonar survey, and historical research of the property and individuals who were associated with the property.

![Map showing the location of the Barren Creek Marine Railway (18WC3).](image)

**History**

A variety of different types of sailing vessels and barges, and later steam-powered vessels were constructed on Barren Creek. Shipbuilding began on this creek by the beginning of the nineteenth century. One of the earliest records describing a vessel built on this creek was a 130 ton, two-masted schooner named the *Elizabeth*, built by Brittingham Hall in 1808 (Brewington 1957). Most of the shipbuilding on Barren Creek that was described by historical records probably focused around the town of Barren Creek Springs, later renamed Mardela Springs. Today, this area is a small town located just off of the main route to the beaches of Maryland’s Eastern Shore.

The Barren Creek marine railway site was located on property owned by Train Ackworth Bounds. Records indicate that several other members of the Bounds family were also ship builders. William Bounds was listed as a ship carpenter at the age of 35 in the 1850 census of Somerset County. He and his family resided in the Trappe District and his estate was valued at
James H. Bounds was also listed as a ship carpenter residing in the Trappe district with an estate valued at $50.00 (U.S. Census Bureau Somerset County, Trappe District, 1850).

Train Ackworth Bounds was known to have built several vessels in this area during the late nineteenth century. Train was the son of George Washington Bounds (1803-1872) and Rachel Ann Weatherly Bedsworth. Federal Census records identify George Washington Bounds as a farmer who lived in Barren Creek from 1840 through 1870 (Dryden 1989). Train Ackworth Bounds was born at Barren Creek Springs on March 8, 1838 (Seaver 1928). He died on August 21, 1891 (MSA, Wicomico County Inventories, LSG1, 368).

Bounds’ initial shipbuilding activities probably occurred near Mardela Springs. A local newspaper account by a long time resident described late nineteenth-century shipbuilding activities on Barren Creek approximately 40 years after the death of Train A. Bounds (Wilson 1928). She indicated that Train A. Bounds constructed six barges at the shipyard near the bridge (in Mardela Springs) between 1876 and 1877 (Wilson 1928). Adkins (1982) indicated that he built schooners for the bay trade and smaller vessels for local use at a ship yard on Barren Creek located west of town.

The 1877 Lake, Griffing, and Stevenson map of the Barren Creek District identifies a shipyard on the south side of Barren Creek near a steam sawmill belonging to J. H. Bacon (Figure 7-2). A residence belonging to Mr. T. A. Bounds is located in Mardela Springs on the north side of the Creek. This is most likely the shipyard that was identified in Wilson’s newspaper account. Based on the proximity of the saw mill to the shipyard it is possible that it was also owned by Bacon. J. H. Bacon and T.A. Bounds had previously conducted business activities together. Based on this meager evidence, it is impossible to ascertain the complete nature of the relationship between the two. In 1869, T. A. Bounds and J. H. Bacon purchased a shared 1/3 interest in Double Mills for $2500.00 (Peregoy and Bradley 2010). Double Mills was a gristmill located several miles east of Mardela Springs. The business relationship did not last very long. Approximately three months after the purchase of Double Mills, Bounds sold his interest in the mill to Bacon. By 1870, Train A. Bounds age 40 was described in the Census records as a Farmer. His wife Elizabeth J. was 35 years old and his children were named Joseph W. (age 15), George W. (age 13), Samuel J. (age 10), Annie E. (age 8), Thos. R. (age 5), and Etta (age 3). In addition to his children three other individuals are listed in their household.
These included Nancy Windsor (age 65), Sallie A. (age 25), and Asariah Sewell a 50 year old Farmer (US Census 1870, Wicomico County, Barren Creek District).

Figure 7-2. A residence of T.A. Bounds and a shipyard located on the south side of Barren Creek near the present town of Mardela Springs (Lake et al. 1877).

The Barren Creek Marine Railway site was identified near the mouth of Barren Creek and was also located on property owned by Train A. Bounds (Figure 7-3).
In 1882, T. A. Bounds patented a 42-acre tract called “Annie” (MSA, Patents, Certificate 17) (Figure 7-4). He also owned several other properties in the district that were conveyed by his father’s will (MSA, Wills WBI, folio 70).

At this time there are no historical records confirming that this site was the location of a marine railway. Historical data do suggest that Train A. Bounds continued to build small vessels after the completion of the six barges he built, which were described as the last vessels built in
Mardela Springs. Two small vessels bearing the names *Train A. Bounds* and *Train Acworth* were listed as having been built after 1877. These vessels were probably named after the shipwright Train A. Bounds. At this point it is uncertain that he built them. In addition to these pieces of circumstantial evidence, a number of items from Train A. Bounds’ inventory were used in shipbuilding (Table 7-1). These items included nails, ship augers, blocks and falls, boat molds, caulking tools and materials, and timber (MSA, Wicomico Co. Inventories 1891, LSG1, 368). These items represent approximately ¼ of the value of his estate. The remainder of his estate was related to agricultural items and household items.

**Table 7-1. Inventory of the estate of Train A. Bounds.**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Value in $</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Horse Cart</td>
<td>8</td>
</tr>
<tr>
<td>1</td>
<td>Ste of Stay Wire</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>Set of cart harness</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>Timber cart</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td>Horse mare</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>grain reaper</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Crow bars</td>
<td>1.5</td>
</tr>
<tr>
<td>1</td>
<td>Lot spike nails</td>
<td>1.2</td>
</tr>
<tr>
<td>1</td>
<td>Lot finish nails</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Oil cans</td>
<td>0.2</td>
</tr>
<tr>
<td>½</td>
<td>Keg of putty</td>
<td>0.15</td>
</tr>
<tr>
<td>2</td>
<td>Scraping irons &amp; blocks</td>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
<td>Box and contents</td>
<td>0.1</td>
</tr>
<tr>
<td>2</td>
<td>Jack screws</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>Bolt cutter</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>Camp Screws</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>Ship augers</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Cross cut saw</td>
<td>0.75</td>
</tr>
<tr>
<td>1</td>
<td>Set of pitanes</td>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
<td>Heavy Block &amp; fall</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>Boat moulds</td>
<td>0.25</td>
</tr>
<tr>
<td>1</td>
<td>Hand saw</td>
<td>0.25</td>
</tr>
<tr>
<td>1</td>
<td>Lot of caulking cotton</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Lot of white oak lumber at Vienna</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>Boards of sawed wood</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>Cords of oak tap wood</td>
<td>4.5</td>
</tr>
<tr>
<td>3 ½</td>
<td>Cords of sawed pine wood on landing</td>
<td>4.25</td>
</tr>
<tr>
<td>4</td>
<td>cords of wood in branch</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Lot of white oak lumber at steam mill</td>
<td>10</td>
</tr>
<tr>
<td>1</td>
<td>Lot of wh. oak lumber at Samuel Bounds</td>
<td>4</td>
</tr>
</tbody>
</table>

**Archaeology**
In 2005, several articulated timber elements were identified on the north shore of Barren Creek. Preliminary investigations of these timbers indicated that they were part of a cradle for a small marine railway. Based on this information the site was called the Barren Creek marine railway site (18WC3). The site was also the location of a small, previously recorded, prehistoric site. As a result, the original site boundaries were extended to include the shipyard (Figure 7-1). The Barren Creek marine railway site is currently located on two pieces of private property. The western property is an active gun club and shooting range. The eastern property is a wooded tract associated with a private residence. The majority of the marine railway was located on the eastern property (Figure 7-5). The property owner of the eastern property could not be contacted and so all investigations of the property were confined to the areas of the site that are in and adjacent to Barren Creek. The site is located approximately 20 m east of a modern gravel boat ramp and extends along the shoreline approximately 40 m (Figure 7-6). It is only visible at low tide and consists of timbers, metal rails, portions of a cradle, and miscellaneous wood debris. Several vertical posts are visible and protruding from the water. It is unclear whether these vertical posts are associated with the shipyard or are intrusive elements of a later period pier or duck blind. The water depth of the channel adjacent to the shipyard is approximately 12–14 ft.
Feature 1 is the most prominent element at this site (Figures 7-7 through 7-10). Feature 1 is the partially articulated wood and iron cradle that is believed to be the cradle for a marine railway. It is also possible that it functioned as a timber cradle associated with a saw mill, but the cradle recorded at 18WC3 is larger than typically used on a saw mill.
Figure 7-7. Partially articulated marine railway cradle, facing north (Moser 2007).
Figure 7-8. Plan view of Feature 1 (cradle).
Figure 7-9. Detail of launching cradle wheel/axle (Moser 2007).

Figure 7-10. Disarticulated wheels and axle from cradle (Moser 2007).
Feature 1, the cradle, was an essential component to the operation of a shipyard. The cradle was used to haul boats out of the water for repairs to the hull or for the purpose of launching new vessels into the water. This cradle is rectangular in plan and was approximately 8.5 x 2 m (27.88 x 6.56 ft) in size. The partially disarticulated nature of the cradle made it difficult to more precisely determine its size. The cradle is constructed of a wood frame fastened together with small square headed bolts and metal flat iron plates. The wheel and axles were heavily corroded. They appeared to be cast as a single element. The small iron railway wheels fastened to axles were approximately 26 cm (10.4 in.) in diameter.

There were two or more axles associated with the carriage. The axles were mounted to the forward and rear sections of the cradle. A single axle with one remaining wheel was fastened to the cradle. The wheel on the axle located closest to the shoreline was missing and the second axle was completely missing from the carriage. Another axle with both wheels still fastened was located just east of the launching cradle. It is unclear whether this axle represents the second or third axle from the cradle, or whether it was part of another cradle. The distance between the wheels of the second axle measured 2,020 mm (6.62 ft) corresponding to an approximately 2,020 mm rail gauge (the distance between the inner sides of the heads of the rails). Standard gauge railway track is 1,435 mm (4 ft 8 ½ in) in width and was universally adopted in the United States by 1886. The railway gauge at the site indicates that it is a custom broad-gauge railway width. This indicates that the cradle fit on a railway approximately 6 ¾ ft in width.

There is little assembled research with which to correlate the size of a vessel with the size and width of a particular marine railway. Some modern advertisements for marine railway systems recommend a 10 ½ to 11 ft maximum vessel beam for such a small railway. These dimensions may be too small. A more realistic vessel beam for a marine railway would measure approximately three times the width of the railway. Such a measurement would mean that approximately 1/3 of the beam of the vessel would project to either side of the railway. Applied to Barren Creek Marine Railway this particular measurement would represent a maximum vessel beam of 19 ½ ft. This measurement is well within the parameters required to build or repair some of the small sloops that were constructed on Barren Creek. The *Julia Hamilton* built in 1884, had a beam of 14.2 ft and the *Ackworth Bounds* built in 1875 had a beam of 15.8 ft.

The second prominent feature at the site was Feature 2. Feature 2 consists of two small *in situ* iron rails extending perpendicular from the bank of the shoreline towards the channel. A
large number of disarticulated rails were present in the water between Features 1 and 2. The rails and metal fragments in the water represent the remains of the railway which probably extended further south into Barren Creek. Feature 2 is located approximately five m east of Feature 1 (Figure 7-11). The two in situ rails that comprise Feature 2 are angled and extend 1.0 m and 1.65 m from the bank, respectively. These two rails are spaced approximately 0.98 m apart. The spacing of the rails suggests that a third rail was probably once associated with Feature 2. A third rail spaced approximately the same distance apart from the others would accommodate the approximately two-m wide launching cradle. There are several examples of marine railways which used three rails.

![Figure 7-11. Feature 2, in situ marine railway tracks (Moser 2007).](image)

The rails themselves are flat-bottomed, tee-shaped rails measuring approximately 5 cm (approximately 2 in.) in height. This size of rail is typically categorized as a rail of 12 lb/yd in size and is the smallest North American rail profile produced. These rails were bolted together with fishplate connectors on either side of the rail. The flat-bottomed rails may have been directly fastened to a timber that was in turn fastened to wooden sleepers or cross ties. A
possible sleeper or cross tie timber was identified during the initial reconnaissance of the site but it could not be relocated due to extreme high tides during subsequent site visits. Evidence of this possible construction element is a single photograph (Figure 7-12).

![Figure 7-12. Possible railway sleeper timbers for the marine railway (Moser 2007).]

The site is located in one of the few areas near the mouth of Barren Creek that is not tidal marsh. Heavy erosion along the shoreline, and disturbances from the construction of a modern boat ramp located just west of the site make it difficult to evaluate the amount of preparation and investment of time, money and effort that went into preparing the substructure of the launching area. The predominant soil type at the site is excessively drained Runclint Sand with 2-5 percent slopes. The ground surface in the vicinity of Feature 2 is firmer than most adjacent areas of Barren Creek. Much of the shoreline contained substantial quantities of quartz gravel in the vicinity around Feature 2. Large quantities of gravel, brick and oyster shell were present along the entire shoreline. A block of mortared and articulated bricks approximately 47 x 36 cm in size was identified in this area. The debris field consisted of disarticulated plank, blocks of articulated brick with sand mortar bonds, and other materials (Figure 7-13). Another unusual feature of this site were dozens of gravestones located along the shoreline (Figure 7-14).
Figure 7-13. Disarticulated wood, gravel, shell and grave markers along the shoreline (Moser 2007).

The gravestones, along with the articulated bricks, were piled along the beach and may represent part of a breakwater or shoreline stabilization project (Figure 7-14). One informant interview reported that Mr. Short, the owner of the property, was a gravestone mason. Also recovered from the water in this area was a 51-cm iron pin or fastening (Figure 7-15). It is unclear what function this iron pin served. The pin was photographed and then returned to the water.
Figure 7-14. Example of grave markers located at site probably intended for stabilizing the shoreline (Moser 2007).

Figure 7-15. Large iron pin recovered from debris field (Moser 2007).
Vertical planks, some small vertical pilings, and a perpendicular bulkhead were also present at the site. At least some of these remains appear to be the remnant of a duck blind or other small waterfront shack (Figure 7-16). One of the most unusual features of this site includes the presence of multiple gravestones from different periods. One that was documented indicates that these stones were placed sometime after 1936. These grave stones were piled along the beach and may represent part of a breakwater or shoreline stabilization project. A side scan sonar survey of the area was completed at low tide (Figure 7-17). The survey indicated that additional debris was present below the low tide mark; however, there was no discernable pattern to the debris.

**Interpretation**

Extensive historical research, including map research and a title search of the property ownership has been unable to directly identify this location as a shipyard. The circumstantial evidence associates the property with Train A. Bounds, and perhaps his brother Albert M. Bounds, during the latter part of the nineteenth century and suggests that a relatively small shipbuilding and ship repair business operated in this area. Both Albert M. Bounds and Train A. Bounds were identified in the 1870 Census as farmers. At the time of his death, the inventory of Train A. Bounds possessed a significant quantity of agricultural implements as well as substantial quantities of corn. This suggests that if they were involved in the shipbuilding business at this location, they probably only served as part-time craft specialists.
Figure 7-16. Wood stakes from possible duck blind present at marine railway site (Moser 2007).

Figure 7-17. Side Scan Sonar image showing debris field off of marine railway site (Moser 2007).
The site offers a location that is several miles closer to the open waterway of the Nanticoke River than Mardela Springs. It would have been much less difficult to tack a sailing vessel to this marine railway for repairs than one that was located in Mardela Springs. Despite this advantage of location, it was still more difficult to reach than ship facilities in nearby Sharptown or Vienna due to the winding passage through the tidal marsh. The Barren Creek Marine Railway site location provided much greater protection for small vessels than Sharptown or Vienna.

Rewastico Creek Shipyard (18WC155)

Site 18WC155 is a small shipyard site located on the north side of Rewastico Creek approximately 2.7 miles (4.36 km) east of the Nanticoke River (Figures 7-18 and 7-19). The site measures approximately 100 m N/S by 80 m E/W. Two separate areas of the site were investigated during this study. The first area, where the majority of maritime components are located, consists of a 43-m long section of the shoreline located on Rewastico Creek. The second area consists of a low density artifact scatter located in a plowed agricultural field directly northwest of the shoreline. The site is located on a curve of the creek at a location known as a thalweg, or the line of fastest flow of the main channel of Rewastico Creek.

The two areas of the site are separated by a short steep wooded slope directly behind the shoreline leading to the upland terrace fields. Within these woods are a series of one to two meter high linear earthen embankments that appear to be associated with the grading or dumping activities of the farm. Modern trash, including metal cans and machine-made glass, are located in the vicinity of the embankment. The shoreline is covered by marsh grass and other wetland vegetation. The slope is covered by mature hardwoods and dense underbrush, and the field is under active soybean cultivation. Surface visibility at the site varied between approximately 70-90 percent in the plowed fields, to zero along the shoreline.

Soils in the field consist of excessively drained Runclint-Cedartown complex soils, with 2 to 5 percent slopes (USDA, NRCS, Websoil Survey). This remnant fluviomarine terrace is predominately composed of Runclint Sand and Cedartown Sand, and the remaining minor components consist of Evesboro, Klej and Galloway soils. Soils along the shoreline consist of Nanticoke silt loam and Mannington mucky silty loam. These soils are very frequently flooded and are typically found on tidal flats, mud flats, and flood plains. These soils are very poorly
drained and the water table is usually present between 0 to 5 inches below ground surfaces. Other minor components of this soil complex consist of Manahawkin and Mispillion soils.

**History**

Beauchamp Hull is the earliest individual documented announcing the launch of vessels on Rewastico Creek.

To be sold by the subscriber, living on Rowostico Creek, a double deck'd vessel, now on the stocks, about 120 tons burthen, may be launched in July, or sooner as may best suit the purchaser, as she is now planked and cieled up to the wale. Any person inclinable to purchase, may view the vessel, and know the terms of sale, by applying as above, to…Beauchamp Hull (*Maryland Gazette*, April 1, 1764)

This large meandering tidal creek had sufficient depth to accommodate relatively large ocean-going vessels but had no significant population centers along its length, indicating that the shipyard was a rural plantation rather than an urban setting. Later, in the nineteenth century, some portions of Rewastico Creek were dammed to create mill ponds. There is limited historic documentation of shipbuilding on Rewastico Creek after the 1760s. Only a single record of shipbuilding after the 1760s has been identified. In 1822, the 82-ton schooner *Cherub* was registered as having been built by ship carpenter John Nichols (Brewington 1957). A partial title search of the property was completed as far as the mid-nineteenth century. Ralph Lowe purchased the property on which site 18WC155 was located in two separate transactions. In 1866 he purchased the Eli Bradley Farm from Mary W. Taylor (MSA, Somerset County Deeds LW9, folio 692). In 1867 he purchased the Dorman Farm via a trust from Robert Langsdale (MSA, Somerset County Deeds LW 10, folio 307). Subsequent research on the property of Robert Langsdale was unable to identify any property fitting the description of Rewastico Creek.
Figure 7-18. Photograph of exposed timber at 18WC155 at high tide (Moser 2007).

Figure 7-19. Site location 18WC155, 7.5' USGS Mardela Springs Quadrangle showing.
**Archaeology**

A large agricultural field located directly behind the shipyard contains evidence of both prehistoric occupation and a historic occupation that is roughly contemporary with the suspected date of operation of the shipyard site (Figure 7-20). The current landowner informed the crew that a single stone grave marker was present in a small grove of trees approximately midway between the shoreline and his driveway. Examination of the gravestone indicated that it belongs to Henry B. Sebrease, and it is dated November 6, 1853.

![Figure 7-20. Todd farm field facing southeast is located directly behind the shipyard (Moser 2007).](image)

The shoreline is covered in a 10-cm thick layer of seasonal tidal muck and marsh vegetation that significantly hinders ground surface visibility. In the summer this muck is covered with wetlands vegetation. Beneath this layer of muck the shoreline is relatively stable. Soils below the surface muck contain mussel shells and some small pebbles and gravels. The shells and stone greatly enhance the stability of this shoreline to support weight. Site 18WC155
contains a number of features likely associated with shipbuilding/repair/breaking. The most obvious feature on this site is a large slipway (Feature 1) located on the eastern side of the site.

*Feature 1*

Feature 1 is a box-shaped slipway structure sloping at an angle into the water. The slipway extends into the creek from the shoreline approximately 6.7 m and is approximately 8.5 m in width (Figures 7-21 and 7-22). The slipway is constructed from a series of un-worked timbers oriented parallel to the shoreline and a mix of silty clay soil. This investigation identified six small un-worked logs. It is possible that additional timbers were present within the soil matrix of the slipway. A seventh timber (T1) located on the south edge of Feature 1 forms the threshold between the end of the slipway and the deep water located just off the launching structure.

*Figure 7-21. Slipway (Feature 1) at 18WC155 facing east (Moser 2007).*
Timber T1 is approximately 8.72 x 0.57 m in size and it is the largest timber on site (Figure 7-23). The uppermost surface of timber T1 is squared while the inside and outside surfaces are in the round. The bottom of timber T1 was so covered with barnacles that it was impossible to determine whether it was shaped. T1 exhibits some evidence of surface wear on its uppermost side. The eastern edge of the slipway is formed by a timber (T2) half-lapped over the end of T1. Timbers T1 and T2 are fastened together with a large metal pin or spike (Figure 7-24). A heavily eroded piling that extends just above the bottom of the creek bed is located directly below the point of intersection of timbers T1 and T2. This piling almost certainly supported timber T1. The creek channel is migrating northward and is scouring out major portions of Feature 1 below T1. Timber T1 is currently held in place by Timber T2 and portions of the root mass on the western portion of T1. In the near future this timber will probably tear away from the slipway.
Figure 7-23. Photograph showing smooth upper surface of timber T1 (Moser 2007).

Figure 7-24. Photograph showing details of timber T2 half lapped over Timber T1 (Moser 2007).
Timber T2 is 6.67 m long, 20 cm in diameter and rounded for most of its length. In addition to the half lapped joint over T1, timber T2 is also notched under timber T3 on its northern end (Figure 7-25). Timber T3 forms the northern boundary of Feature 1 and is fastened to Timber T2 with an iron spike or pin. Timber T2 slopes downward from its intersection at T3 to its intersection of T1 approximately 9.85 percent. This slope is within the range typically observed of previously documented slipways.

Figure 7-25. Detailed view of the eastern end of T3 is fastened to the notched northern end of T2 (Moser 2007).

Mapping of Feature 1 was difficult. Portions of the site are buried under substantial quantities of muck and vegetation, while other portions of the site have eroded. The site is also
frequently submerged and is only exposed for mapping during low tide. Nevertheless, the following preliminary site plan has been developed (Figure 7-26).

Figure 7-26. Site plan of 18WC155.

Feature 2

Feature 2 is a series of planks located parallel to the shoreline and extended into Rewastico Creek. Approximately 10 rows of planks are oriented parallel to the shoreline and roughly abut, but are not joined to one another. In some places, the planks are two layers in thickness. The planks form a rough floor on the creek bottom and they extend from the shoreline to the edge of the channel (Figure 7-27). The planks associated with Feature 2 are more haphazardly organized, more covered in barnacles, and more highly eroded in deeper water at the edge of the channel.
Most of the planks that were examined during this survey exhibit evidence of previous use. Most possessed fastener holes and a few contained wrought iron nail fasteners. This indicates that the planks were previously utilized elements of an earlier wood structure or vessel. A variety of plank lengths were observed, although only two examples were recorded. The planks generally appeared 1 to 1 ½ inches in thickness and approximately 6 inches in width. The two measured lengths of plank were approximately 6.56 ft (2 m) and 10 ft (3.05 m) respectively. Overlying the floor of Feature 2 are four highly eroded timbers that extend from the shoreline towards the channel (Figure 7-28). These four timbers were called frames. Each frame is roughly the same width and height. Frame 2 (F2) is the shortest, measuring approximately 12.13 ft (3.7 m) in length while frame 4 (F4) is approximately 17.05 ft (5.2 m) in length. The frames rest on the plank floor and do not appear fastened to the planks.
Without a more comprehensive investigation of Feature 2 it is impossible to interpret its exact function. However, the planks of Feature 2 are not randomly scattered on the site and they seem to cover the bottom of the creek from the shoreline to the edge of the channel. This plank field may represent an intentional attempt to provide a stable cover on the bottom of the creek bed. The frames on top of the plank field may represent a framework for launching or repairing small vessels. Another interpretation is that Feature 2 represents what was the hull remains of a small vessel that sank or was broken up adjacent to the shoreline. Initially, the small size of the “frames” located on the plank field suggested that this was unlikely. However, two small ship knees and a frame were identified near Feature 2.

A small knee, or frame, was identified on the shoreline between Features 1 and 2. Labeled as K1 on the site plan, this knee is L-shaped and measures 1.33 m at its longest point, approximately 25 cm at its widest point and is approximately 3.5 cm in thickness. A second small knee (K2) was identified at the southern end of the site (Figure 7-26). This knee is approximately 53 x 55 x 7 cm in size. Knee K2 has a single iron bolt, or drift pin, that once fastened it to another timber (Figure 7-29). In addition to the knees a fragment of a small frame
was identified during fieldwork in the winter of 2005. Subsequent fieldwork failed to re-locate this frame (Figure 7-30).

Figure 7-29. Photograph of knee K2 (Moser 2007).
Figure 7-30. Fragment of a small frame that was identified in December 2005 (Moser 2007).

**Side Scan Sonar**

Side scan sonar investigations at high tide provided some additional information about site 18WC155. Feature 1 was readily identifiable on each pass at various resolutions. Feature 2 was less distinct and was difficult to identify due to the large quantities of submerged timber that is present along this portion of the shoreline (Figures 7-31 and 7-32).
There are three plausible explanations for the presence of this timber. It is possible that the submerged timber may represent debris associated with shipbuilding activities at the site. However, it is more likely that timber represents a debris field from the decay of marine structures along the shoreline. The creek channel is migrating northward and has already undercut Timber T1 and exposed other timbers in Feature 1. It is likely that other timbers in the vicinity of T1 have already rolled into the creek. Finally, it is also highly probable that a series of waterlogged trees and other debris from upstream have been deposited along this curve in the river.
Surface Collection

In addition to the timbers and structures a large historic and prehistoric artifact scatter was identified in the plowed field directly to the north of the features along the shoreline. A pedestrian survey was conducted to identify potential industrial portions of the site located away from the shoreline. Artifacts in the field were distributed over an area estimated 75-x-80 m in size. Pin flags were initially used to mark the locations of artifact clusters (Figure 7-33). The majority of cultural material in the field consisted of brick and oyster shell. Diagnostic artifacts were collected in an attempt to better understand the chronological and functional attributes of the site.

A total of 93 historic and eight prehistoric artifacts were recovered from 18WC179, including 75 historic ceramic sherds, five ferrous artifacts, five glass shards, and three tobacco pipe fragments (Table 7-2). The ceramics primarily consist of refined earthenwares and a small number of utilitarian vessel fragments. These artifacts suggest that this portion primarily functioned as a domestic site. Mean Ceramic Dating (MCD)
of diagnostic ceramics recovered during the surface collection indicate that the site was most likely occupied between the years 1793 and 1871. The median date of this occupation was approximately 1836. Based on the diagnostics, the MCD for the site is approximately 1811. The diameters of two pipe stems recovered in the assemblage were 5/64ths of an inch. This diameter typically suggests a range of manufacturing dates that is earlier than the MCD for the ceramic assemblage. However, both pipe fragments were small and could easily represent early nineteenth-century pipes when the correlation between pipe stem diameter and manufacturing dates begin to decline.

Table 7-2. Artifact Catalog 18WC155.

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**Dendrochronology**

In October 2006, the site was revisited for the purpose of taking wood core samples from major timbers. The work was completed by Michael Worthington and Daniel Miles of the Oxford Dendrochronological Laboratory and assisted by Paul Krusic of the Columbia University Dendrochronology Laboratory. During the dendrochronological fieldwork, the site was heavily inundated by high tides and rain
(Figure 7-34). This made it difficult to relocate specific timbers that were previously identified. In all, approximately 10 timbers were sampled and approximately 15 cores were obtained using an increment tree-ring borer. Of these samples only one tree ring sample could be statistically matched with sufficient confidence to indicate an outer growth ring dating to 1791 (Daniel Miles: Personal Communication 2007). Due to difficult weather conditions during the fieldwork, all markings on the sample tubes became unreadable. The one sample that was successfully recovered and matched to the site probably came from timber T1. Numerous samples were taken from this timber and it is one of the only timbers that retained sufficient integrity to retain intact growth rings.

Figure 7-34. Dendrochronological sampling at 18WC155 (Moser 2007).

**Interpretation**

Investigations at 18WC155 suggest that the site may have functioned as a shipbuilding, ship repair, or ship breaking site. The features located at the site bear some functional similarities to wharves and piers located in the study area. The site is also located adjacent to the *thalweg*, or the line of fastest flow, which is also the deepest area
of the main channel of Rewastico Creek. The water depth just off of the Timber T1 is approximately 4 to 5 ft at low tide and the main channel is approximately 10 to 15 ft in depth. Despite these similarities of location and depth Feature 1 is very distinct from most of the wharves and piers that were identified within the study area. Furthermore, Feature 1 bears little similarity to the wharf types discussed by Andrea Heinzelman (1986). Timber T1 evidences a substantial amount of modification and wear to the uppermost surface. This wear suggests a substantial weight wearing down the timber through time. It is unclear whether this wear was the result of shipbuilding and launching activities or from ship repair activities. Based on other shipyard studies it is unlikely that this timber was worn from ship launching activities. Feature 1 seems to represent the groundways of a slipway. If this area was a ship launch facility it is likely that additional launchways would have been located on top of Feature 1 and that they would have been perpendicular to the direction of Timber T1. However, no evidence of holes for fastening such launching ways or keel blocks was identified on the timbers of Feature 1. As a result, it seems most plausible that the wear on the upper surface of Timber T1 was caused by the weight of a vessel being drawn out of the water. Therefore Feature 1 is interpreted as a careening frame or a repair facility for drawing vessels out of the water and repairing them.

Additional examination of Feature 2 suggests that it probably represents the wreck of a small vessel abandoned or perhaps partially broken at this ship repair facility. The wreck of a similarly small vernacular vessel (18WC179) that was identified during this project on the Wicomico River (Figure 7-35) possessed framing and planking of similar sizes and orientation as that of Feature 2. The strong similarity between Feature 2 and nearby site 18WC179 suggests that it is a wreck site.
Analysis of the site chronology suggests a relatively close temporal relationship between the industrial site located along the shoreline and the domestic site located in the field to the north. Dendrochronological investigations indicate that at least one of the timbers of Feature 1 was felled circa 1791. The MCD for the domestic component of the site was approximately 1811. Although 20 years difference separates the two areas of the site the statistical nature of the data precludes an overly precise matching of the two sites. It is possible that the one dated timber from Feature 1 has lost outer tree rings through physical weathering and decay. It is also a possibility that the domestic component of the site was occupied both before and after the construction of the shoreline features. In any event, it is very possible that both areas of the site were occupied and used simultaneously.

**Bivalve Site (18WC160)**

Site 18WC160 is a small twentieth-century marine railway or boat ramp located in the town of Bivalve, Maryland (Figure 7-36). Bivalve is a community on the eastern
bank of the Nanticoke River. The town is located approximately 18 miles west of Salisbury. Originally it was called Waltersville. In 1887 the town name was changed to Bivalve (Bivalve 2010). The site is presently located within a residential area of the community. The site may have been disturbed by a twentieth-century bulkhead construction and a stone rip-rap installation. This site was not targeted for significant field investigation due to the likely modern construction date.

The age of this railway could not be determined but it probably dates from the early to mid twentieth century. The site may have operated as a commercial boat repair facility, or alternatively, it may have operated as a boat lift prior to the development of modern hydraulic boat lifts. It is clearly an inclined plane for launching or withdrawing a small boat from the water (Figure 7-37). Measurements from aerial photographs indicate that the railway is approximately 1.75 m (5.75 ft) in width. The total length of the railway could not be measured because a substantial portion of the railroad extends underwater. The measurable portion of the railway is approximately 17.7 m (58 ft) in length.
**Quantico Creek Site (18WC164)**

The Quantico Creek site is a large multi-component historic site with multiple wharves, a mill dam, and a possible shipyard located on the south side of Quantico Creek, approximately 3.37 mi (5.4 km) east of the Nanticoke River (Figure 7-38). The investigated portion of the site is approximately 150 x 50 m in size and spans both sides of an unnamed creek.
The total site size is much larger based on the presence of a domestic artifact scatter located in the plowed fields south of the site. This domestic component was not investigated due to the presence of a wheat crop in the field. The chronology and relationship of various features and components are difficult to interpret because of the long-term use and extensive modification of the archaeological remains. The physical remains were first identified during a shoreline survey of Quantico Creek in December 2005 (Moser 2007). A shipyard is depicted in the same approximate location on the Simon J. Martinet map of Somerset County, Maryland (Martinet 1865). The map also indicates that a steam-powered saw mill was present in close proximity to the shipyard location (Figure 7-39).
Soils on the west side of the creek are described as Hambrook sandy loam with two to five percent slopes. This well-drained soil type is geologically associated with flats, fluviomarine terraces, knolls, and depression landforms (Websoil Survey). Soils on the east side of the unnamed creek are Evesboro sand with 5 to 10 percent slopes. These excessively drained soils are typically associated with remnant knolls and dunes. During the investigation several soil cores were taken from the shoreline directly behind the slipway feature. Soils in this vicinity consisted of highly eroded silty clays and were inconsistent with mapped soil types. These soils may represent a highly compacted fill episode.

**History**

In the first two decades of the nineteenth century at least three vessels were built on Quantico Creek. The 62-ton schooner *Two Sisters* was built in 1804 by ship carpenter Charles Weatherly (Brewington 1957). In 1808, the 105-ton schooner *Republican* was
built by Zachariah Nelson (Brewington 1957). Finally, in 1814 ship carpenter William Bounds constructed the 80-ton schooner *Pike* (Brewington 1957). Together these three vessels represent the only documented vessels built on the creek. In addition, there was no specific information about the location of the shipyard. It is possible that the shipyard was located near the town of Quantico which was established in the first decades of the nineteenth century. However, a portion of Quantico Creek near the town was probably insufficient in width and depth to build any large vessels.

There were four ship carpenters identified in the 1850 Census for the Quantico Creek District. In addition to Quantico Creek, the Quantico District also included all of the area lying between Rewastico Creek and the Wicomico River above Whitehaven. Therefore, these ship carpenters may have lived and worked anywhere within the district. They included William Smith, Stephen McKinsey, Elisha G. Owens and Thomas Smith (U.S. Census 1850). By 1880, only Stephen McKinsey was still identified as a shipwright in the 1880 (U.S. Census 1880). In 1880 he resided in the Trappe District.

The only shipyard location documented on Quantico Creek was first identified on Simon J. Martinet’s 1865 Map of Somerset County, Maryland (Martinet 1865). The shipyard was located on the south side of Quantico Creek and east of Teagues Creek near an unnamed stream. Subsequent maps and historical research has failed to identify a complete chain-of-title for the ownership of this property (Figure 7-40). The oldest documented owner of the property near the shipyard location was Purnell Toadvine, a Salisbury merchant. Purnell Toadvine was born August 1, 1808 and died on May 21, 1878 (Simms 1997). Purnell Toadvine made the purchase during a sheriff’s sale of the property of William A. Kennerly dated Jan 9, 1866 and Jan 28, 1868. The reason for the sheriff’s sale is unclear. The property may have been sold as part of an estate sale or to pay off debts. No record of the property has been located prior to 1866. Very little is known about William A. Kennerly. The Quantico District Census described a William A. Kennerly as a 35-year old farmer with a household valued at $7,000.00 (1850 Census, Somerset County).
Archaeology

Site 18WC164 is highly complex and represents a significant commercial/industrial maritime site. A series of features that may be associated with this site include pilings located along the main channel of Quantico Creek (Figure 7-41). The pilings are estimated at 10 inches in diameter and are spaced at approximately 75 m intervals along the channel several hundred meters above and below the site. These pilings appear to mark the edge of the navigational channel of Quantico Creek. They may represent a twentieth-century feature and may not be specifically related to 18WC164. The pilings are found mostly in the water and are only visible at low tide. A few are located on mud flats and they may indicate that the earlier marked channel has shifted southward. The presence of these pilings indicates that this creek was once significantly busier than it is today.

Today site 18WC164 is located at the edge of an active agricultural field operated by Gum Mill Farms. The site is only accessible from the water and by permission of the property owner. Interviews with local inhabitants, including the Phillips family, owners of the property for at least two generations, indicate that a farmhouse was formerly located on the property approximately 100 m south of the site. The farmhouse was owned and occupied by members of the Twilley family who owned the property between 1890s and 1937 but was torn down within the past 50 years.
Two members of the Twilley family are buried in a small family cemetery located approximately ¼ mile from the former residence. These gravestones belong to John W. Twilley (1826-1896) and to his wife Leah Caroline Twilley (1826-1898). The area of the former farmhouse could not be approached due to the presence of mature wheat in the field, but some bricks and glass fragments were visible along the edge of the field. The former house site is located on a hill approximately five ft higher than the wharf location.

The most obvious components of site 18WC164 are a succession of wharves that were built at this location. Elements of at least two, and perhaps as many as three, wharves, were located during archaeological investigations in July 2006 (Figure 7-42). The presence of these features further complicates the interpretation of this site. The most obvious feature is Wharf 1 (Figure 7-43).

**Wharf 1**

Wharf 1 consists of at least five large round timbers (T11, T12, T13, T14, and T15) extending perpendicularly from the shoreline towards the channel. The five timbers
have little slope, extend straight out from the shoreline, and hang completely out of the water at low tide. The northern ends of these timbers are exposed and extend into the water while the southern ends are buried by the shoreline. Extensive probing of the marsh directly behind Wharf 1 indicates that timber T14 extends into the marsh approximately 3.7 m making the total length of Timber T14 approximately 12.7 m (41.65 ft). These timbers probably represent a repair episode to a large timber wharf. A pile of modern brick and cinderblock covers the shoreline edge of this wharf and may have been added to create a modern boat launch.

Figure 7-42. Site plan of the Quantico Creek Shipyard.
Located underwater just beyond the end of the five timbers of Wharf 1 is a large timber bulkhead lying roughly parallel to the shoreline and perpendicular to the timbers of Wharf 1. This bulkhead is at least 13.3 m in length and is at least three courses in height on the west end. Side Scan Sonar images indicate that several courses of timbers from this bulkhead may have become detached and now lay on bottom of the creek near the wharf. Beyond the bulkhead the water rapidly increases to over seven ft in depth. At the northeast corner of the bulkhead, a single large piling is located. This piling appears to mark the outermost edge of Wharf 1.

**Wharf 2**

A second wharf (Wharf 2) is just east of Wharf 1 and consists of a large crib wharf approximately 23-x-11 m in size. Wharf 2 is composed of a cribwork, or bulkhead, of logs and is filled with large gravel. Wharf 2 fronts both Quantico Creek and the small unnamed creek to the east. At least part of Wharf 2 may have collapsed. The wharf is not completely square and its structure gives shape to the shoreline. Beyond the wharf are additional timbers and pilings that are probably related to the facilities of this wharf.
**Slipway 1**

Located just east of Wharf 1 are a set of parallel timbers that extend from the tidal marsh towards the channel (Figure 7-44). The timbers associated with this feature are tentatively identified as a shipyard slipway (Slipway 1). This slipway is composed of parallel timbers spaced approximately 2.6 m apart. Each rail is composed of squared timbers that are aligned end-to-end to form a continuous rail. The exposed surfaces of these timbers are highly eroded. A portion of both launching rails extend into the tidal marsh behind the shoreline (Figures 7-45 and 7-46). The southern end of the western rail was identified by probing. The northernmost portions of Slipway 1 are disarticulated, although they appear to be generally located near their original alignments.

*Figure 7-44. Possible slipway remains facing northeast (Moser 2007).*
Figure 7-45. Slipway 1 and wharf remains facing west (Moser 2007).

Figure 7-46. The south end of the western launching rail of possible Slipway 1 (Moser 2007).
A small section at the end of the western rail was exposed by the excavation of a hole approximately 0.75 x 0.75-m in the tidal marsh. The anaerobic conditions of the tidal marsh resulted in a much better state of preservation of this railway. The end timber of the western rail is perfectly square approximately 31 x 31 cm in size (Figure 7-46). The timber is perfectly flat and it appears to have been cut with a straight saw. The slipway rails are approximately 26.4 m in length.

**Mill Dam**

Just east of Wharf 2 on the unnamed creek are the remains of a small mill dam and several pilings (Figure 7-47). The dam is constructed across the main channel of the creek, which is heavily silted. The mill dam consists of one or more large timbers that span the creek. Located on the upstream (south) side of these timbers are a row of vertically driven sharpened planks. Two of these sharpened plank fragments were measured and both were 3.3 cm in thickness and 19 cm and 26.5 cm in width respectively (Figure 7-48). The planks were made of oak and showed evidence that they were cut by a circular saw. Located on the east bank of the creek is a large debris field composed of whole bricks and brickbats. This debris field may represent the remains of another wharf, a portion of the tide mill, or another portion of the shipyard.

![Figure 7-47. View of the unnamed creek east of Wharf 2 (mill dam visible in the background) (Moser 2007).](image-url)
A local informant reported that he has collected a number of bronze spikes from this area of the site. Bronze spikes are generally used to fasten timber and plank features below the waterline (Figure 7-49).
Sonar Survey

A Side Scan Sonar survey of the site was conducted in July 2006 by BRS. The data produced during this survey suggest that a large quantity of disarticulated timber from the site has moved into the channel of Quantico Creek. A large debris field is located at the end of Slipway 1. Further investigations of this area may help definitively determine the function of various portions of the site. A possible wreck site was also identified in the channel near the north shore of Quantico Creek directly across from the Quantico Creek Shipyard Site (Figure 7-50).
**Interpretation**

Based on historical cartographic data, and the presence of a probably slipway (Slipway 1), this site is interpreted as a probable mid-nineteenth century shipyard site. However, the presence of multiple wharves and a tidal mill has made conclusive interpretation of this site difficult. Additional work will be required to determine the precise nature of this site. In October 2006, dendrochronological testing was conducted. Numerous samples were collected from multiple timbers throughout this site. Test results failed to yield a match with any historically dated timber from this region (Miles, personal communication 2007).

**Dolbey Marine Site (18WC104)**

Site 18WC104 is located on the north side of the Wicomico River in the town of Whitehaven, Wicomico County, Maryland. This site was originally recorded in 1999 as a shipyard and a boat that was abandoned in the 1970s. The shipyard was re-located during a visual inspection of the shoreline at Whitehaven. The shoreline is disturbed in close
proximity to the shipyard. At least one element of a ship launching/repair marine railway structure was observed at the site (Figures 7-51 and 7-52). The marine railway and associated slipway machinery is located along the shoreline directly behind (North) an abandoned menhaden trawler named the Wilbert A. Edwards in the town of Whitehaven, Wicomico County (Stump 2000).

Figure 7-51. Site 18WC104, facing northwest (Moser 2007).
Measurements made from aerial photographs of the single remaining slipway of the Whitehaven Shipbuilding Company indicates that an elevated single slipway is approximately 3.25 m (10.66 ft) in width and approximately 26 m (85.28 ft) long (Figures 7-53 and 7-54). The rails of the slipway do not extend the entire distance between the end of the slipway to the shoreline edge. The rails may have been removed or covered between the end of the slipway and the shoreline. It appears that sleeper rails are present at the edge of the shoreline indicating that portions of the slipway are intact below the water. Based on these sleeper rails, the visible portion of the marine railway is approximately 49 m (160 ft) in length.
Figure 7-53. Photograph of a plat dated 1919 of the Whitehaven Shipbuilding Company.
The machinery present at the Dolbey Marine site bears some similarities to the shipyard machinery patented by Primus Emerson in 1869 (Figure 7-55).
Figure 7-55. Patent No. 93,868 Primus Emerson’s marine railway (U.S. Patent Office 1869).
Site 18SO364 is a shipyard site located on the south side of Wicomico Creek approximately 2.9 miles (4.8 km) southeast of the Wicomico River (Figures 7-56 and 7-57). The site was first identified during a shoreline survey of Wicomico Creek conducted in December 2005 (Moser 2007). The shipyard is part of a 1.85-acre residential property located on a peninsula bounded by Wicomico Creek to the north, tidal marsh to the northwest and a small unnamed stream to the west. The landform directly behind the shoreline consists of a steep rise and most of the remainder of the property consists of a low, level, bluff. The western half of the property is wooded and slopes to the northeast. The eastern half of the property is dominated by a pool, large residence and manicured lawn. A modern pier is located just east of the slipway.

Figure 7-56. Site location 18SO364, 7.5' USGS Eden Quadrangle.
The most evident part of the site consists of a large timber slipway (Figures 7-58). The slipway is sub-rectangular in plan with overall dimensions of approximately 10.7 m (35 ft) wide by 30.5 m (100 ft) long. Currently, the site is covered by a dense layer of floc over most of the lower slipway. The slipway represented the primary area of investigation. One non-systematic shovel test was excavated approximately 15 m south of the shoreline to investigate an anomalous topographic feature. The results of this shovel test excavation and, the presence of several additional topographic features in the woods behind the slipway, indicate that additional site components are probably located on the ridge behind the shoreline.

Soils at the site consist of frequently flooded Transquaking and Mispillion tidal marsh just northwest of the site, and soils away from the shoreline are Runclint-Evesboro
complex with 2 to 5 percent slopes. These excessively drained sand and loamy sands are typically found on fluviomarine terraces and dunes (USDA, NRCS, Websoil Survey).

Figure 7-58. Slipway at 18SO364, facing south from the boat (Moser 2007).

Introduction

Site 18SO364 is a late eighteenth and early nineteenth-century shipyard located on the south side of Wicomico Creek in Somerset County, Maryland. The site was initially identified by the presence of a large wooden slipway located west of a modern pier. Subsequent title research indicates that the property was owned by a shipwright named Daniel Whitney in the early nineteenth century. Prior to Whitney’s purchase of the property, it was owned by William Adams, Jr. and then by Dr. Charles Nutter. John Adams (father of William Adams) may have been involved with shipbuilding at this location. In 1777, John Adams advertised in the *Maryland Gazette* describing a vessel on the stocks on Wicomico Creek.

A fine vessel; now on the stocks, in Somerset County, on Wycomico Creek, and will be launched in six weeks 44 feet keel, 19 beam 7 1/2 in the hold, 3 feet 7 inches between decks completely built, new frame all
of mulberry and red cedar, except her floor runners and lower futtox. Any person inclinable to purchase the said vessel may know the terms, by applying to the subscriber John Adams, August 21, 1777. (Maryland Gazette and Baltimore General Advertiser August 21, 1777).

It is unclear whether this vessel was built at 18SO364 or at another shipyard located on the creek. In addition to his ownership of the tract of land on which the shipyard was located, Adams also possessed extensive property holdings elsewhere on Wicomico Creek. Three other individuals who were associated with either the shipyard property or shipwright Daniel Whitney were Henry Lowes, his son Tubman Lowes, and Dr. Charles Nutter. Each of these individuals was associated in some capacity with the shipbuilding on Wicomico Creek. Research indicates that Henry Lowes (?-1791) and Tubman Lowes (1764-1815) both resided at the family plantation called “Chatham” which was located west of Whitney’s property. Henry Lowes was a merchant who was both a ship-owner and a shipbuilder in Somerset County. Henry was married to Esther Handy, the stepdaughter of Day Scott, a merchant and possible shipyard owner on the Wicomico River (Papenfuse et al. 1979:552). Henry’s son Tubman Lowes and shipwright Daniel Whitney had several business connections in the late eighteenth and early nineteenth century and were probably involved in a shipbuilding business partnership. In 1805, Tubman Lowes was listed as the builder of a 120-ton schooner named the Daniel Whitney, which was built on Wicomico Creek.

The 1798 Federal Direct Tax Assessment of Somerset County identified Tubman Lowes as the owner/occupant of a plantation (Chatham) located near the mouth of Wicomico Creek. The Lowes’ plantation included a 52-x-32-ft two story brick residence described as “very old” and out of repair with 4 outbuildings valued at $400.00 (1798 Federal Tax Assessment, Wicomico Hundred). A review of properties of Tubman Lowes indicates that he owned approximately 881 acres of land, approximately 200 acres of which was considered marsh land at the time of his death in 1815 (Papenfuse et al. 1979:552). An inventory of his estate was conducted on September 4, 1815 (MSA, Somerset County Inventories Liber EB 31, folio 56, 169, 250). The inventory included one lot of old ship carpenters tools valued at $9, another lot of old ship carpenters tools valued at $9, a compass saw, three whip saws, a cross cut saw, three narrow axes, one set
of blacksmiths tools, old iron in the smiths shop, one small bar of steel, 200 bushels of coal, and a lot of dew retted flax. Also included within the inventory were 19 slaves ranging in age from 90 to 8 months and valued at a total of $3390.02. While the probate documents provided no specific information about the location of his shipyard it is clear from his land holdings that his property bordered both Wicomico Creek and the Wicomico River.

**Tract History**

Site 18SO364 is located on lands that were part of the estates of John and Alexander Adams, Jr., sons of the Rev. Alexander Adams (1680-1769). Specifically, the shipyard property was conveyed from John Adams to his son William Adams, Jr. William Adams, Jr. then conveyed the property to his wife Louisa Adams (also his first cousin) who was also the daughter of Alexander Adams, Jr., and also to Thomas Hamilton. After William Adams died, Louisa Adams married Dr. Charles Nutter. In 1804, Louisa Adams and her husband Dr. Charles Nutter, and Thomas Hamilton divided the property they received from William Adams Jr. and she was left with approximately 558 acres of the original estate (MSA, Somerset County Land Records, Liber T, folio 530). On December 18, 1810, Dr. Nutter sold this property to shipwright Daniel Whitney (MSA, Somerset County Land Records Liber T, folio 584). Dr. Nutter died three years later on November 16, 1813 (*Republican Star*, December 7, 1813).

The conveyance from Dr. Nutter and his wife consisted of the same 558 acres of land from the tracts “Young Tinson”, “Tonys Vineyard”, “John’s Desire” and “Adams Discovery.” These tracts were conveyed for the price of $3,400 current money. In 1817 Daniel Whitney added property to these tracts by patenting two additional small tracts of property including 8 ½ acres of “Ladrith’s Disappointment”, and 9 ¾ acres of “Adams Folly,” which probably adjoined this property (MSA, Patent Certificate 22 and 1375). The property on which the shipyard is located is believed to be on the 558 acres that were sold to Daniel Whitney. A local newspaper published in Princess Anne described Whitney’s property (MSA, Special Collections 4848, Village Herald, December 21, 1830).

**THE subscriber, being authorized to sell the lands, on which the late Daniel Whitney resided, for the benefit of his creditors, will sell, on WEDNESDAY, the 12th of January next, at 12 o’clock M. on the premises, all those tracts or parcels of land, or so much thereof as will be sufficient to pay his debts,**
which said Daniel purchased of a certain Dr. Charles Nutter, lying on the South side of Wicomico Creek, and adjoining the farms of John H. Bell and Littleton P. Dennis, Esq’s., containing, according to a deed from Dr. Nutter to Daniel Whitney, 500 acres, more or less.

More than half of this land is in timber, and is attended with facilities of sending to market its timber, staves, firewood and agricultural productions, rarely to be met with, as it is bounded by a creek navigable for vessels of 80 tons, within 50 yards of the door. A further description is deemed unnecessary, as it is supposed that those who wish to purchase will judge for themselves…

WM. T. G. POLK, Agent.

Daniel Whitney

The following information was provided by researcher Emalu Myer Simpson (Simpson personal communication). Daniel Whitney was the son of Thomas Whitney who died December 25, 1796 in Somerset County (MSA, So. Co. Wills, Liber EB 17, folio 575). Thomas Whitney was survived by 15 children. Daniel Whitney's share of his father’s estate amounted to £56:6:6 (MSA, Somerset Administration Account, Liber EB 24, folio 57). According to a transcript of a family bible that was passed down from other Whitney family descendants, Daniel Whitney was born on September 3, 1777, and died on April 3, 1827 at the age of 51. Daniel married Sally Harris on Jan 15, 1811 (Pollitt 1986). The 1810 Federal Census enumerated Daniel Whitney’s household including one Free White male between the ages of 10 and 16 years of age and two free white males between the ages of 16 and 26 years of age. In addition to these individuals, the Census describes Daniel Whitney’s household as comprised of one other (non-white) free person and two slaves (U.S. Census 1810). The Whitney family bible records that Daniel and Sally had at least one daughter named Elizabeth Susan Whitney who was born on March 12, 1812 (Simpson, personal communication 2007). Sally died when Elizabeth was four years old. Consequently Elizabeth was raised by her aunts. Elizabeth Susan Whitney married William Massey Tull on July 10, 1833 (Simpson, personal communications 2007). Elizabeth died on October 19, 1895 at the age of 83 (Whitney Whistler 1986).

When Daniel Whitney died in 1827 he left a substantial estate of his personal property. The inventory of his estate was recorded on September 17, 1828. (Table 7-3).
Table 7-3. Partial inventory of the estate of Daniel Whitney (MSA, Somerset County Administrative Accounts Liber 6, folio 263-266).

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negro Man Spencer</td>
<td>80.00</td>
</tr>
<tr>
<td>Negro Man Alfred</td>
<td>300.00</td>
</tr>
<tr>
<td>1 Sorrel Mare</td>
<td>10.00</td>
</tr>
<tr>
<td>1 Gray Mare</td>
<td>18.00</td>
</tr>
<tr>
<td>1 Sorrel Mare</td>
<td>60.00</td>
</tr>
<tr>
<td>1 Pair Oxen</td>
<td>25.00</td>
</tr>
<tr>
<td>1 Do. Do.</td>
<td>20.00</td>
</tr>
<tr>
<td>1 Do. Do.</td>
<td>30.00</td>
</tr>
<tr>
<td>2 Small Bulls</td>
<td>15.00</td>
</tr>
<tr>
<td>1 Cow</td>
<td>15.00</td>
</tr>
<tr>
<td>1 Cow &amp; Calf</td>
<td>10.00</td>
</tr>
<tr>
<td>1 Cow</td>
<td>9.00</td>
</tr>
<tr>
<td>1 Cow &amp; Calf</td>
<td>8.00</td>
</tr>
<tr>
<td>2 Bull Yearlings</td>
<td>5.00</td>
</tr>
<tr>
<td>9 Sheep</td>
<td>9.00</td>
</tr>
<tr>
<td>2 Ploughs</td>
<td>2.00</td>
</tr>
<tr>
<td>1 Do. Do.</td>
<td>2.00</td>
</tr>
<tr>
<td>2 Harrows</td>
<td>2.00</td>
</tr>
<tr>
<td>1 Harrows</td>
<td>0.50</td>
</tr>
<tr>
<td>2 Pair chain traces</td>
<td>2.00</td>
</tr>
<tr>
<td>1 Pair Hames [Hams]</td>
<td>0.25</td>
</tr>
<tr>
<td>3 Grubbing Hoes</td>
<td>0.75</td>
</tr>
<tr>
<td>3 Ho[e]s</td>
<td>0.25</td>
</tr>
<tr>
<td>1 Brier Hook</td>
<td>1.00</td>
</tr>
<tr>
<td>2 Narrow Axes</td>
<td>1.50</td>
</tr>
<tr>
<td>1 Ax</td>
<td>1.00</td>
</tr>
<tr>
<td>1 X Saw</td>
<td>2.00</td>
</tr>
<tr>
<td>1 Pit Saw</td>
<td>3.00</td>
</tr>
<tr>
<td>1 Crow Bar</td>
<td>1.00</td>
</tr>
<tr>
<td>Lot of Old Iron</td>
<td>1.50</td>
</tr>
<tr>
<td>1 Pair Sipe Bills</td>
<td>0.50</td>
</tr>
<tr>
<td>1 Iron Rake</td>
<td>0.10</td>
</tr>
<tr>
<td>1 Pair Numbs</td>
<td>1.00</td>
</tr>
<tr>
<td>1 Do. Do.</td>
<td>0.15</td>
</tr>
<tr>
<td>1 Timber Chain</td>
<td>3.00</td>
</tr>
<tr>
<td>2 Ox Chains</td>
<td>1.50</td>
</tr>
<tr>
<td>2 Pair Can Hooks</td>
<td>2.00</td>
</tr>
<tr>
<td>Some Old Canvas</td>
<td>0.10</td>
</tr>
<tr>
<td>1 Iron wedge</td>
<td>0.40</td>
</tr>
<tr>
<td>1 Pair Steelyards</td>
<td>1.00</td>
</tr>
<tr>
<td>16 Old Casks</td>
<td>3.00</td>
</tr>
<tr>
<td>3 Work Bridles</td>
<td>3.00</td>
</tr>
<tr>
<td>Lot of flax in sheave</td>
<td>3.00</td>
</tr>
<tr>
<td>2 Cleorses</td>
<td>0.75</td>
</tr>
<tr>
<td>1 Ox Yoke</td>
<td>0.25</td>
</tr>
<tr>
<td>Corn Bshl.</td>
<td>0.50</td>
</tr>
<tr>
<td>White Oak ... Timber</td>
<td>0.50</td>
</tr>
<tr>
<td>1 Old X Saw</td>
<td>0.25</td>
</tr>
<tr>
<td>2 Oak Baskets</td>
<td>0.25</td>
</tr>
<tr>
<td>Pair Nail drawers</td>
<td>0.5</td>
</tr>
<tr>
<td>2 Hand Saws</td>
<td>2.0</td>
</tr>
<tr>
<td>1 panel saw</td>
<td>0.5</td>
</tr>
<tr>
<td>3 adz</td>
<td>2.0</td>
</tr>
<tr>
<td>1 grind stone</td>
<td>0.50</td>
</tr>
<tr>
<td>1 pin mall</td>
<td>1.0</td>
</tr>
<tr>
<td>2 caulking mallet</td>
<td>0.75</td>
</tr>
<tr>
<td>2 saw &amp; bucks</td>
<td>0.25</td>
</tr>
<tr>
<td>Lot of breeding planes</td>
<td>2.0</td>
</tr>
<tr>
<td>Lot of Old planes</td>
<td>3.0</td>
</tr>
<tr>
<td>Lot of Old augers</td>
<td>1.0</td>
</tr>
<tr>
<td>Lot of chisels</td>
<td>1.50</td>
</tr>
<tr>
<td>1 Iron Square 1 Hammer</td>
<td>0.25</td>
</tr>
<tr>
<td>1 Old Brace &amp; Som[e] Bits</td>
<td>0.5</td>
</tr>
<tr>
<td>1 Drawing Knife</td>
<td>0.35</td>
</tr>
<tr>
<td>1 Stick Basket with [Ten ???]</td>
<td>1.50</td>
</tr>
<tr>
<td>1 Old Compass Saw</td>
<td>0.40</td>
</tr>
<tr>
<td>1 Do. With White Le[a]d</td>
<td>1.75</td>
</tr>
<tr>
<td>4 Jugs and some Oil</td>
<td>2.0</td>
</tr>
<tr>
<td>2 Jugs containing turpentine</td>
<td>1.0</td>
</tr>
<tr>
<td>4 Jugs</td>
<td>1.0</td>
</tr>
<tr>
<td>1 Small Do.</td>
<td>0.5</td>
</tr>
<tr>
<td>1 Dutch Oven</td>
<td>0.25</td>
</tr>
<tr>
<td>2 Old tea Kettles</td>
<td>1.0</td>
</tr>
<tr>
<td>1 pair pot hooks</td>
<td>0.10</td>
</tr>
<tr>
<td>7 Hives with Bees</td>
<td>2.0</td>
</tr>
<tr>
<td>1 Saddle</td>
<td>5.0</td>
</tr>
<tr>
<td>1 Bridle</td>
<td>0.25</td>
</tr>
<tr>
<td>1 Old tool chest</td>
<td>0.25</td>
</tr>
<tr>
<td>1 Lantern</td>
<td>0.10</td>
</tr>
<tr>
<td>Some Sheet Le[a]d</td>
<td>0.25</td>
</tr>
<tr>
<td>1 Bed No. 1 wt. 31 lb.</td>
<td>6.20</td>
</tr>
<tr>
<td>1 Do. Do.</td>
<td>34.00</td>
</tr>
<tr>
<td>1 Bed No. 2 wt 50 lb.</td>
<td>10.00</td>
</tr>
<tr>
<td>1 Bed No. 3 wt 40 lb.</td>
<td>8.00</td>
</tr>
<tr>
<td>1 Bed No. 4 wt 40 lb.</td>
<td>8.20</td>
</tr>
<tr>
<td>1 Bedstead mat &amp; end</td>
<td>1.25</td>
</tr>
<tr>
<td>1 Old mat and old hide</td>
<td>0.20</td>
</tr>
<tr>
<td>1 pair linen sheets</td>
<td>2.0</td>
</tr>
<tr>
<td>1 pair linen &amp; cotton Do.</td>
<td>2.00</td>
</tr>
<tr>
<td>1 pair Blankets</td>
<td>3.00</td>
</tr>
<tr>
<td>1 Do. Do.</td>
<td>4.0</td>
</tr>
<tr>
<td>1 Old bed quilt</td>
<td>0.50</td>
</tr>
<tr>
<td>1 Counter [pin?]</td>
<td>4.00</td>
</tr>
<tr>
<td>1 Old Walnut Table</td>
<td>1.0</td>
</tr>
<tr>
<td>1 Cupboard</td>
<td>3.0</td>
</tr>
<tr>
<td>1 Desk &amp; Book case</td>
<td>6.0</td>
</tr>
<tr>
<td>1 Gun</td>
<td>4.0</td>
</tr>
<tr>
<td>6 Windsor chairs</td>
<td>5.0</td>
</tr>
<tr>
<td>2 Dishes</td>
<td>0.6</td>
</tr>
<tr>
<td>10 plates</td>
<td>0.5</td>
</tr>
<tr>
<td>1 pair cut glass Decanter</td>
<td>1.0</td>
</tr>
<tr>
<td>1 plain Decanter</td>
<td>0.4</td>
</tr>
<tr>
<td>1 pair pitchers</td>
<td>2.0</td>
</tr>
<tr>
<td>1 Sugar dish</td>
<td>0.25</td>
</tr>
<tr>
<td>1 Trunk</td>
<td>1.5</td>
</tr>
<tr>
<td>1 Do.</td>
<td>0.50</td>
</tr>
<tr>
<td>1 Looking Glass</td>
<td>1.50</td>
</tr>
<tr>
<td>1 Old Walnut Table</td>
<td>1.0</td>
</tr>
<tr>
<td>1 Old Walnut Table</td>
<td>1.0</td>
</tr>
<tr>
<td>1 Look [pin?]</td>
<td>4.00</td>
</tr>
<tr>
<td>1 Old Walnut Table</td>
<td>1.0</td>
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<td>1 Old Walnut Table</td>
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<td>1.0</td>
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<tr>
<td>1 Old Walnut Table</td>
<td>1.0</td>
</tr>
<tr>
<td>1 Old Walnut Table</td>
<td>1.0</td>
</tr>
</tbody>
</table>
The inventory also provides additional details about the labor structure at Whitney’s shipyard. Only two slaves a “negro man Spencer” and a “Negro man named Alfred” valued at $80 and $300 respectively were included within Whitney’s inventory. This suggests that while Whitney may have used slave labor, his shipyard probably did not employ large numbers of slaves. This is further supported by information contained in the 1810 Census in which Whitney was listed as the head of household with one white male (10-16 years old), two white males (16-26 years old), one (non-white) free person, and two slaves (U.S. Census 1810). The free white males described in the 1810 Census may represent apprentices or journeyman ship carpenters.

Whitney is known to have had several apprentice shipwrights who were bound to him after the 1810 Census. On January 8, 1811 the Orphan’s Court bound apprentice Thomas Burgin as an apprentice to “learn the trade of shipwright” to Daniel Whitney (MESDA:file 59167). Thomas Burgin was most likely the son of Daniel Whitney’s sister Sarah Burgin who died by 1810. In addition to his nephew Thomas, Daniel Whitney acquired several additional apprentices who were probably not related to him. In 1816, the County Orphans Court bound two additional apprentices named Charles Jackson and Daniel B. McGrath to Whitney (Heise 1996:107). Based on these records, it is likely that Whitney used apprentices and local labor to build and repair vessels at his shipyard.

The inventory also provides some indications of the nature of Whitney’s knowledge as a shipwright. Among the items listed in his inventory were “one lot drafts” and one pair of “wooden compasses.” Drafts are plans that are used in the design and the construction of watercraft. These plans usually consist of a sheer plan, body plan, and a half-breadth plan. They provide scaled measurements that were used to create vessel dimensions built to an exact scale. Such standardized designs indicate that at least some of Whitney’s vessels were well thought out prior to the construction of the vessel. The presence of the wooden compasses suggests that Whitney may have actually used the plans to transfer measurements from the plans to a mould loft floor to build a vessel.

This use of construction drafts was highly unusual for this period since the use of such formal designs required the use of mathematics and a certain amount of formal education. These plans described within the inventory may even have been plans of the schooner drafted by Thomas Kemp that was described in the 1814 newspaper advertisement (Figure 7-59). Such knowledge of drafts was unusual outside the major shipbuilding yards of the Old World.
Instead, most shipwrights of the period and the region built and used half models. Half models are three dimensional models from which unskilled or even illiterate ship builders could build a vessel using simple proportions in order to create the frames of the vessel under construction. The shape of these frames both individually and collectively determined the shape of the vessel, its speed, its capacity, and its strength. Whitney’s possession of ship drafts indicates that Whitney probably had some formal training in reading such plans and it may also indicate that he was very familiar with theoretical ship design.

Other items of interest within his inventory include Nicholson’s Encyclopedia. This probably refers to *The British Encyclopaedia or Dictionary of Arts and Sciences*, which was published in 1809 and was ascribed to William Nicholson but was compiled by Reverend Jeremiah Joyce (Issitt 1998). This presence of this book suggests that Whitney had some interest in scientific knowledge of the period.

Together, Dr. Charles Nutter, Tubman Lowes, and Daniel Whitney were responsible for the construction of over 2,150 tons of shipbuilding and the majority of this tonnage was constructed on Wicomico Creek (Table 7-4). Based on circumstantial evidence, Daniel Whitney most likely served as the Master shipwright for Dr. Nutter and Tubman Lowes. Coincidentally, after the death of Tubman Lowes in 1815, listings of new vessels constructed by Daniel Whitney declined precipitously. Whitney completed just one vessel in 1816 and then did not complete another new vessel until nine years later in 1825.
Table 7-4. Vessels built by Daniel Whitney, Tubman Lowes, and Charles Nutter.

<table>
<thead>
<tr>
<th>Name</th>
<th>Rig</th>
<th>Tonnage</th>
<th>Length</th>
<th>Beam</th>
<th>Depth</th>
<th>Year</th>
<th>Place of Build</th>
<th>Built By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daniel Whitney</td>
<td>Schooner</td>
<td>121.47</td>
<td>54</td>
<td>22.5</td>
<td>9.5</td>
<td>1805</td>
<td>Wicomico Creek</td>
<td>Tubman Lowes</td>
</tr>
<tr>
<td>Shepherdess</td>
<td>Ship</td>
<td>325.24</td>
<td>78</td>
<td>29</td>
<td>17.5</td>
<td>1806</td>
<td>Wicomico River?</td>
<td>Charles Nutter</td>
</tr>
<tr>
<td></td>
<td>Ship</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
<td>1807</td>
<td>Wicomico Creek, Chatham</td>
<td>Tubman Lowes</td>
</tr>
<tr>
<td>Aurora</td>
<td>Ship</td>
<td>371.81</td>
<td>70</td>
<td>28</td>
<td>13</td>
<td>1807</td>
<td>Somerset</td>
<td>Charles Mitten/Nutter?</td>
</tr>
<tr>
<td>Charles &amp; Bancker a.k.a.</td>
<td>Ship</td>
<td>75</td>
<td>60</td>
<td>25.6</td>
<td>15</td>
<td>1808</td>
<td>Wicomico River “Lower Ferry”</td>
<td>Daniel Whitney</td>
</tr>
<tr>
<td>Susquehanna</td>
<td>Ship</td>
<td>75</td>
<td>28.91</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horatio</td>
<td>Brigantine</td>
<td>52.5</td>
<td>24.33</td>
<td>10</td>
<td></td>
<td>1810</td>
<td>Wicomico Creek</td>
<td>Daniel Whitney</td>
</tr>
<tr>
<td>Commodore Rodgers</td>
<td>Schooner</td>
<td>292</td>
<td>82</td>
<td>27</td>
<td>13</td>
<td>1812</td>
<td>Wicomico Creek</td>
<td>Charles Nutter</td>
</tr>
<tr>
<td>--</td>
<td>Schooner</td>
<td>85.1</td>
<td>73</td>
<td>24.16</td>
<td>10</td>
<td>1813</td>
<td>Wicomico River</td>
<td>Daniel Whitney</td>
</tr>
<tr>
<td></td>
<td>Schooner</td>
<td>184</td>
<td>100</td>
<td>24</td>
<td></td>
<td>1814</td>
<td>Wicomico Creek</td>
<td>Est. of Dr. Charles Nutter/Daniel Whitney/Thomas Kemp</td>
</tr>
<tr>
<td>IDAS</td>
<td>Ship</td>
<td>214</td>
<td>79</td>
<td>24.5</td>
<td>10.5</td>
<td>1816</td>
<td>Princess Anne</td>
<td>Daniel Whitney</td>
</tr>
<tr>
<td>Lovely Sir</td>
<td>Schooner</td>
<td>57</td>
<td>41</td>
<td>20</td>
<td>6.25</td>
<td>1825</td>
<td>Wicomico Creek</td>
<td>Daniel Whitney</td>
</tr>
</tbody>
</table>

Figure 7-59. Advertisement from the Baltimore Patriot dated April 18, 1814.

An 1814 newspaper advertisement from the Baltimore Patriot described a schooner built on Wicomico Creek by Daniel Whitney, possibly constructed at 18SO364. There are no
carpenter certificates for 184-ton schooners built in Somerset County in 1814. However, the newspaper article also identified a Baltimore shipbuilder named Mr. Kemp. This shipwright is undoubtedly Mr. Thomas Kemp, a noted Eastern Shore shipwright who relocated to Baltimore. Mr. Kemp was born in Talbot County in 1779 and moved to Baltimore in 1803. He established his own shipbuilding business in Fell’s Point in 1805 and continued operations until 1822. Thomas Kemp is best-known as the builder of the Baltimore privateers *Comet* and *Chasseur* which were built as Baltimore Clippers (Robinson 1957:30). Both vessels were among the most successful American privateers during the War of 1812. The relationship between Whitney and Kemp is notable since Kemp is the most famous Chesapeake Bay shipwright (Footner 1999:111).

In addition to his relationship to Mr. Kemp, several Carpenter’s Certificates also indicate that Whitney continued to construct vessels until close to his death in 1827 (Brewington 1957). In addition to his work on Wicomico Creek, several documents also indicate Whitney’s construction of vessels in other areas of Somerset County (Table 7-4). Prior to his purchase of the shipyard property from Charles Nutter, Whitney appears to have constructed vessels on the Wicomico River at the “Lower Ferry,” which is the current location of the town of Whitehaven. Curiously, a vessel bearing the name of *Daniel Whitney* is listed on an 1806 Carpenter’s Certificate having been built on Wicomico Creek by Tubman Lowes. While Tubman Lowes was listed as the builder, it is most likely that Tubman Lowes was the shipyard owner rather than the designer or the artisan responsible for the completion of the vessel. The name of the schooner clearly indicates some sort of relationship between Tubman Lowes and Daniel Whitney. It is unclear whether the relationship between the two men was personal or business related. It is clear that during this period Tubman Lowes operated a shipyard at his family plantation called Chatham. An 1807 newspaper advertisement specifically indicated that Chatham was the location of a shipyard (Figure 7-60).
The size of the ship in the advertisement suggests that it required substantial investment and substantial expertise in its construction. Daniel Whitney may have been one of the shipwrights who provided the expertise required for such a large undertaking.

Similarly, Dr. Charles Nutter was also listed as the builder of the ship Shepherdess which was probably built on the Wicomico River. Several other vessels including the ship Aurora and the Commodore Rodgers were described as built by Charles Nutter on the Wicomico River or Wicomico Creek. Regardless of the builder, and regardless of the place they were built, there is relatively little information about any of these vessels. Extensive attempts to track the ownership, and ports of entry and clearance, or insurance records for these vessels have yielded little additional information about them.

**Archaeology**

The slipway at 18SO364 is the most unique aspect of this site and distinguishes it from previously identified eighteenth/nineteenth century Chesapeake shipyards. The slipway consists of a sloping, sub-rectangular timber structure with overall dimensions of approximately 10.7 m (35 ft) wide by 30.5 m (100 ft) long (Figures 7-61 through 7-66).
The slipway is divided into two distinct areas that were designated as the upper and a lower slipway. The upper slipway is a roughly 9-x-10-m area located just north of the shoreline. It is composed of five large roughly parallel timbers that are spaced irregularly and probably form the slipway groundways (Table 7-5).

Table 7-5. Dimensions of major timbers from the upper slipway.

<table>
<thead>
<tr>
<th>Timber</th>
<th>Length (m)</th>
<th>Width (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>7.3</td>
<td>0.42</td>
</tr>
<tr>
<td>T2</td>
<td>7.25</td>
<td>0.52</td>
</tr>
<tr>
<td>T3</td>
<td>9.5</td>
<td>0.50</td>
</tr>
<tr>
<td>T4</td>
<td>10</td>
<td>0.54</td>
</tr>
<tr>
<td>T5</td>
<td>9.5</td>
<td>0.63</td>
</tr>
</tbody>
</table>
Timber T1 is located closest to the shoreline and Timbers T2 through T5 are located progressively further north in the creek. Timbers T1, T2 and T3 are spaced approximately 0.75 m and 1.0 m apart. Timber T4 is located approximately 2.4 m from timber T3. The misalignment of timber T4 suggests that this timber may have been moved from its original position. This is further supported because portions of the elevation of T4 are higher than timbers T3 and T5. The wide gap between timbers T3 and T4 also indicates that another timber may have been removed from this location. Finally, timbers T1 and T2 are considerably shorter than timbers T3-T5. The difference in length of these two could represent earlier components of the site, replacement components, or it may represent a functional difference within the upper slipway. Because no excavations were conducted, it remains a possibility that additional timbers are present under the bank directly behind the slipway. A sixth timber (T10) is located at the east end of T5. The dimensions of this timber were difficult to define due to the fact that it was submerged and largely buried in sand. Timber T10 is approximately 4.95 m long, is rounded and approximately 17–20 cm in width, and the middle may be hewn flat.
The five large timbers of the upper slipway are between 7.3 and 10 m in length and average approximately 0.52 m in width (Figure 7-62). They are set into a coarse sand mixed with some small brick fragments. Only the uppermost 25 percent of the timbers were exposed. The lower 75 percent may have been set into shallow trenches to provide additional stability. Each timber is hewn flat on the upper and lower surfaces and left “in the round” on their sides. There is no evidence of fasteners on the upper surface or sides of the timbers. There are a number of shallow U-shaped notches and abrasion marks perpendicular to the wood grain on each of the five timbers (Figure 7-64). The notches and abrasions are mostly located on the forward (north) edge of the timbers. The reason for the presence of these notches is unknown; however, they are located in the approximate position consistent with either the location of keel blocks or ships keel. Timbers T1-T5 were set on shallow slope of approximately 0.22 m (0.75-ft) over a distance of approximately 7.5 m.
The lower slipway is an area of densely spaced pine pilings approximately 19.2 x 10.7 m (63 x 35 ft) in size (Figure 7-65). A count of the total number of pilings was not feasible during this investigation. However, a sample count was taken of 2m$^2$ area of the lower slipway. A total of 99 pilings were present within the sample area. Extrapolation based on this sample and the overall dimensions of the lower slipway, suggests that the lower slipway is composed of an estimated 5,084 pilings. Examination of the pilings indicates that they are a species of fast growing pine with 10–25 growth rings present. The pilings ranged in size between 10 and 27 cm and averaged 17.4 cm in diameter. The overall length of these pilings could not be estimated based on their exposed length. Each piling is probably at least two meters in length. The majority of pilings are eroded to a sharpened point and only those with ends that are flush to the creek are smooth and have been protected by sand and sediment.
Two other large timbers (T6 and T8) are located east of the modern pier. Timber T6 is 4.1 m in length and averages approximately 25–43 cm in width. This large timber is most closely similar in size to timbers T1-T5. Timber T6 may have been moved from another location, possibly during the construction of the modern pier. Located on the shoreline just east of the pier is a large, heavily worm eaten and rotted squared timber (T8) measuring 74 x 34 x 20 cm. This timber resembles a keel block and may have functioned as such. Examination of the surface of timber T8 was hampered by the deteriorated condition of the timber. Just east of timber T8 along the shoreline are a large number of rounded cobbles that are not native to this area that probably served as ballast stones (Figure 7-67).
Figure 7-66. Plan view site I8SO364.

Figure 7-67. Probable ballast stones along the shoreline east of the modern pier (Moser 2007).
Sonar Investigations

Side scan sonar investigations of the site were considerably hampered by the depth of organic sediment (*floc*) overlying most of the lower slipway. The sonar detected pilings of the lower slipway, the modern pier, and a previously unidentified anomaly near the north end of the slipway. Examination of the piling placement confirmed the linear nature of the slipway and that the majority of structural elements seem to be in close proximity to the slipway. A closer examination of the sonar data and photographs of the lower slipway suggested a V-shaped anomaly on the northern end of the slipway created by the pattern of the pilings. This is apparently caused by differences in the heights of some areas of pilings. Pilings towards the edges of the northern end of the slipway were higher in elevation than the pilings in the center of the slipway. The apparent absence on sonar of the pilings in the center of the slipway was caused by the additional depth of these pilings that were then covered with substantially more sediment than the surrounding pilings. The channel created by the different depths of pilings may have been intentionally designed, or it may have been the result of additional weight placed on these pilings, forcing them further down into the creek bed.

An anomaly located just west of the end of the slipway is approximately 5-x-10 m in size (Figure7-68). This area of the slipway was not thoroughly investigated during the fieldwork due to the depth of the sediment. The indistinct sonar image of the anomaly suggests that it is fully or partially covered by sediment. If true, this suggests that the anomaly is probably associated with the period of shipyard operations, rather than significantly later periods. Further investigations will be required to identify the nature of this anomaly.
Due to the thickness of *floc* across the slipway, the best method for detecting the outlines of the slipway was through probing. In addition to the pilings that were identified during the investigations, smaller archaeological materials were also identified. One large octagonal trunnel was recovered from the sediment. It was approximately 3.25 cm (1.27 in) in diameter and approximately 28 cm (11 in) in length (Figure 7-69).
Other materials recovered from the floe included well-preserved fragments of wood, which had clearly been worked with adzes or axes. Finally, a small section of a one-inch thick plank with a wrought iron nail was recovered (Figure 7-70).
Finally, two intuitive shovel test pits (STPs) were excavated directly inland from the shipyard on a suspiciously flat area within woods. These STPs revealed the presence of a lens of oyster shell and recovered a single Creamware ceramic sherd.

**Dendrochronology**

In October 2006, the Oxford Dendrochronological Laboratories (ODL) and several volunteers visited site 18SO364 to collect tree-ring samples from timbers T1, T2, T3, T4, T5, and T6. Multiple samples were collected from each timber (Figure 7-71). Initial analysis of the samples failed to identify any correlation with ODL reference samples. Subsequent consultations with Paul Krusic at the Columbia University dendrochronology laboratory successfully matched several of the samples taken from timbers T1 and T2 (Miles 2006). Two other samples were matched to the site but specific provenience information was lost from the sample. The four samples that correlated with the Columbia University data were combined to form a tree-ring site master chronology for the site. The site master tree-ring chronology spanned the dates from 1681 to 1798 (Miles 2006). In addition to the matches listed above Columbia University also identified several matches including a t-value of 5.02 with WATCH, 4.33 with PIEDMONT, and 4.26 with MONTP (Comparative samples from regional historic structures) (Miles 2006).

Timber T1 was felled sometime after 1793. Timber T2 was felled sometime after 1798. Two other site samples with no provenience were felled after 1794 and 1798 respectively. Because no bark was present on these samples it is likely that several years of growth rings were lost due to the deterioration of the wood quality. However, the clustering of dates from this site suggests a felling date of circa 1800 for these timbers.
Interpretation

Site 18SO364 is one of the few previously unknown site locations identified as a shipyard site by this study. The tree-ring cores collected during this study indicate that site 18SO364 operated as a shipyard circa 1800. Historical research on the property indicates that the site was owned by Dr. Charles Nutter and Daniel Whitney during this period. Daniel Whitney’s probate inventory is one of the few documents directly linking Whitney’s shipbuilding operations to the shipyard on his own property. Other documents simply link his shipbuilding activities to the general area of Wicomico Creek.

The single major feature identified on the site consisted of a large complex slipway composed of dozens of large timbers and thousands of individual piles. The construction of the slipway represented a heavy investment in the site infrastructure. The largest of the timbers from the upper slipway minimally weigh 665 kg (1377 pounds), but probably weigh well over a ton. The pilings of the lower slipway represent an extraordinarily large investment in time and effort. If contemporaneous with the larger timbers, the pilings were driven prior to the introduction of the steam-powered pile driver. While mechanical assistance from pile drivers was available in
the early nineteenth century, such a large number of piles would have required the labor of a small crew and a considerable amount of time. Piling technology was relatively little changed between the Middle Ages and the 1840s. Only after this period did the introduction of steam-powered pile drivers greatly reduce the labor and time required to build maritime structures. A pile driver similar to the 1300-pound pile driver recovered during excavations at Jamestown, which used human or animal power, was most likely used to drive the estimated 5,040 piles used in the lower slipway. The exact amount of force required to drive each pile depends upon their length, diameter, and the soil conditions on site.

The plane of the slipway was also carefully designed with a gradual descent into the water. The upper slipway possessed a minimal slope that decreased on average approximately 0.22 m (0.75 ft) in elevation between timbers T1 and T5. This resulted in a slope of approximately 2.88 percent. The lower slipway drops approximately 0.996 m (3.27 ft) in elevation resulting in a slope of approximately 5.15 percent. Beyond the last pile of the lower slipway the depth of the original creek bottom rapidly decreases. Just beyond the last piling Wicomico Creek became four ft deeper and approximately 15.2 m (50 ft) from the end of the slipway the creek drops to nearly 2.59 m (8.5 ft) in depth.

The method in which this slipway functioned is still unclear. The five timbers (T1–T5) of the upper slipway most likely functioned as groundways. The pilings of the lower slipway may have functioned in both shipbuilding and a ship repair capacity. The pilings probably supported additional timbers that may have served as sliding ways. The timbers of the sliding ways were often temporary and could be removed from the slipway between the various ship building and repair operations.

**Summary**

This chapter describes the results of archaeological and historical investigations of six sites (18WC3, 18WC155, 18WC160, 18WC164, and 18SO364, 18WC104) that were associated with shipbuilding or ship repair within the study area. Two of the six sites date to the Colonial and Early Republic periods, while the remainder spans the mid nineteenth through early twentieth centuries. The two earlier sites used conventional wooden slipways to launch or repair vessels while three of the sites used marine railways. The sixth site was so heavily disturbed by subsequent wharf construction that it was difficult to determine the launching methods with
certainty. The next chapter analyzes and interprets the context of these sites within the model of Somerset County shipbuilding.
CHAPTER 8: INTERPRETATION AND RESULTS

Introduction

The purpose of this study was to identify the archaeological remains of shipyard sites within the 1200 sq. mi. study area. This study area was selected based on the historical documentation indicating a substantial concentration of shipbuilding in this region between the eighteenth and twentieth centuries. The study area also was selected due to the sparse suburban development of the waterfront in this area. The absence of significant shoreline development (e.g., bulkheads, rip-rap, and piers) in this area increased the likelihood for identifying intact archaeological features and deposits along the shoreline. The available historical documentation and Geographic Information System (GIS) models employed in this study were designed to maximize the probability of locating and identifying shipyard sites. Once shipyard sites were identified, additional targeted investigations were intended to provide additional information to develop a typology of shipyard sites to test several archaeological models of the influence of cultural and environmental variables.

Results

Fieldwork for this study resulted in the investigation of approximately 180,748 m of shoreline in Somerset, Wicomico, and Worcester Counties, Maryland. This investigation identified 67 previously unknown archaeological sites and revisited 13 previously identified archaeological sites. The new sites were located in Wicomico (n=43) and Somerset Counties (n=24) but no new sites were identified in Worcester County (Table 8-1). A wide variety of types of archaeological sites were identified during the survey, including wharves, mill dams, and shipwrecks in addition to shipyards. The survey identified five archaeological sites associated with shipbuilding or ship repair within the study area (18WC3, 18WC155, 18WC160, 18WC164, and 18SO364) and one previously identified shipyard site was revisited (18WC104).
Table 8-1. Summary of survey results by location.

<table>
<thead>
<tr>
<th>Areas Surveyed</th>
<th>Survey Area (m)</th>
<th>New Archaeological Sites</th>
<th>Site Revisits</th>
<th>Wharf/Landing Wreck</th>
<th>Shipyard or Marine Railway</th>
<th>Unknown/Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharptown</td>
<td>250</td>
<td>1</td>
<td></td>
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<tr>
<td>Nanticoke River</td>
<td>9640</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barren Creek</td>
<td>18850</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
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<td>12850</td>
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<td></td>
<td>7</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Quantico Creek</td>
<td>14452</td>
<td>10</td>
<td></td>
<td>9</td>
<td></td>
<td>1</td>
</tr>
<tr>
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<td>2740</td>
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<tr>
<td>Manumsco Creek</td>
<td>4752</td>
<td>1</td>
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<td></td>
<td></td>
<td>1</td>
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<tr>
<td>Wetipquin Creek (Above Bridge)</td>
<td>11320</td>
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<td>4</td>
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<td>1560</td>
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<td>9020</td>
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<td>Upper Wicomico River</td>
<td>21894</td>
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<td>1</td>
<td>2</td>
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<td>1</td>
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<td>Wicomico Creek</td>
<td>20732</td>
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<td>1</td>
<td>10</td>
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<td>Manokin River</td>
<td>15810</td>
<td>7</td>
<td>3</td>
<td>7</td>
<td>1</td>
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<tr>
<td>Big Monie Creek</td>
<td>23948</td>
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</tr>
<tr>
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<td>67</td>
<td>9</td>
<td>52</td>
<td>10</td>
<td>6</td>
</tr>
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</table>

This study has significantly expanded the number of shipyard sites that has been archaeologically identified in the State of Maryland. Despite this success, a significantly smaller number of archaeological examples of shipyards was identified than was expected at the initiation of this project. Furthermore, the six shipyards that were identified operated over a much longer chronological range than was anticipated at the outset of this study. The earliest shipyards that were identified were in operation by the 1790s while the later sites operated into the early twentieth century. Comparisons among such sites is far less meaningful than comparison of six contemporary or nearly contemporary sites. The long chronological range among the six shipyards makes specific comparisons between them difficult to evaluate. While differences between the identified shipyards could reflect the changing principles of site organization, the range of temporal variability does not lend itself to quantitative analysis. The substantial differences between the technologies of these periods and the relatively low resolution of data collected from these sites during the survey, and subsequent investigations, permit only relatively simple straightforward comparisons among them. Furthermore, these data
also must draw upon extensive historical information and from archaeological data collected outside the study area.

At the outset, this study proposed that the organization of spatial relationships recorded at individual archaeological sites reflected differences in site function as well as individual adaptation to specific local geographic, economic and technological variables. The non-arbitrary spatial relationships of each shipbuilding site reflects the underlying social, economic, and technological rules employed by the artisans and merchants that owned and operated these shipyards (Keller and Keller 1996:61). This study intended to analyze the variability of a large number of shipyards that were expected to be identified during fieldwork. A sufficiently large sample would have documented the full range of shipyard variability by employing typologies to classify attributes of individual sites. The limited sample size of shipyards identified in this study was insufficient to develop a reliable typology. As a result, the typology developed for this study is expanded to include information collected from primary documentary evidence and archaeological data drawn from sites outside the study area.

Through archaeology and historic research the approximate locations of 58 shipbuilding sites were identified within the study area. This number was primarily calculated using Carpenter’s Certificates and supplemented using information printed in newspapers, historic directories, Federal Census data maps, and archaeological information. These shipyards range in date between 1692 and the mid twentieth century; however, most of them were operated between 1740 and 1918. This estimate of shipbuilding locations is relatively conservative but some of these shipyards may have been operated by multiple owners over the course of many years. This number is considered conservative because most early shipbuilding records do not specify the location in which a vessel was constructed. For every record indicating a possible shipbuilding location there were five records that only provided a county name as the record of the construction location. Based on this information it is impossible to calculate the total number of shipyards and the intensity of shipbuilding operations within the study area. This number also does not reflect the number of shipyards that functioned primarily as repair yards. The record is further complicated by the fact that some records list the shipwright as the builder of record, while others list the shipyard owner as the builder of record.

Of the 58 shipbuilding locations that were generally known, 18 of these locations were precisely identified within the study area through both archaeology and historic records. Of these
18 shipbuilding locations only four date to a period prior to 1850. The remaining 15 locations operated between 1850 and the mid twentieth century. As a result, the following analysis predominately applies to post Civil War shipyard sites.

![Figure 8-1. Location of 18 shipyards identified in this study.](image)

**Typology**

A typology was developed as part of this study to better understand and examine the physical patterns of shipyard sites. Any useful typology must account for the wide degree in variability in shipyards and the limited areas that are often investigated. Also, any typology should incorporate elements of the local environment, the types of vessels constructed, and the intensity and duration of shipbuilding operations at that location. Such influences certainly played a significant role in the design and layout of shipyard sites. The types of activities at shipyards should also be incorporated. Generally, work regularly performed at shipyards can be classified into three categories; new construction, repair and refitting, and breaking and salvage. Each of these tasks was probably completed at most shipyards; however, some locations may have specialized in one, some, or all of these tasks. Many of the single-use sites may have been expedient sites that were used for a brief period or purpose and then were abandoned. The
purpose of this typology is to develop a single frame of reference for describing the variability at pre-industrial shipyard sites from expedient single-use sites to major military dockyards. Understanding the complete range of variability then facilitates the testing of various archaeological models and hypotheses.

Historical and archaeological investigations indicate that shipyard sites vary considerably in their function, size, form, operational longevity, rate of production, and the types of vessels that they produced, repaired, or dismantled. Due to many of the difficulties associated with archaeological investigations of shoreline sites many investigators have had difficulty distinguishing shipyard sites from other types of shoreline sites. Many researchers have investigated individual sites without understanding the contextual differences between the different types. This contextual comparison is necessary for understanding the similarities and differences of shipyards and how these sites have changed through time. This comparative context represents the beginning of the development of a typology of shipyard sites using both archaeology and history. Typologies contextualize and give meaning to the excavated data by defining recurrent elements of archaeological phenomena (Fritz and Plog 1970:405).

Comparison of the physical structures at specific shipyards provides a basis for a more rigorous interpretation of these sites. Such a typology assists in drawing broader comparisons between shipyards and the development of models that describe patterns and processes that created the degree of variability exhibited by shipyards.

The typology developed for this study analyzes the investments in shipbuilding infrastructure at shipbuilding and repair sites as a new basis for comparing sites. The investment in physical structures (e.g., fixed infrastructure) at shipyards serves as a proxy measurement of their size, function, and production intensity. The mechanism(s) for launching vessels that was the most visible and durable aspect of the shipyard provides one avenue for such comparisons. Vessels could be constructed or repaired in highly expensive drydocks, or on relatively inexpensive marine railways. The differences between these kinds of infrastructure vary considerably in scale, financial cost, and represent real differences among sites. Other information, such as the presence or absence of a blacksmith’s shop, storage sheds, saw houses, saw pits, utility buildings, worker housing, slave quarters, and other structures and features often associated with shipyards, further refine this typology.
Scott Emory (2000:36) is the first and only investigator who has proposed a typology for classifying shipyard sites. Based on his research at a late nineteenth-century shipyard in Milford, Delaware, Emory proposed ranking shipyard sites hierarchically using overall shipyard size, the classes and numbers of vessels, and the income generated by the shipyard as the basis for classification (Emory 2000:36). He suggests that the highest level of shipyard classification should be attributed to facilities that built the largest warships of their day (Emory 2000:36). This flexible and broad typology accommodates a wide degree of variability between the vessels they constructed and it allowed some comparisons to be made among shipyards. Despite the fact that Emory’s (2000) typology accounts for the full range and variability of shipyard sites, it is not easily operationalized, it is too broad to be entirely useful, and it is largely based on differences between the vessels that were produced. Also, since the size of many shipyards cannot be determined without a thorough archaeological investigation or intensive historical research it uses investment in fixed shoreline infrastructure as a proxy measurement of shipyard size and production intensity. This indicates that the typology is somewhat better at describing the similarities and differences of the vessels themselves rather than the similarities and differences among shipyards.

My study uses an approach based on Emory’s (2000) methodology to develop a new typology of shipyard sites. Unlike Emory’s (2000) typology, which utilized the size of shipyards and types of vessels that were constructed their as the basis of his typology, my study uses a typology based on investment in fixed infrastructure within the shipyard as a proxy measurement of shipyard size and production intensity. The investment in fixed infrastructure serves as a proxy method for comparing the amount of capital and labor that was invested in the site.

This typology focuses on the most identifiable and classifiable aspects of material culture such as the number of launching ways, the method of launching (e.g., slipway vs. drydock), culturally sensitive traditions of ship launching (e.g., side, bow, or stern), and the complexity of the structures necessary to support ship construction. Other information, such as the presence or absence of a blacksmith’s shop, storage sheds, wharves, saw houses, saw pits, utility buildings, workers housing, slave quarters, mould lofts, cranes, mast ponds and other structures and features often associated with shipyards will help to further refine this typology. My typology develops a frame of reference for describing the variability of pre-industrial shipyard sites. Once
this variability is described and classified, the typology can be used to test various archaeological models and hypotheses.

Until recently the limited numbers of reported shipyard excavations and limited historical documentation about shipyard infrastructure have impeded the development of a reliable method of comparison between and among sites. The organization of the existing archaeological information into a linear typology, suggests that they can be ranked hierarchically based on their complexity, size, and investment in fixed shipyard infrastructure such as slipways. The following typology ranks shipyards into five broad categories or tiers.

**Tier I**

Tier I shipyards were the largest shipyards in operation in a given period. Tier I shipyards were exclusively state owned and operated shipyards. They represent the full mobilization of power and resources of state level societies and are typically only found with large standing navies. These shipyard sites exhibit extensive horizontal and vertical integration of their labor forces. The Royal British shipyards, the large Ming shipyard excavated at Nanjing, and the Venetian *Arsenal Nuovo* are perhaps some of the most well-known examples of Tier 1 shipyards (Church 2007). In addition to assembling and repairing warships they also included a variety of other services, including rope making, anchor making, and sail making, in support of the construction and maintenance of the fleet. The centralization of these industries in one location permitted a greater level of control over the rate of production and quality. In addition to their function as a ship construction location, these dockyards also maintained and repaired vessels. The royal dockyards of the European and Mediterranean naval powers operated on a scale that was far beyond those of any other shipyard facility.

By the end of the eighteenth and beginning of the nineteenth century, Great Britain was the dominant naval force in the world. The size and scale of the Royal dockyards reflected the importance of the navy for the maintenance of Great Britain's Colonies. The Royal British dockyards possessed multiple drydocks, wet-docks, slipways as well as a large diversified permanent workforce, and are the best understood both archaeologically and historically due to the extensive documentation of their development. As Coad (1983:15) states, prior to the mid-eighteenth century, “the Royal dockyards could lay claim to being the industrial centers of England, if not in terms of absolute numbers, certainly in the variety of crafts and trades to be found in them or closely associated with them." The dockyards that were used as fleet bases had
sheltered moorings, ordnance yards, gunpowder stores, victualling yards, and eventually, naval hospitals in addition to the structures necessary to build and launch a ship of the line (Coad 1983:19). However, it was the presence of large multiple slipways and drydocks at such yards that distinguished Tier I sites from any other.

**Tier II**

The Tier II sites were equally well organized and possessed a large diversified labor force. The VOC shipyard at Oostenburg, Amsterdam is an example of a Tier II site. These sites differ from Tier I sites because, although they could also be owned or supported by the government, they were typically smaller in size than Tier I sites. Excavations at the VOC shipyard in Amsterdam have demonstrated the scale of effort in constructing the shipyard, the longevity of its shipbuilding operations, and the efficiency of its design and layout indicating a large degree of engineering foresight and innovation in the organization of industrial production. Excavations have identified a portion of the harbor, two launching slips, and number of structures associated with the shoreline. The number of pilings and the amount of construction on this site represents a large scale installation that was very well capitalized.

The shipyard at Bucklers Hard represents another Tier II shipyard on the Beaulieu River, England. Portions of four separate slipways were identified during the investigations. The topographical analysis and excavations of portions of the slipways indicate the presence of some complex timber features. Furthermore, the topographical survey suggests some degree of preparation of the the slipways through excavation and leveling along the banks of the shore. The probability that a high volume of soil was removed for the creation of this shipyard, the extensive timber remains, and the presence of four separate slipways suggest that this was a major shipbuilding site. Additional research and investigations could further refine the placement of this site within the typology.

**Tier III**

Tier III shipyards were well-organized, had a substantial labor force, and could build or repair multiple vessels simultaneously. The Pritchard’s Shipyard site is a Colonial and Early Republic period (1753–1831) example located on Hobcaw Creek, South Carolina, as is the Stephen Steward shipyard located near Annapolis, Maryland. Both are examples of Tier III
shipbuilding sites (Amer and Naylor 1996; Thompson 1993). Pritchard's shipyard may represent the largest shipyard pre-dating the War of Independence that has been discovered in the United States. It was identified during a shoreline survey that uncovered eighteenth and nineteenth-century artifacts, as well as ballast rock, brick, “ship frames eroding out of the bank”, and two distinct areas along the shoreline containing wood cribbing and pilings (Amer and Naylor 1996). These two areas were the remains of two of the three slipways that were depicted on a historical plat of the plantation (Amer and Naylor 1996). The third slipway was probably covered by a modern concrete boat ramp. Aside from these initial investigations, little archaeological information about the slipways and other waterfront features has been reported from the site. A series of investigations in areas away from the shoreline has identified three industrial structures on the property (Morby 2000). The Stephen Steward shipyard is an eighteenth-century Colonial and Revolutionary War Period shipyard located on the West River in Arundel County, Maryland. This site is one of the best-documented and well-preserved shipyards in the Chesapeake Bay. The excavations at the Steward Shipyard also represent some of the most comprehensive excavations on a shipyard site in the United States. Selected portions of the site have been the focus of multiple archaeological investigations (Gibb and Moser 1999; Moser and Cox 1999; Seidel 1993; Thompson 1993). Historical documents indicate that at least two ships were built “on the stocks” simultaneously (Maryland Gazette, Mach 14, 1754). The size and scope of this shipyard and the site infrastructure is considerably smaller than Tier I and II shipyard sites; however, the Steward shipyard site is larger and more sophisticated than many other American shipyards of this period. 

**Tier IV**

Relatively few Tier IV shipyards have been identified. They were small shipyards with some investment in permanent infrastructure, but were usually organized to build or repair only one vessel at a time. In this study, the Wicomico Creek Shipyard (18SO364) discovered during a shoreline survey in Somerset County, Maryland is an example of a Tier IV shipyard (Moser 2007). The shipyard was initially identified by the presence of a single large wooden slipway adjacent to a modern pier. The slipway is sub-rectangular in plan and its overall dimensions are approximately 35-x-100 ft (10.7-x-30.5 m). The slipway is divided into two distinct areas designated as the upper and a lower slipway. The upper slipway, or groundways, is located along the shoreline, and is composed of five large transverse timbers set into shallow trenches with
only the upper portions of the timbers visible. These timbers may represent groundways and a
construction area. Sampling indicates that the lower slipway was composed of over 5,000
individual pilings driven vertically into the shore. The creek channel deepens rapidly beyond the
end of the slipway from 4 ft–8.5 ft (1.2 m–2.6 m) to approximately 50 ft (15 m) beyond the last
pilings. Dendrochronological analysis indicates that the large timbers of the upper slipway were
felled circa 1800 (Moser 2007). This information, in conjunction with historical research
indicates that the tract was part a shipyard operated and later owned by shipwright Daniel
Whitney. Whitney is known to have constructed several large vessels in the area, including the
292-ton Commodore Rodgers, and he may have been involved in the construction of the 325-ton
Shepherdess (Moser 2007). The total size and scope of this shipyard has not been completately
explored. The slipway identified at the site was sufficient to accommodate the 27 ft beam and 82
ft length of the Commodore Rodgers and the 29 ft beam and 78 ft length of the Shepherdess with
sufficient room to spare for the standards, scaffolding and shores.

**Tier V**

Tier V shipyards were small expediently organized shipyards with little permanent
infrastructure and were likely used for constructing or repairing a few vessels. The
archaeological remains of these shipyards are often ephemeral and easily mistaken for other
waterfront activities. One example of such a shipyard was operated north of Annapolis,
Maryland by Benjamin Salyer. Salyer was a colonial shipwright who became entangled in legal
and financial difficulties. A series of county court cases, newspaper advertisements, and the
account book of a local merchant identify a sailing vessel Salyer was contracted to construct and
described the schedule of payment for this work. The vessel was described as measuring 48 ft
(14.6 m) along the keel, 20 ft (6.1 m) beam, 10 ft (3 m) hold, 4 ft (1.2 m) between the decks, and
her upper works were supposed to be completed as “galley built” (MSA Anne Arundel County
Judgments, Liber ISB 2, folio 35). The contract directed the Benjamin Salyer to “put on all
chocks and furrings, make the timbers fair, to dub, bore and completely do all plank work from
the keel to the gunnels” (MSA Anne Arundel County Judgments, Liber ISB 2, folio 35). The vessel was most likely constructed on a five-acre (2-ha) tract called "Whitaker's Honesty" located on the north side of the Magothy River (MSA, Unpatented Surveys, No. 446) owned and operated by a partnership of merchants who employed Salyer.
The shipyard was never completely described; however, a court case against Salyer contained an inventory of items at the shipyard including 13 gallons of rum, a cagg [sic keg] for same, a pail, and two cans (MSA, Anne Arundel County Judgment Records Liber ISB 2, folio 297). Additional debts owed by Salyer included money for 270 ft (80 m) of pine plank, 2000 ft (610 m) of two-inch (five cm) plank totaling £9.12.11, and a debt of £6.14.2½ incurred for the use of Patrick Doran's slave, named Sambo, for a total of sixty days of work. The nature of Sambo's labor is unknown, however it very likely that Salyer utilized Sambo to help construct a vessel at his shipyard. In any event Salyer used Sambo’s labor beginning January 14 for forty-seven days, and again for 23 days between March 12th and April 6th. An account book of one of the partners also described additional property that included two beds, one case with 14 bottles full of rum, John Dixon’s tools, John Jones’ tools, one anvil, one pair of bellows, bar iron, one great hammer, one little hammer, a five pound maul, a scriving chisel, carpenters tools, and a crowbar (MHS, Thomas Williamson’s Account Book, 1746-1749). Although little evidence of this and other similar shipyards can be found, it is likely that most Tier V shipyards will have to be identified through historical research and perhaps then identified archaeologically. It is likely that shipyards such as Benjamin Salyer’s rarely possessed the permanent infrastructure necessary to identify such sites archaeologically.

**Models**

This study was designed to test four archaeological models and hypotheses to determine which model(s) were the most accurate in characterizing Maryland shipyard archaeological sites. These models, which were described in Chapter Two, are broad models that were proposed to infer the relative importance of each in determining the location of shipyards, their internal layout and design. They were developed using variables associated with the environmental and physical geography, and social and cultural networks.

Many of these models tested in this chapter share similar dependent variables that are indistinct and can’t be precisely separated between models. For example, the model that proposed that site locations were primarily decided on the basis of soil properties presents similar patterns to sites located within urban areas since the urban areas also may have been established based on soil properties. As a result, some models were more exclusive than others.
Environmental Model

The environmental model predicts that environmental variables were a major determinant of site location, distribution, size and internal organization. Ford (2001; 2006) also tested many of the environmental variables in his research on Chesapeake Bay shipyards. Ford (2006) identified 95 pre-1850s shipyard sites throughout the Chesapeake Bay region. His study identified these sites almost exclusively through using primary and secondary historical sources. He then tested several variables to determine the relative influence of environment and geography on the spatial location of shipyard sites.

Ford (2006) tested the importance of proximity to cities, the degree of site protection, slope, local soils suitable for vessel construction, presence of soils suitable for the growth of oak, and the presence or absence of soils suitable for tobacco cultivation. In his study Ford (2006:131), found that 79 percent of the shipyards were located within 8 km (5 miles) of an urban center and 53 percent were located within town boundaries. The majority of shipyard locations possessed a shoreline slope ranging between 3 and 11 degrees and averaging four degrees. He found that 84 percent of the sample were ‘very protected’ or ‘protected’, and that 16 percent were not protected well due to their location in broad shallow bays, near the openings of bays, or located on the open Bay.

Ford’s (2006) analysis of the soil stability necessary for supporting structures at shipyards indicated that these soils were generally less favorable than the soil stability for the entire counties in general. Ford also found that all of the shipyards in the study were located within 1.1 km (0.7 miles) of soils suitable for the growth of oak, while 34 percent were located within 0.2 km (0.1 mile) of soils suitable for oak growth. Finally, his study found that shipyards were generally not located in the vicinity of soils favorable for tobacco cultivation.

Ford (2006) describes the importance of white oak (*Quercus alba*) to the shipbuilding industry in Maryland. Ford (2006) studied the proximity of soils supporting the growth of white oak timber as a possible reason for locating shipyards in particular locations. White oak is a salt resistant tree that prefers deep, moist, well-drained, acidic soils. It typically found in sandy or loamy soils with a pH Range between 3.7 and 7.3. In his study, Ford (2006) identified locations for 95 shipbuilding yards. He found that all of the shipyards were located within 1.1 km (0.7 miles) of oak promoting soils. Similar oak promoting soils are present in Somerset, Wicomico, and Worcester counties. The only portions of the study area that do not contain oak promoting
soils were located in areas of tidal marsh and hydric soil conditions that are predominately found in the southwest quadrant of Somerset County and along the course of the Pocomoke River in Worcester County.

**Lower Eastern Shore Models**

In the Lower Eastern Shore, environmental variables appear to have had minimal impact on the suitability of a particular site selected for a shipyard. Analysis of shipyards within the study area suggests several distinct differences with Ford’s (2006) analysis. The locations of shipyards in Ford’s (2006) study primarily relied more heavily on shipyard location data from the Western Shore and the central and northern Eastern Shore of the Chesapeake Bay. These regions were generally geographically different from the low topographic relief of the Lower Eastern Shore. Forty-four percent (n=8) of the shipyards located within the Lower Eastern Shore study area possessed a natural ground slope between 4 and 12 percent, while 66 percent (n=10) had a ground slope that did not fall between 4 and 12 percent. Given the relatively flat nature of the Lower Eastern Shore, all instances in which the ground did not fall within the projected range were less than four percent.

**Site Protection**

Using Ford’s (2006) rating system that categorizes shipyard locations as ‘very protected’, ‘protected’, and ‘unprotected,’ 83 percent (n=15) of shipyards within the Lower Eastern Shore study area were categorized as very protected or protected. These shipyards were located on rivers, narrow tidal creeks, and protected embayments. Although these locations were much more protected from heavy winds and waves generated across a large fetch, they were still affected by abnormally high tides associated with hurricanes and heavy rain events. The three shipyards that were not considered protected were located on wide expanses of open water that could easily be subject to flooding from an abnormally strong wind out of one direction.

One of these three locations was the Fishing Island shipyard which was located on a small island on the south side of the Manokin River. This shipyard was in operation by 1877, and continued to operate into the early twentieth century. Its location indicates that the site was exposed to western and to a lesser extent northern winds. The northern shoreline of the Manokin River would have provided some protection from the northerly winds which were typically the worst experienced on the Chesapeake Bay. Much of the Chesapeake and Delaware bays are
estimated to have class 3 winds. The highest winds and waves most frequently occur over the largest open water, or fetch. Based on the direction of the prevailing winds, which are generally from the north through west, sites with a southeastern exposure were generally more vulnerable. The complexity of the irregular Chesapeake Bay shoreline, with its many islands and inlets, render regional systematic modeling of site protection characteristics a complicated exercise.

Soils

Analysis of the soils within the study area indicates that the area was generally poorly suited to tobacco agriculture (Carr 1988; Russo 2004). Carr’s (1988) analysis of soils within the study area indicated that as much as 17 percent of the study area approximately 1,200 sq. miles, consisted of water, tidal marshes and beaches that were incapable of supporting staple crop agriculture in the region (Russo 2004). A re-examination of the soil types present in the study area confirms the presence of both hydric and partially hydric soils. The USDA (2010) defines hydric soils as “soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part.” These hydric, and many partially hydric, soils were largely incapable of supporting large-scale cultivation of the dominant crops of tobacco and wheat in the seventeenth and eighteenth century.

Some tobacco agriculture was recorded in Colonial period inventories along with small stocks of wheat and some of the implements necessary for its cultivation. The most predominant agricultural pursuits within the study area were animal husbandry and timber extraction and refinement (Russo 1999; 2004). The most widely used American shipbuilding timber was white oak. Analyses of the distribution of soils supporting the growth of white oak indicate that these soils were ubiquitous throughout the study area. Almost all areas of partially hydric and non-hydric soils in Somerset and Wicomico counties were capable of supporting the growth of white oak timber. Also, in addition to white oak, two other types of shipbuilding timber were mulberry (Morus rubra) and Eastern red cedar (Juniperus virginiana), also present within the study area. Soils adjacent to virtually every shipyard location identified in this study except for Fishing Island and Teague’s Creek shipyards were capable of supporting the growth of shipbuilding timber. The soils associated with Teague’s Creek are classified as Transquaking and Mispillion and are frequently flooded silty clay loam and mucky silt loam soils that are located within estuarine salt marshes. Today, these hydric soils are incapable of supporting timber growth for species useful for shipbuilding. It is unknown whether these soils would have supported timber
growth between the seventeenth and nineteenth centuries when sea levels were lower than the current sea level, and tidal marshes may have offered greater protection.

The results of this analysis demonstrate that it was unlikely that any particular shipyard was located more than a few hundred meters distant from potential sources of shipbuilding timber. Additional archaeological evidence of the widespread availability of wood is provided by the evidence of dozens of wharves constructed of slabwood planks that were identified throughout the study area. Slabwood is a residual wood product that is created during the milling process. Slabwood is the curved portions of a tree that were cut from the more valuable heartwood. It was a cheap material that was and still is often purchased for use as firewood. The presence of so much slabwood throughout the study area indicates that milled lumber was readily available throughout much of the study area by the mid-nineteenth century. In the few instances where shipyards were located significant distances from sources of shipbuilding timber, it would have been a relatively easy task to transport it to a shipyard by water. Water transport of timber to a particular shipyard also may have facilitated the process of “brining” green wood in salt or brackish water for several weeks prior to its use. This process reduced the sap in the tree and assisted in seasoning the wood for the shipwright to cut and shape into a desired form.

In the Colonial period the water transport of timber would have been an effective means of transport due to the extensive network of waterways on the Lower Eastern Shore. Beginning in the early nineteenth century these waterways would have been less available as many of these waterways were dammed to provide power for tidal and gravity powered mills. After the Civil War the railway network expanded throughout the Eastern Shore. This expanded railway network, along with a more robust road network, could have shipped wood directly from mills to the larger urban shipyards that developed during this period. As a result, the importance of soil conditions required for supporting the growth of shipbuilding timber near a particular shipbuilding site would have declined through time. Consequently, the proximity of shipbuilding timber does not appear to have been a major determinant in the selection of shipyards identified in this study. Since no expedient shipbuilding sites were identified during this study, the relative importance in the proximity of a site to quality timber could not be evaluated.

In addition to the agricultural properties, two other soil variables were tested in relation to the study area. These two dependent variables were: the presence /absence of hydric soils and a
measure of the soil’s capabilities to support a structure without a basement. This measure of soil stability was selected as a proxy measurement of the soils’ ability to adequately support a heavy structure such as a ship under construction.

Seventy-two percent of the shipyards located in this study were located on soils that were classified as non-hydric (n=11) or partially hydric (n=2) soils. The five remaining shipyards were located on soils that are presently classified as hydric soils. These five shipyards (Riverton, Rewastico Creek, Quantico Creek, and Dolbey Marine were located in areas that were adjacent to areas that were non-hydric. Only Teague Creek shipyard was located in an area containing hydric soils and no adjacent areas of non-hydric soils. The presence of several shipyards in areas of hydric soils is not surprising given the need to convey vessels from land to the water. The fact that so few shipyards were located in areas of non-hydric soils is remarkable given the fact that soil drainage is such a major component of many GIS-based predictive models of historic archaeological site locations. It is also possible that these historic archaeological site locations have been affected by sea-level rise, a condition that has impacted many coastal islands and communities located on the Lower Eastern Shore of Maryland and Virginia.
Figure 8-2. Map of hydric soils within the study area (USDA 2008).
The Teague Creek shipyard (18SO342) stands out from rest of the sample. Not only is this shipyard located on hydric soils, but all of the land directly adjacent to the east of the shipyard is also marsh. The rising sea-levels throughout this peninsula may have resulted in the abandonment of this site. An 1865 map of this area identified it as Miles Landing which was connected by road to Fairmount (Martinet 1865). By 1877, a shipyard was located at Miles Landing (Lake et al. 1877). Between 1901 and the mid twentieth century the shipyard was abandoned and the road to Miles Landing was excavated to provide a drainage canal. Subsequent roads through the area did not service Miles Landing. They followed low topographic ridges through the marshes to other nearby populated places instead. Beginning in 1877, a new shipyard was identified at Fishing Island located approximately 3,100 m to the north of the Teague Creek site.
Figure 8-3. Engineering properties of soils to support structures without basements (USDA 2008).
The USDA uses a series of different categories to rate the engineering properties of soils within the study area. The engineering category to evaluate soil characteristics that are the most similar to the qualities necessary in construction and operation of a shipyard are “dwellings without basements.” The category, “dwellings without basements,” serves as a proxy measurement of the stability of the soil to support structures. This broad measure of load-bearing capacity is based on depth to the water table, ponding, flooding, subsidence, linear extensibility and the compressibility of the soil. These soils are classified into a system of three classifications of “Not limited,” “Somewhat Limited,” and “Very limited.” Not limited, means that the soils are favorable for the construction of load-bearing structures. Somewhat limited, means that the limitations of that soil type can be overcome or minimized by special planning, design, or installation. Very limited, indicates that the soil has one or more features which cannot be overcome without major soil reclamation, special design, or expensive installation procedures (USDA 2008).

Analysis of the engineering properties at 14 shipyard sites in the study area found that 71 percent of the sites were located on soils with engineering constraints. Fifty-seven percent (n=8) were located on soils that were very limited; 14 percent (n=2) on partially limited; and 39 percent (n=4) were not limited. The soil properties in the remaining sites in the sample were not rated by the USDA due to their location within an urban area. Case by case examination of each of the shipyards in the sample indicates that several of the sites may have benefited from the addition of fill to help improve soil drainage and soil engineering properties. Dolbey Marine and the shipyard at Riverton were both located on or near poor quality soils; examination of aerial photographs suggest that fill may have been added to both sites. Both sites were located in close proximity to the boundaries of better quality soils. Mistakes in the mapping of boundaries of soil data also might account for some of the poor quality of soils at this location.

These results may reflect the difficulty in using modern soil data to predict soil properties in areas that have been significantly impacted by sea-level rise since the settlement of this region. Both sea-level rise and ground subsidence from the withdrawal of groundwater has affected this region. Estimates vary considerably about the extent of sea-level rise in this area; however, some estimates suggest that relative sea level may have risen approximately 30–40 cm/century since the mid nineteenth (Gibbons and Nicholls 2006). Such rapid sea-level changes would have significant impact on the water table throughout the study area and consequently affected the
quality of the soils. The difficulties of understanding these changes can wreak havoc on GIS-based predictive models to locate shipyard and on analyses results. The Teague Creek shipyard (18SO342) is a perfect example of an instance in which the rising sea-level has left the site located within a marsh.

The results of the GIS-based analysis of the soil characteristics at known shipyard locations indicates that the presence of poorly drained soils, and soils with limited or partially limited engineering qualities did not significantly affect choices in the construction locations of shipyards. While marginal environmental and geographic conditions may have been undesirable locations for constructing a shipyard at a particular location, these conditions could be mitigated through engineering modifications to increase the stability of the shoreline. Other researchers also have suggested that shipbuilders used engineering modifications to distribute the weight of a vessel under construction (Abell 1981; Barker 1994; Ford 2006). There are very few suggestions that such modifications were common at shipyards that were located on soils with well-suited drainage and engineering properties. Archaeological evidence from the Wicomico Creek shipyard (18SO364) indicates that intensive shoreline modifications and the installation of complex launching infrastructure were used even when such modifications were not necessary. The Wicomico Creek shipyard was located on non-hydric soils with no limits on engineering properties. In addition, the Wicomico Creek shipyard also possessed a slope that was within the 4–11 degree range that was suggested by historical sources. In effect, the Wicomico Creek shipyard was located in an ideal setting prior to any modification of the site. The installation of the massive ground ways and slipway at the site only increased the site’s potential for use as a shipyard.

**Geographic Model**

Physical and cultural geography have played a critical role in the development of all historic sites. Topography can limit both the initial size and subsequent expansion of historic sites. Distances between shipyards, commercial centers, suppliers, and other information networks can affect the speed of communication and the rapidity with which shipwrights could respond to changing market conditions, construction materials, and fill orders. This model uses topography and proximity to nucleated town sites as a primary determinant in predicting shipyard distribution, site size, and organization. This model predicts that larger, better
organized shipbuilders located their shipyards in close proximity to, or on the periphery, of nucleated town sites.

In most areas of the Chesapeake Bay, towns served as a focal point for the commerce of the region. The growth and development of towns was perceived by the General Assembly as an important aspect of economic development. Despite legislative encouragement through the passage of a series of legislative ‘Town’ and ‘Port’ acts to establish towns in this region, the Chesapeake Bay did not develop urban centers in the seventeenth and eighteenth centuries. Many of the traditional functions that are typically found in urban centers such as trade, finance, and craft specialization were very slow to develop in the region. Instead, many of these functions were found in the most economically diverse plantations. This dispersed settlement system on the Lower Eastern Shore tended to curtail the development of populations in evolving “toward the town-based hierarchy of settlement forms and economic functions described in central-place and associated theories” (Thomas 1994:253). Consequently, few urban centers successfully developed and even fewer on the Lower Eastern Shore. The absence of a significant marketable export crop from the Lower Eastern Shore further contributed to the lack of substantial concentration of capital that was usually necessary to support a wide variety of craft specialists. As a result of these conditions, only five towns developed within or adjacent to the study area during the Colonial period: Green Hill, Princess Anne, Rehobeth, Salisbury, Snow Hill, Whitehaven I, and Vienna.

A distribution analysis of the shipyards identified during this study could not be completed due to an insufficient sample size. Impressionistic evidence indicates that shipyards were located on any backwater creek that was sufficiently deep. Within the study area these sites tended to be 1st and 2nd order tidal streams located on sites usually with 2.45 m (eight ft) of water depth. Also, none of the shipyards that I identified seemed to be located particularly close to towns. Later in the nineteenth century shipyards seem to have moved into towns.
Figure 8-4. Five Km buffer of towns and the locations of identified shipyards.
Social Networks

In the social model, kinship ties among shipwrights and local communities (especially local merchants) may have played an important role in the location and organization of a shipyard site. In an era with few permanent financial institutions such as banks or creditors, shipwrights sometimes formed limited partnerships that were often based on kinship relations with wealthy planters and merchants (Mathias 2002; Walsh 1988). Peterson (1989:26) attributes the success of Mystic, Connecticut’s shipwrights to the personal contacts with relatives and friends who brought in customers. Shipwrights actively used these kinship ties to create ties of both residency and reciprocity within the community (McCann 2001). These close kinship ties often created ties of long term residency within the region. Ford (2006) suggests that the most shipyards were located within 8 km (5 miles) of urban centers because that was generally the accepted maximum distance of community networks at the end of the eighteenth century and it was also the approximate distance that individuals were willing to travel for work (Walsh 1988). The sizes of the community networks established by Walsh (1988) were probably larger than the size of the community networks that were established in the study area. The distance that individuals were willing to walk within the study area was limited because of the impediments from the high density of waterways and marshlands. The creeks and marshes within the study area played a substantial role in inhibiting the development of the road network in this area. That factor would have strongly limited the linear distances that individuals could travel before needing to use a ferry to cross bodies of water. Individuals living along the water may have been able to travel by boats along drainages; however, the constraints of weather and tides would have been a deterrent to regular travel using this method, especially during the winter.

The social network kinship model predicts that shipwrights located their shipyards near the geographic center of their kinship network. Conversely, shipwrights who did not use kinship-based relationships would evidence greater geographic mobility. The strength of these kinship ties was critical to the success or failure of the shipbuilding enterprise.

In Colonial Somerset and Worcester Counties, the complexity of kinship relationships made the measurements of these networks difficult to establish. In several instances multiple shipbuilders possessed identical names. Many families in the region had family traditions in which brothers tended to give identical names to their children. Consequently, there were many
related individuals bearing the same name within the study area. As a result it was difficult to link an individual’s occupation and name within the physical geography of the study area. Other difficulties included continually redefined boundaries for the different counties and states. Several shipwrights who were probably located in Maryland in the 1740s became citizens of Pennsylvania, and later Delaware, as various boundary surveys such as the Mason and Dixon survey redefined the jurisdictions of entire families. The creation of Worcester County from Somerset County further complicated the difficulty in identifying social networks within the study area. As a result most information gathered about kinship networks is based on impressionistic historical and genealogical evidence rather than rigorous empirical analysis.

There are several examples of shipbuilders that had kinship ties with other local shipwrights and merchants. Henry Lowes, a Somerset County ship-owner and a shipbuilder was married to Esther Handy, the stepdaughter of Day Scott. Day Scott was a merchant who owned a shipyard on the Wicomico River that operated in the 1740s. The Day Scott shipyard and “Chatham,” the plantation, on which Henry Lowes resided, were located on opposite sides of the Wicomico River just a few miles apart. There are also many instances of general kinship relations between families with one or more known shipbuilders or merchants, but these connections are not sufficiently direct kinship relationships to infer specific strategies by shipbuilders.

In many instances the conventional rules for kinship were less widely adhered to because of the highly flexible system of court sponsored apprenticeships within the region. Given the high parental mortality rates from the seventeenth through early nineteenth centuries within the study area, the county courts frequently bound orphans to craftsmen in the study area. Between 1737 and 1815 the Somerset and Worcester County courts bound 40 apprentices to 22 different ship carpenters. These apprenticeships served two functions: they removed orphans from the financial support of the County courts and placed them under the financial support of individual county citizens and provided the orphans with useful skills so that they might support themselves by the time they reached their majority. It is unclear exactly how many of these apprentices continued to pursue interests in shipbuilding beyond the terms of their apprenticeship. It is clear that in at least two instances the apprentices continued within the occupation that was selected for them by the courts. In at least two instances, two of these apprentices went on to take on court ordered apprentices of their own. They were the apprentice Thomas Slocumb, who was
bound to Isaac Tull, and apprentice John Askins who was bound to Beauchamp Hull (Heise 1996).

In at least one instance a prominent Somerset County shipwright, Daniel Whitney, appears to have traveled to four separate shipbuilding locations during his career as a shipwright. This mobility occurred despite the fact that he owned property and operated an archaeologically identified shipyard on the south side of Wicomico Creek. In 1808, he built a vessel at Whitehaven on the Wicomico River. In 1810, Whitney built a vessel on Wicomico Creek (presumably at his shipyard). In 1816 he built a vessel in Princess Anne, the County seat of Somerset County; and by 1825 he was back to building vessels at Wicomico Creek. The Whitehaven shipyard was located approximately 7.5 km from Whitney’s shipyard (18SO364) while Princess Anne was located approximately 6.6 km from 18SO364. Whitney used the Whitehaven location several years prior to his purchase of his property at 18SO364. It is unknown why he traveled to Princess Anne after he had already purchased the shipyard on Wicomico Creek.

Technology and Economics

The technology and economic models were considered central to the premise of this investigation. Initially, the broad technology and economic models were envisioned as separate, distinct phenomenon that were independently measurable; however, upon further research I found that it is impossible to completely separate the changes in technology and economics associated with shipbuilding from one another. The technology that was incorporated into shipbuilding was inextricably linked and embedded within the larger context of economic and technological changes that defined the industrialization of the United States during the nineteenth century. The introduction of new technology was a reflection of the need for increased economic efficiency. During the nineteenth century the shipbuilding industry on Maryland’s Lower Eastern Shore bifurcated into two different scales of industries that were each influenced by different economic patterns. The large-scale shipbuilding industry was greatly influenced by the phenomenon of accelerating obsolescence. The large-scale shipbuilding industry primarily built large vessels for international voyages outside of the Chesapeake Bay, while the small-scale shipbuilding industry constructed relatively smaller vessels for use within the Chesapeake Bay. This phenomenon slowly, and then more and more rapidly, required that shipyards incorporate new technologies and new work processes into their businesses.
In some instances, extensive technological innovations were employed by shipbuilders to achieve a particular goal. In other instances, organizational optimization was critical for achieving goals. For example, the development of mass production and economies-of-scale, were organizational strategies resulting in optimization that could theoretically result in a higher output of ship production than was likely at an expeditiously organized shipyard. Despite the improved shipyard output that increased organization brought, the development and installation of the shipbuilding infrastructure also required an up-front investment of capital, labor, and time. This investment might result in an overall reduction of costs per unit; however, this could only be achieved with the intent and the knowledge that the production of ships was likely to be both profitable within the intermediate time-frame and that this profitability could be maintained and sustained with only a minimal commitment of additional resources and capital.

In these instances, “stock of knowledge” rather than technology is a better concept for understanding many of the changes in shipyards during the nineteenth and twentieth centuries. C.M. Keller and J. D. Keller first introduced this concept in 1996 (Dobres 2000:109). Stock of knowledge includes “‘the tools, methods, and the spatial organization….to facilitate the goal orientation of work and accomplishment of desired ends’” (Thiesen, 2000:34, as cited in Keller and Keller 1996). This broader definition is more inclusive and more useful for studying the interrelated aspects of technology.

Presumably, the more expedient the function of a particular site, the more likely that it had a substantially smaller investment of capital, labor, and time. Another expedient approach might involve an investment in technological adaptations to achieve similar economies-of-scale without the investment. In fact, it is possible that many investments in new technologies were designed to circumvent the expenditure of investment capital for major infrastructure projects. Some new shipbuilding companies and those businesses that were marginal and had insufficient capital resources were more likely to invest in new shipbuilding technology. If this is an accurate representation of investment strategies in shipbuilding technology then archaeologically the identification of these investments at small shipbuilding sites would validate this model. Unfortunately, it is the small shipyard sites which are the most difficult to locate archaeologically and within historical documentation.

One of the most notable examples of the adoption of innovative technology that circumvented capital expenditures was the invention of the Patent Slipway. The Patent Slipway
or marine railway was invented in Europe by Thomas Morton in 1818 and in the United States by Commodore John Rodgers in 1823 (Adams and Christian 1975; Morrison 1909; Rumm 1978). The development of this technology quickly changed everything about the cost of building and operating a shipyard. Initially, the cost to install a marine railway ranged from £450 to £1,900, depending on the size of the railway that was constructed (George 1873). The construction of drydocks were estimated to cost ten times more, and were more expensive to operate. The introduction of this technology may have been what we today label a “disruptive innovation.” Disruptive innovations are innovations that are so radical that they quickly made more conventional technology within an industry obsolete.

On the Lower Eastern Shore the introduction of the marine railway may have quickly superseded early slipway technology. Certainly, within the context of the archaeological survey of the project area—no shipyard sites dating after the early 1800s were identified that used slipway or drydock technology. It is impossible to precisely attribute the disappearance of slipways to the introduction of marine railways, but it is likely that the timing of this innovation influenced the trajectory of shipbuilding within the study area. Other changes that occurred during this period included changes to ship design and the economics of shipbuilding and repair in the region. These factors also may have played a major role in the changes of shipyard production and shipyard location.

Access to existing technology and the development of new technology closely correlates with the development of new systems of organization at industrial archaeological sites. The introduction of new technologies affected shipbuilding on two levels—through the introductions of new ship designs and also through the introduction of new shipbuilding technologies. Both of these aspects of technology influenced the organization, development, and productivity of shipyards as industrial sites. In some instances the new technology was represented by new vessel types. Shipbuilding technology was adapted from other fields of knowledge and also within the discipline of marine architecture. Throughout the nineteenth century rapid changes in technology greatly affected the industry. The invention of reliable steam-power engines enabled shipyards to utilize powered hoists, winches, pumps, and saw mills. Such technology also resulted in a gradual shift in patterns of ship construction from sail to steam-powered merchant vessels. In the Chesapeake Bay, sail powered vessels persisted for decades after other regions had shifted to newer forms of propulsion. Smaller vessels were produced for the oyster industry;
these vessels were legally required to be under sail while dredging for oysters. Introduction of steam-powered deck machinery such as donkey engines and power winches allowed large sailing vessels to remain competitive with steam-powered merchant vessels during the nineteenth century by reducing the number of crewmen necessary to operate the vessels (Souza 1998:124).

Two influences that affected the cyclical economic patterns of Chesapeake Bay shipbuilding were local and international economic patterns that operated at multiple scales simultaneously. In the late eighteenth century, the international economic patterns of boom and bust were often exacerbated by the influence of political events in the Atlantic such as wars, embargoes, and even U.S. economic and foreign policy. Congress enacted several major policy changes to customs, tariffs, and vessel registration in the United States. In turn, these changes affected the number and types of vessels that were built in the United States and within particular regions of the United States. For example, in 1789 the U.S. government began levying tariffs on non-American vessels engaged in the coastwise trade (Peterson 1989:1). In 1792, the U.S. government began excluding foreign-built vessels from registering as American vessels. It was during this period that the heyday of Chesapeake Bay-built schooners began. In 1817, the U.S. government limited the coastwise trade exclusively to American-built vessels (Peterson 1989). These legislative actions gradually created a protectionist environment that supported the development of an American shipbuilding industry, the American carrying trade, and excluded foreign competition within these markets.

Legislative mandates by the State of Maryland also supported the continued use of sail power in the oyster industry. In order to protect the state oyster beds from overharvesting, in the nineteenth century, the Maryland legislature banned dredges under powered boats from harvesting oysters in the Bay. Instead, oyster boats that wished to dredge were required to be under sail or were required to use oyster tongs for harvesting. Initially, pilot schooners and other vessels were used for harvesting oysters; however, these types of vessels possessed a draft that was too deep to reach many of the shallow oyster beds in the Chesapeake. The freeboards on these types of vessels were too high to provide easy access to pull the harvest onto the boats. The need to be under sail power and the need for shallow draft vessels with low freeboards resulted in the development of many small workboat designs. Brogan’s, Pungy’s, Bugeyes, and Skipjacks were vernacular forms of watercraft that developed as a result of the needs of the fishing and
oyster fleets that plied Chesapeake waters. These smaller vessels required a smaller scale of shipyard infrastructure for their construction and maintenance.

Lower Eastern Shore shipwrights also continued to produce wooden vessels at a time when many other regions were shifting to iron hulled vessels. In general the United States shipbuilding industry lagged behind European shipyards in the transition to iron hulled vessels. In many respects this failure to capitalize on new technology was the result of economic forces. In the United States, plentiful supplies of shipbuilding timber meant that shipwrights could continue to produce wooden vessels relatively inexpensively. In Europe where shipbuilding timber was more scarce, and valuable, it made economic sense to begin building iron hulled vessels (Thiesen 2000).

The introduction of mechanical aids and labor saving devices such as sawmills, new methods of steaming planks, and the introduction of cheap iron nails dramatically decreased the time required to construct a vessel. These forms of sustaining innovations represent gradual introductions of technologies that improved efficiency without creating the changes that were introduced by disruptive innovation. More than most individuals, shipbuilders participated in the global exchange of ideas and information about new vessel designs. Every time a new and innovative design appeared in a port, the shipwright had the opportunity to view the design and assess its effectiveness in achieving particular goals. They could then choose to incorporate elements of these designs into their vessels.

Although non-statistical, the archaeological evidence identified during this study suggests that new technology played an important role in changes associated with Lower Eastern Shore shipyards. An impressionistic analysis of the launching technology employed at the shipyards within the study area suggests that the introduction of the marine railway may have enabled local shipyards and boatyards to operate even in the presence of much larger facilities in larger port cities. Archaeological and historical data indicate that marine railways superseded larger traditional slipways and drydocks in the nineteenth century. It also appears that marine railways were not located in the places that eighteenth and early nineteenth century shipyard sites occupied. Marine railways were almost always located within small communities, districts, or towns that supported large fleets of oyster and fishing vessels (Fishing Island, Bivalve). The only identified known exception was the site of the Barren Creek Marine Railway. After the Civil War large marine railways were established in the larger port towns within the project area.
(Sharptown, Whitehaven, Salisbury, and Pocomoke City). The deeper draft of ships that were built during this period most likely necessitated the shift to larger ports with deep river channels. As a result, Sharptown on the Nanticoke River, Whitehaven and Salisbury on the Wicomico River, and Pocomoke City on the Pocomoke River all became the centers for large scale ship construction.

In 1900, the value of the buildings and property at Branford shipyard were valued at approximately $1000.00 (Lesher 2010). Additional items including cash, lumber and other building materials were valued at $300. Records indicate that the value of a bugeye he built in the 1880s was approximately $1,141. This suggests a relatively high parity between the values of the infrastructure at his shipyard and the cost of the vessels that he built. Later Branford began building less expensive skipjacks. Throughout his 28-year career, Branford built 49 bugeyes and skipjacks (Lesher 2002).

The lack of comparable documentation from different periods of Chesapeake shipbuilding makes a direct comparison of the shipyards difficult. However, it is possible to see that between 1850 and 1908 the size and scale of shipyards increased substantially. In 1850, five shipyards were documented in Somerset County (including Wicomico). Each employed between two to eight people. Capital investment in these shipyards ranged between $400 and $2,000. In 1880, there were just three shipyards that employed 15 to 100 workers and invested more capital in infrastructure ranging between $4,000 and $6,000. By 1908, three shipyards described by the State of Maryland indicated that investment in capital ranged from $6,500 to $33,500. Also, during this period ownership of larger shipyards changed from sole proprietorships and become partnerships. Although the purchasing power of dollar-denominated currency fluctuated (both inflationary and deflationary periods) between 1850 and 1910 and is difficult to directly compare, these figures indicate that the amount of capital required to own and operate a shipyard soared during this period and prevented smaller shipyards from competing in this area.
Conclusion

Four proposed historical and archaeological models were evaluated to determine their effectiveness in describing and explaining the patterns of shipyard development within the study area from the seventeenth through the early twentieth centuries. Analysis of the earliest Colonial records, which systematically document shipbuilding within Maryland, establish that the study area was one of two major centers for ship production within the Colony between 1730 and 1750 (Commission Book 82). Later, records indicate that the study area continued a substantial shipbuilding industry into the mid-nineteenth century. After the 1850s, shipyards became more closely associated with one of two types of urban centers. Larger vessels were predominately constructed at larger shipyards located along the major waterways of the region, while smaller shipyards were located in smaller urban centers and generally built smaller vessels that were closely associated with fishing, oystering, and local trade. Historical information suggests these smaller yards were generally more dispersed. Both types of shipyards probably relied on vessel repair work rather than new construction.

The environmental model predicted that environmental conditions were a major determinant of site location, distribution, size and internal organization. In general, the influence of the present environment conditions and variables that were tested did not support an optimized site location model. The majority (66 percent) of site locations that were identified through archaeological and historical research were located on slopes of less than four percent and on soils that today are identified as having limited or partially limiting engineering properties. Many of the identified sites did possess some variables that were considered advantageous in an optimized site location model. These variables included location in ‘protected’ environments (83 percent), or location on non-hydric and/or partially hydric soils (72 percent).

While the environment had some influence on the site location chosen by shipbuilders, the geographic model was generally more important in influencing not only the site location but also the size and internal organization of some shipyards. The location of the largest shipyards that were identified in this model were located in nucleated towns that were adjacent to large deep water rivers. In this case both the towns and the shipyards owed their presence to the depth of water that was present. Both shipyards and ports required deep water for economic success; consequently, the two were frequently co-located. The largest shipyards within the study area
were located on major rivers (Nanticoke, Wicomico, and Pocomoke Rivers), and near major port
towns of the region (Sharptown, Salisbury, Pocomoke City). The shipyards that were located on
these rivers were larger than the shipyards located in smaller ports. These larger shipyards also
possessed large diversified work forces, more extensive shipbuilding facilities (sometimes
including multiple marine railways), and the capacity to haul larger and heavier vessels from the
water. Each shipyard that was located in a major regional port also had the advantage of a
location along a major transportation route that could not be dammed for tidal power, and
because of their associations with towns, these rivers were dredged when it became necessary.
Consequently, a greater depth of water at shipyards generally correlates with larger more
complex shipyards. This observation is accurate in describing post 1850s shipyards, but does not
appear to accurately describe shipyards during earlier periods.

The geographic location of the Wicomico Creek shipyard (18SO364), and many of the
other shipyards that operated in the period before 1800, does not fit a nucleated urban core
model. Although many of the locations of these earlier shipyards could not be precisely
documented, historical information that placed many shipyards on creeks and small rivers within
the study area indicate that these earlier period shipyards were highly dispersed. It is unclear
how many vessels each of these shipyards constructed. Their dispersed locations probably reflect
the lack of urban centers in the region during the Colonial Period. If many of these shipbuilding
sites were expedient sites designed for a single use, limited use over longer periods may explain
part of the difficulty in archaeologically identifying these earlier period sites during the survey.
Colonial Period shipyards generally constructed smaller vessels than were built at shipyards in
later periods. Consequently, these shipyards did not need to have access to deep navigable
channels as did nineteenth century sites. Also, these shipyards would not have required as much
large-scale infrastructure as later period sites. Finally, if shipbuilders were expeditiously,
infrequently, or irregularly building vessels, shipwrights were probably less likely to invest in the
infrastructure that would have left a more visible archaeological signature. The Wicomico Creek
shipyard is somewhat anomalous. The site represents a significant construction effort to prepare
the site for ship construction and repair. The number of timber pilings present in the lower
slipway would have required weeks if not months to prepare. Because this site was constructed
before the introduction of steam-powered pile drivers, each piling was driven mechanically by
human or with animal power. This slipway represents a considerable expenditure of time,
money, and energy. As a result, it was probably intended to operate efficiently for many decades as a shipbuilding and repair facility. This site is the only shipyard that was identified on Wicomico Creek even though historical records indicate that Henry Lowes, Tubman Lowes, and John Adams all also constructed vessels along the creek. It is possible that the Wicomico Creek shipyard (18SO364) is considerably older than the tree-ring dating indicated, and that this site was the location at which some of these shipbuilders operated.

Regardless of when the site was used, the shipbuilders at 18SO364 and many other locations on Wicomico Creek were not located in close proximity to urban centers. Whitehaven was the closest town to the Wicomico Creek shipyard and was located over 5 km in a straight line from the site. If traveling by road or by water this distance was much greater. There is little research to indicate whether the “town” of Whitehaven was actually a town in the first decade of the nineteenth century. Although it was definitely transportation hub with a ferry crossing and shipyard, it is unknown whether it had acquired all of the diversified economic functions that typically constitute a true urban center. It is clear from this research that 18SO364, the Rewastico Creek shipyard (18WC155), and most likely other shipyards of this period were located at some distance from urban centers.

Social networks clearly played a major role in structuring the economy of old Somerset County. The specific role of those networks in the creation and maintenance of business relationships is less clear. There were kinship relationships between a number of the shipwrights and merchants that were examined as part of this study. The degree of relatedness between these individuals is very difficult to establish. While the role of active social networks may have worked to enhance the business activities of a particular shipbuilder, it is not clear whether these networks operated in this fashion. The larger questions of whether these relationships were coincidental or whether they simply represented part of a larger kinship network is not known. The seventeenth and eighteenth centuries were a period in which the range of an individual’s social network was limited by the distances one could easily travel. Such distances would have limited the selection of spouses to the local community. In many instances these individuals would have grown up near one another and perhaps attended the same church together. Based on purely impressionistic evidence, these local ties seemed more important in the selection of a spouse than as a deliberate strategy to achieve business ambitions. In the seventeenth and eighteenth centuries, the high mortality rate of the population within the study area would
probably have eliminated much of the effectiveness of this active strategy. It seems more likely that social networks were used by the local populations to limit the down side of poor economic performance or to assist in the repair of families that were impacted by the high mortality rate. By the mid nineteenth century such alliances would have become less necessary in providing sources of customers or capital for business endeavors as newspapers began providing regular advertising and a local banking system developed to assist with investment capital.

Social networks do seem to have had some impact on the geographic mobility of individual shipwrights. Throughout the study there was considerable evidence for geographic mobility of shipbuilders and their families. There were several instances in which shipbuilders and their families permanently relocated to areas outside of the study area (primarily Delaware and Virginia’s Eastern Shore), while others such as Sewell Long, moved to Annapolis where he continued to operate as a shipbuilder. Because many individuals who were described as a shipbuilder in the historic documents were only identified at a single moment or for a short period, their status is difficult to determine. In some instances they remained in the study area where they worked, lived, and died in anonymity. In other instances they traveled outside the study area as economic opportunities in old Somerset County declined and new opportunities became available with the opening of the West.

The technological and economic models were useful for describing some of the phenomena of shipbuilding within the project area. Generally, new technology and knowledge entered into the project area in the form of new vessel designs, improvements in old vessel designs, and in improvements in the efficiency of launching and repairing vessels. Over time these technological improvements necessitated greater specialization within the industry and required a greater commitment of capital investment. In 1850, the largest capital investment in a Somerset County shipyard was $2,000. By 1880 the smallest shipyard identified in this study had an infrastructure valued at $4,000. This indicates that many shipbuilders began investing more capital into the infrastructure of their shipyards. Not every shipbuilder followed this path. In 1900, the total investment at the Branford shipyard was just $1,000. But Branford was a shipbuilder who primarily built small fishing and oyster boats and employed just two people. Eight years later most shipyards in the study area had capital improvements ranging between $6,500 and $33,500. In order to build the larger vessels more site infrastructure and greater numbers of employees were necessary.
The technological model was generally accurate in predicting the incorporation of new technology and techniques into shipbuilding in the region. The model did not predict that the resulting introduction of technology would concentrate capital into the hands of fewer and fewer individuals. It was expected that the introduction of marine railway technology, which was considerably less expensive than either a drydock or the construction of a permanent slipway, would have resulted in the creation of greater numbers of shipyards rather than fewer. However, the availability of this lower cost technological development did not create that result. The lack of greater numbers of marine railways is most likely attributable to the economics of shipbuilding in the Chesapeake. Finally, the technological model as it was envisioned for this study did not distinguish between the costs of improvements to the shipyard and possible corresponding decreases in the cost per ton of constructing and repairing vessels. While the technology may have corresponded to increased efficiencies, and lower costs, it did not necessarily equate to greater profitability or quality, which is most of the bottom line for the adoption of new technology.

The economic model, which is impossible to distinguish from aspects of the technological model, has a great deal of utility for explaining the patterns of the overall shipbuilding industry in the region; although, not of individual sites. In the seventeenth and beginning of the eighteenth centuries, the study area could be considered to be located on the periphery of the trans-Atlantic core-periphery relationship and the economic periphery of the Chesapeake Bay as described by Wallerstein (1974, 1980, 1989). In this instance, the study area was on the periphery of the major commercial centers in Europe as well as the political and economic periphery of the Colony of Maryland. As the shipbuilding industry developed in the Lower Eastern Shore region, the relationship changed. Because shipbuilding was an economic activity in which most of the means of production were controlled locally, the shipyards were more directly linked with the European Core than many of the economic relationships between Europe and the Americas. Ships built in the Colony could immediately move from periphery to the Core areas with few middlemen. As a result, as the eighteenth century progressed, the Lower Eastern Shore began taking on some characteristics of the semi-periphery. With the American War of Independence and subsequent trade protectionism of the early Republic, the Lower Eastern Shore became a shipbuilding center for the Chesapeake region for a brief period of time. Gradually the shipbuilding industry in the region began declining as new urban cores, such as the
ports of Baltimore, Norfolk and Philadelphia, eclipsed it. Gradually, even the largest shipbuilding centers in the study area shifted to periphery during the late nineteenth century. In the late nineteenth century the largest Chesapeake shipyards shifted to iron hull, and steam and gas propulsion technology. Through the early twentieth century, the age of sail and the wood hull vessels had reached their largest sizes, but iron and steel hulled vessels continued to grow larger. The widespread introduction of iron hull technology brought an end to the major shipyards in the study area. For several more decades the shipyards in the small ports continued to build small Chesapeake watercraft such as oyster boats and fishing vessels. The economic model relied upon data that was too general and too broad to accurately describe or explain patterns of shipyard establishments and the expansion and contraction of shipbuilding production at individual shipyards. Instead, the economic model is useful for interpreting the collective long term patterns of shipyards within the study area.

**Summary**

This chapter summarized the results of the archaeological fieldwork and historical research presented in earlier chapters. This chapter also presented a proposed outline for the creation of a typology to help compare shipyard sites. This typology draws upon the results of this investigation and incorporates that data with the limited information available about shipyards worldwide. This chapter also describes four models that were tested to help explain archaeological variability of shipyard sites within the study area. These models help to assess the relative importance of different variables in establishing shipyards of varying sizes. The models also assisted in understanding how these patterns of shipyard variability changed diachronically in response to changing economic priorities and rapid technological developments. The final chapter will complete the discussion of this investigation and suggest directions for future research.
CHAPTER 9: CONCLUSION

In this dissertation, I employed the direct historical method to assist in understanding regional patterns of industrial organization based upon the distribution of shipyard archaeological sites. The initial historical research was followed by a field investigation designed to identify shipyard archaeological sites within the study area. Later, supplemental fieldwork examined several of these sites and their variability. The methods that were employed during this project included historical research, GIS predictive modeling, shoreline survey, and intensive site mapping, surface collection, and side scan sonar survey. These methods have been effective in the identification and investigation of historical archaeological sites in shoreline environments.

In this study, the direct historical method was particularly effective in limiting the size of the survey area. Instead of surveying every single waterway within the study area, this method focused the investigation on areas with clear historical evidence of shipbuilding. Overall, the direct historical method was more useful for identifying broad patterns of shipbuilding activities that could often identify specific waterways on which shipyards were located. Despite this fact, the method was far less effective at identifying specific shipyard locations. Even when historical records clearly describe a shipyard at a specific location such as “about one hundred and fifty four yards from and below a place usually made use of …to build vessels at” (Russo 1999:73), it was still very difficult to interpret and locate the shipyard. Even possessing this information about the shipyard location, the site could not be identified in the field. Similarly, several sites including the Wicomico Creek shipyard (18SO364) were identified in the field prior to the availability of historical data about shipbuilding at that location.

The greatest disadvantages of the direct historical method were the biases that are inherent in the use of all historical research. The “tyranny of the written record” generates disproportionate historical information about large, well-known sites, especially those that were located in urban areas. Those shipbuilders that were functionally illiterate and/or lived and worked in rural areas, were itinerant, or operated small expedient sites, are probably not well represented in the historical record. The written record is wonderful for providing a rich context and substantial data for testing archaeological models; however, the nature of the historical data probably skewed the research design to identify larger archaeological sites. At the outset of this project, this was not viewed as a problem since the research design never intended this survey to
be a comprehensive study of all shipbuilding activities in study area. Rather, it was intended to identify a sample of shipyards in order to compare their variability and test models.

The GIS-based predictive model was somewhat less useful than foreseen. Previous research by Ford (2001, 2006) indicated that environmental conditions, physical geography, and cultural geography created some predictable patterns in the location of shipyards. A similar GIS-based model was incorporated into this study, to expand the sample of shipyards that were identified during the fieldwork. This dissertation study identified numerous new archaeological sites in areas that were predicted to have a high to moderate chance of containing shipyard archaeological resources. Unfortunately, many of the variables that were useful for predicting the locations of shipyards were also broadly useful in the identification of all historic and prehistoric sites. Areas that were predicted to have a high potential for containing shipyard sites were also the locations of other maritime resources—mainly wharves, piers, landings and ferry crossings. The presence of these other site types masked evidence of shipbuilding activities. It is clear from this study that shipyards were not usually built in poorly drained swampy locations. In fact, the one constant variable that constrained the location of the shipyard sites was the presence of relatively stable soils along the shoreline even when the mapped soil characteristics were not well-drained soils. This variable was almost equally applicable to the location of historic wharves and landings. As a result of this investigative survey, significantly more wharves and landings were discovered than were shipyards.

Ford (2006) concludes his study by suggesting that the GIS-based predictive model requires greater refinement prior to becoming useful in identifying shipbuilding sites. Based on the results of this dissertation study, I question whether the effort to develop a more refined predictive model would be worthwhile. Shipyards, like few other sites, are already highly constrained within the maritime environment because they must be located along the shoreline of navigable waterways. Based on this dissertation research, creating better models that further refine site locations would be difficult based on the resolution of the geographic data sets. This study demonstrated two elements of maritime archaeological sites, particularly those located within narrow riverine environments and environments with extensive tidal marshes that limit access to the waterways. First, because many maritime sites are constrained by their need to be adjacent to the waterway, they are often densely concentrated within small areas that possess the optimal site characteristics of well-drained soils and a moderate slope. The processes and
environmental characteristics that would normally distribute archaeological sites across the landscape, instead concentrate these sites in clusters in maritime environments. Second, although early and expedient shipyard sites also may have been clustered in optimized site environments, many of the shipyards from later periods identified in this study were located in areas that were modified landforms. It is this modification of the natural environment that is one of the hallmarks of human civilization and one of the characteristics that complicates the site modeling process.

In a region in which there were relatively few “optimal” shipbuilding locations based on landform, slope, soil characteristics, and adjacency to navigable waterways, it would be expected that shipyards mostly would be located within these areas. Instead, shipyards were located in areas that were predicted to have a moderate or low probability of occurrence. Several of these sites exhibited specific instances in which the landform and the topography and/or slope were altered to achieve the desired site characteristics. These modifications primarily involved the alteration of the shoreline slope by extending a slipway or a marine railway into the water through the construction of an artificial slope on the existing topography through the addition of fill. In at least one instance, they also may have modified the landscape through cutting and excavating downward through the shoreline (although this may have been the result of natural erosion). At three of the four shipyard sites that were intensively investigated, the shoreline at each site represented a micro-environment that was not easily captured by the gross scale of the GIS data. It is also possible that several sites were altered through the introduction of fill, or an aggregate material to stabilize the shoreline. Each of the shipyards that were investigated exhibited surprising shoreline stability because of the presence of shell or gravel. This was not the norm for most of the mucky study area.

The discovery of five new shipyard sites (18WC3, 18WC160, 18WC155, 18WC164, and 18SO364) more than doubled the number of known shipyard archaeological sites in Maryland. These sites represent a wide range of chronological periods. The study of these sites in conjunction with other shipyards and marine railways advances the disciplines of maritime and industrial archaeology and our understanding of the cultural development of shipbuilding on the Lower Eastern Shore of Maryland and the Chesapeake Bay. These sites were discovered in a region that has had some previous professional archaeological investigations of the shoreline (Lowery n.d.). The project has demonstrated the difficulty in undertaking comprehensive surveys within tidal creeks and estuaries. Differing tidal, environmental, and weather conditions
affect the quality of the survey data that is collected. Many of the shoreline sites that were identified during this survey, which were readily visible at low tide during the winter months, would not have been visible during the low tide of the summer months. While every attempt was made to maximize the results of this survey, the water-based methodology employed during this project resulted in uneven survey coverage. Issues that affected the survey coverage included the weather conditions, the distance of a survey area from a boat ramp, the size of the survey area, the temperature, the time of high and low tides, and the depth of the water.

A final difficulty in the archaeological identification of shipyards lies in the extensive redevelopment of many of the shipbuilding centers. Many urban shipyards located in industrial and port towns including Snow Hill, Pocomoke City, Salisbury, Sharptown and Whitehaven have all been redeveloped by urban renewal. With the exception of the Whitehaven shipyard (18WC104) nearly all evidence of the shipyards at these locations has been destroyed or covered by development.

As a result of this survey, it is now clear that some of the best, well-preserved maritime cultural resources are present in the small creeks and rivers of the State’s most rural waters. Many of the creeks in Wicomico and Somerset Counties are particularly likely locations for conducting serious archaeological research. The deterioration of these cultural resources is more often the result of neglect and natural decay than from attempts to redevelop the shoreline. It is also clear that the investigation of sufficient numbers of these rural sites can serve as a laboratory to answer significant research questions about the development of the maritime cultural landscape. If completed before the waterfront of this region becomes completely enveloped by the installation of seawalls, rip-rap, piers, docks, and residential developments, this research will contribute to a more fully developed model of the regional cultural development on the Delmarva Peninsula.

Based on the results of this investigation, both sites 18SO364 and 18WC104 were intended for long-term shipbuilding operations. These long-term operations required significantly more investment in fixed infrastructure such as slipways. Other shipyard sites discovered during this survey also indicate the difficulty of using GIS based predictive models to predict shipyard locations.
Directions for Future Study

Shipyard archaeology is still in its infancy and there are many areas that still need investigation. One direction of future study lies in additional research into the central theme of this study to explain conflicting viewpoints about infrastructure at shipyards. In this study, shipyard infrastructure formed the basis of the research strategies to identify shipyards, analyze and compare individual shipyards, and it was also the basis of a typology designed to rank them. Numerous sources suggest that most pre-industrial shipyards required minimal infrastructure to launch and repair sea-going vessels (Goldenberg 1968; Hunter 1999; MacGregor 1993). This viewpoint was also held by a mid-nineteenth century commentator on French shipbuilding, named Patrick Barry. Barry (1864:174-178) stated the following:

The French shipyards are marked by one great feature. They are cheap places. They make no show, and possess only the barest necessaries. A French shipbuilder gets his piece of ground, and very grudgingly erects a very mean wood fence round it. Had his countrymen, in the absence of coal, not a weakness for timber, the fencing of the piece of ground would probably not be thought of. The fencing of the piece of ground completed a saw-pit is dug, and the boards in excess of the fencing are good enough for the construction of a rude mould loft, and a still ruder office. Two Canadian backwoodsmen with the greatest ease would lay out and complete for occupation and business a French shipbuilding yard in a week, and a ten pound note would go a long way towards paying for the material used. A French iron shipbuilding yard is a trifle more elaborate…Putting the two on a liberal footing, the capital sunk in a French wood shipbuilding yard is from £100 to £200, and the capital sunk in a French iron shipbuilding yard is from £200 to £500. On the Thames, and in England generally the capital sunk in a wood shipbuilding yard is from £1,000 to £5,000, and in an iron shipbuilding yard from £5,000 to £25,000. On English iron shipbuilding yards of the larger classes the capital sunk ranges from £50,000 to £250,000. The difference between the French and the English shipyards is remarkable as regards investment. The more money an English shipbuilder makes the more he invests in brick and mortar and in leasehold land, if freehold happens to be beyond his reach. It is difficult to say what a French shipbuilder does with his surplus profit, but it is clear he does not spend it on his premises…. This is a remarkable peculiarity of French sentiment as distinguished from English sentiment. And on the whole it must be confessed that the French are right and we wrong. In looking at the completeness, orderliness, and extent of an English shipyard we form an erroneous judgment. We might just as reasonably judge character by the dress people wear or the houses they inhabit…

Despite this viewpoint that is held by many maritime historians and researchers, there are few contemporary accounts, other than Barry’s (1864), to support this conclusion. Investigations at several shipyard sites, including several documented in this study, indicate that slipways were
more complex than would be expected if the minimalist interpretation of shipyard infrastructure were accurate. Additional research to identify more shipyard slipways would be one method to resolve this issue. Many shipyard studies that have been conducted represent relatively small extensive efforts to investigate these sites. Their complexity and size make it difficult to place archaeological testing into a broader context. One of the most useful endeavors for understanding the shipyard and the people who worked at these sites would be several intensive in-depth investigations of shipyards in various regions of the United States. Such investigations would go a long way in validating the typology that was proposed in this study and in developing more realistic models of shipyards before they are lost to rising sea-levels and residential development.
APPENDIX I: VESSEL GLOSSARY

Bugeyes- a type of vernacular vessel form that developed on the Chesapeake Bay. Bugeyes were shallow draft, work vessels that were built from logs fastened together and built-up with planking and decked. Bugeyes were introduced in the 1870s and continued in use until the 1960s (Chesapeake Gateways 2010).

Brigantine- a two-masted sailing vessel with a square rigged foremast and a fore- and-aft rigged mainmast.

Periauger- a shallow draft, two-masted cargo-carrying craft, ideally suited to the shallow waters. They were usually made of a “dugout and a split cypress log and propelled by both oars and sails” (Warshaw 2010).

Pinks- a term used to describe small vessels probably derived from the Dutch word pincke. They were flat bottomed shallow draft vessels with a large cargo capacity, and were generally square rigged.

Pinnaces- a light boat, propelled by sails or oars that was typically associated with a larger vessel.

Pungy-or Schooner-pungy - a two-masted vernacular watercraft developed in the Chesapeake Bay for oyster dredging and shipment of general cargo. Pungies had V-shaped hulls ranging in length between 30 and 80 ft and operated between the 1840s and 1940 (Chesapeake Gateways 2010).

Schooner- a two or more masted sailing vessel with fore-and-aft sailing rigs in which the forward mast was no taller than the rear masts. In the United States schooner, design continued to improve and increase in size. By the early twentieth century, some American schooners were equipped with five or six masts.

Shallop- a seventeenth-century open workboat that was small enough to row but also had one or two sails. Captain John Smith’s shallop was approximately 30 ft long and 8 feet wide. It drew less than 2 feet of water and carried 15 men.

Sloop- a one masted sailing vessel with a single jib, or headsail. Chesapeake sloops were typically engaged in regional coastwise service.

Ship- the term for a large three-masted, square rigged, sailing vessel with spinnakers attached fore of the lower main mast. The ship was one of the major transoceanic sailing vessels of the eighteenth century.

Skipjack- also called a deadrise, were single masted vessels approximately 25–60 ft in length. Most skipjacks were built between 1896 and 1915 for use in oyster dredging (Chesapeake Gateways 2010). The development of the skipjack represented the end of the era of small sail
powered boatbuilding in the Chesapeake Bay. The skipjack was both less expensive and required less skill to build. As a result a new skipjack cost only about $600 to construct compared to a bugeye of equal size (Lesher 2002).

Snow - a two-masted square rigged vessel with a spinaker on the lower foremast and/or a trysail set on a small mast aft of the mainmast. The Snow was used in the eighteenth century transatlantic tobacco trade.
APPENDIX II: DENDROCHRONOLOGY DATES

The tree-ring cores were processed and analyzed, and a handful were found to match together to form a site master. All but samples 16 and No. were included in the site master, which spanned the years 1681 to 1798. The Columbia Dendrochronology Lab matched the pine site master. The dated samples are shown below, along with the last measured ring date:

Wicomico Creek Shipyard (18SO364)

Timber 1 sample # 16=1793
Timber 1 sample # 17=1797
Timber 1 sample # 22=1798
Timber 2 sample # 26=1798
Timber 1, sample # 40=1794

Rewastico Creek (18WC155)

Timber 1 sample No. 1791

Oxford Tree-Ring Laboratory

UK Office
Tel: 07941 223576
2 Brookland Road
Bristol
BS6 7YH

USA Office
Tel: 410 929 1520
7 Park Circle
Rising Sun
Maryland 21911
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Hebron 7.5’ Topographic Quadrangle.
Monie 7.5’ Topographic Quadrangle.
Wetipquin 7.5’ Topographic Quadrangle.
Snow Hill 7.5’ Topographic Quadrangle.
Pocomoke City 7.5’ Topographic Quadrangle.
Public Landing 7.5’ Topographic Quadrangle.
Marion 7.5’ Topographic Quadrangle.
Kingston 7.5’ Topographic Quadrangle.
Crisfield 7.5’ Topographic Quadrangle.
Marion 7.5’ Topographic Quadrangle.
Princess Anne 7.5’ Topographic Quadrangle.
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BIOGRAPHICAL SKETCH

Jason Moser grew up within walking distance of the Chesapeake Bay. In high school and college he developed a passionate interest in archaeology and maritime history. In 1992, he received his BA in Ancient Studies from the University of Maryland Baltimore County (UMBC). That year he also began working as an archaeologist for the Maryland Department of Transportation. Between 1997 and 2002, he worked as a historical archaeologist at Anne Arundel County’s Lost Towns Project. The project was dedicated to the investigation of seventeenth and eighteenth century archaeological sites in Maryland. In 1998 he received his MA degree in history from University of Maryland Baltimore County (UMBC). His thesis investigated the historical development of Colonial ropewalks and the ropemaking industry in the Chesapeake region. Later, Mr. Moser continued his interests in maritime archaeology by learning SCUBA and becoming a volunteer diver with Maryland Maritime Archaeology Program (MMAP). He moved to Florida in 2002 to pursue a PhD in Anthropology at Florida State University (FSU). Jason was married in 2003 and has young daughter. While working on his dissertation, he worked as a contract archaeologist on projects throughout the southeast and mid-Atlantic regions. He currently works for the Florida Public Archaeology Network in Crystal River, Florida.